THE SEVENTY-FOUR GUN SHIP

Vol. 3

by JEAN BOUDRIOT

TRANSLATED BY DAVID ROBERTS





THE SEVENTY-FOUR GUN SHIP

VOLUME I : HULL CONSTRUCTION.

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Cover Painting by Wm. Gilkerson



Jean Boudriot is the leading authority in the world on French ships of the sailing era. Since the first volume of **Le Vaisseau de 74 Canons** appeared in 1973, he has published on average one book a year, each devoted to a different subject and forming what he calls the Collection Archéologie Navale Française. His work is distinguished by the highest standards of historical accuracy and by his remarkable skill as a draughtsman, through which he has succeeded in bringing his subjects to life in a way never before achieved for the 18th century warship. A well-known figure at international conferences and a prolific contributor to the specialist publication **Neptunia**, Jean Boudriot is a former President of the Council of the Musée de l'Armée in Paris, and a Council Member of the Musée de la Marine. For the last few years he has run a course in naval archaelogy at the Ecole des Hautes Etudes en Sciences Sociales. He and his wife live in Paris, and have a holiday home near Angoulême.

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A Practical Treatise on the Art of Naval Architecture

English Translation by David H. Roberts

VOLUME III

MASTS – SAILS – RIGGING

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FOREWORD

Almost the whole of this Volume is devoted to rigging our 74, using the word "rigging" in its broadest sense, although it is sometimes used to refer to the cordage alone. I have divided the subject into three chapters: the first covers Masts, the second Sails, while the third treats the Rigging (in the restrictive sense), which supports the masts and sails.

There is nothing new about the subject-matter, which has been treated by a number of excellent authors; it is well-documented, and my only contribution has been to assemble it all conveniently within one volume, organising it and and laying it out as clearly as possible. I have increased the number of drawings, although they may not have quite the same appeal as those illustrating the first two volumes; rigging is a somewhat thankless subject, and I can assure you that at times I had to discipline myself to complete a task which frequently seemed to me to be boring.

Do not be discouraged by the mass of detail. The important thing is first of all to understand perfectly the underlying principles of rigging, since this is the best way to avoid getting lost in their application. I should however add that the solutions adopted in obedience to these principles may well vary in detail, since there are no hard-and-fast rules: the art of rigging is governed less by rules than by custom, which varies between different ports.

I will not make any comments regarding the layout of this Volume, since my method of working will by now be familiar: my objective, to provide page by page all the information needed to become familiar with the subject, in such a manner that there should be no need to pause or to have recourse to other works. Added to this is my concern with the logical order of things, of which I have already spoken.

I have strayed somewhat from the strict path of describing a seventy-four gun ship in giving a few tables of dimensions and proportions which ought to make it possible to work out the rigging of any other vessel. Indeed, it is true that the degree of similarity between three-masted ships, whatever their size, is almost total, and I would go so far as to say that the information learned about the rigging of a seventy-four should make it easy to understand that of a vessel with two masts, or even one. Only lateen-rigged vessels need to be treated somewhat differently; I have gathered together some material regarding such vessels, but I shall use it elsewhere*, since my first task is to complete the fourth and final volume of *The Seventy-Four Gun Ship*. But believe me, it is hard for an author researching a subject as rich as naval archaeology to resist the many temptations to be diverted along other paths.

At the end of this Volume I have included a general Table of the French Navy in 1780, using schematic diagrams to introduce the various types of ships; while this may prove of general interest, it also confirms the notion of similarity existing between all these vessels, for which an understanding of the seventy-four will provide the key.

Finally, the tables of prices and costs should help to underline the considerable strain imposed on a nation in order to maintain a Navy.

J.B., 1975

*See for example J. Boudriot *Chébec Le Requin 1751*, Paris 1987.

TRANSLATOR'S NOTE

In contrast to the two earlier volumes of this work, the subject of masting and rigging is relatively well documented among (nearly) contemporary English writings, albeit still in less detail than in the works of for example Romme or Lescallier.

My main source for the technical vocabulary used in this volume has been David Steel's *The Elements and Practice of Rigging and Seamanship* (2 Vols, 1794), and the 1798 expanded edition. I have also consulted Darcy Lever's *The Young Sea Officer's Sheet Anchor* (1808), and for somewhat earlier comments William Falconer's *Universal Dictionary of the Marine* (1780 edition). Among modern works, two books in particular stand out: James Lees' *The Masting and Rigging of English Ships of War, 1625 - 1860*, and John Harland's *Seamanship in the Age of Sail*.

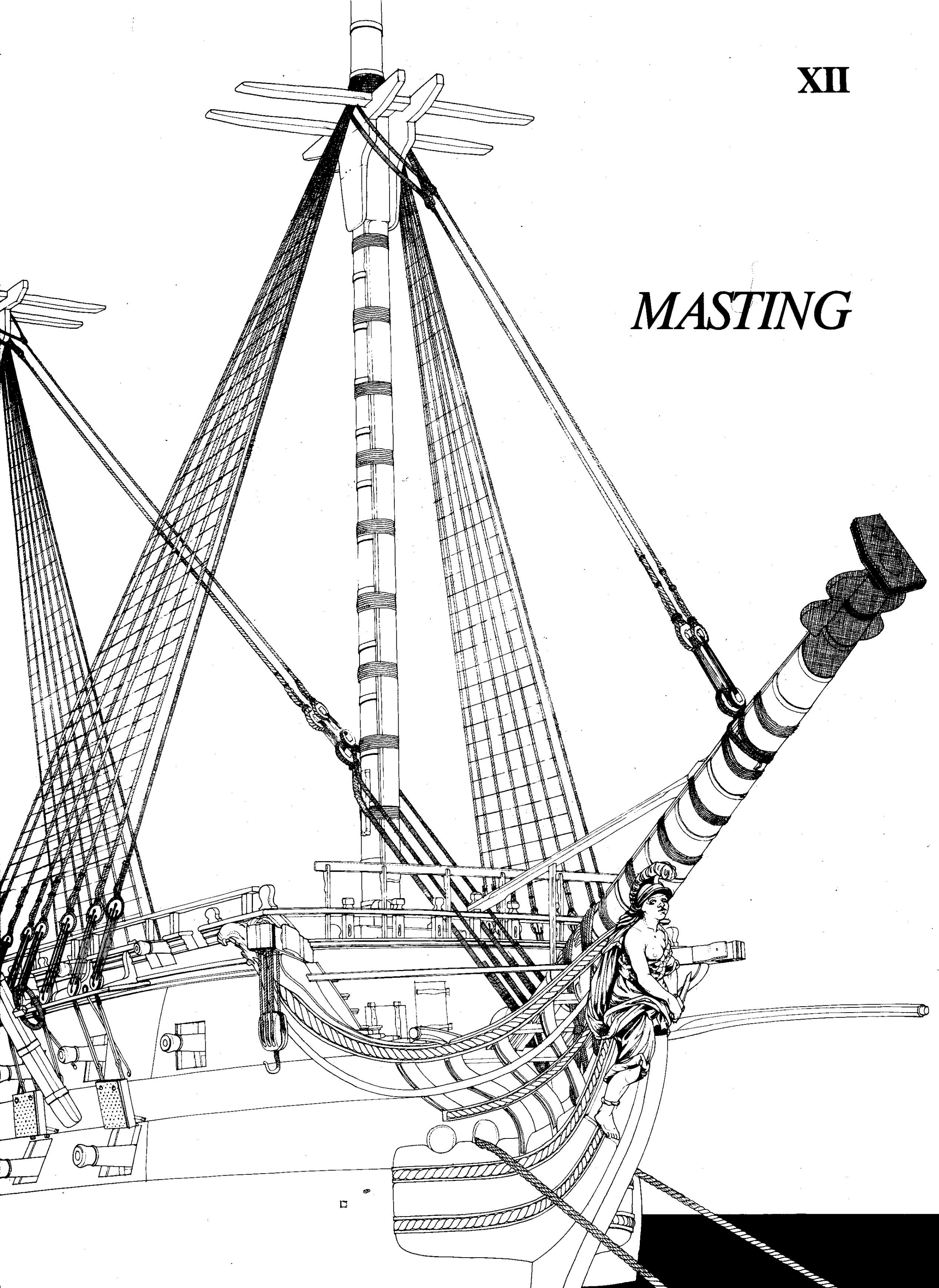
For French-English dictionaries I have used in particular Lescallier's *Vocabulaire des Termes de Marine Anglois et François* (1797 3-vol edition), probably the best bilingual dictionary of the period, and Romme's *Dictionnaire de la Marine Anglaise* (1804), but as I have remarked before there is no really satisfactory dictionary and I have indeed over the past few years begun to compile my own.

Once again I must own my debt of gratitude to many people, not least to Jean Boudriot for his constant encouragement, and to his wife for her unfailing hospitality on my frequent visits to Paris and Angoulême. As with the two first volumes I was able to call on the invaluable assistance of David White, Curator of the Draught Room at the National Maritime Museum at Greenwich; despite many other calls on his time, he has once again painstakingly read the manuscript and made many suggestions for improvement. If despite his help some mistakes have slipped through they are my sole responsibility.

David H. Roberts
1987

XII

MASTING



1. General Considerations

First of all I would suggest that you look at Figure 215, both to get an overall idea of the way the masts of our 74 are arranged, and to become familiar with the basic terminology.

From the start one very elementary question can be posed: why does our 74 have three masts (as do almost all ships of more than 30 metres in length)? In order to answer this question, and to explain the general arrangement of masts and sails, I must first impose on you some rather abstract explanations, but not I hope so much as to put you off.

When the sails carried by various masts of the ship are at right-angles to the keel, with the wind dead astern, the sails mask each other. If it is decided to rely on the forward sails, the after sails must be *furled*; the thrust of the wind is only applied to part of the sail area, but with sufficient force to compensate for the fact that only a proportion of the sails are spread. The distance separating the masts, however great, has no effect on the thrust of the wind on the sails.

Furled: rolled up along the yards.

If the wind direction is oblique in relation to the keel, and if the sails are spread at a more or less acute angle, it is clear that the thrust of the wind will be less effective than in the former case. In order to compensate for this, a lot of sail has to be carried, but the sails must not mask each other.

A vessel close-hauled will not sail closer to the wind than about 6 points (67°30′). In this condition its yards will be braced approximately midway between the ship's head and the direction of the wind. That is to say at three points off the wind (33°45′). Armed with this fact, if we draw two sails parallel with each other whose width is equal to half the length of the vessel (for experience has shown that this is the maximum width possible for a sail), and arranged so that they do not mask one another, we will find that the distance between the two forward (or after) edges of these sails will be equal to three tenths of the vessel's length, and that this will also be the distance separating the two masts on which they are set. Thus a priori three masts will be required.

In fact, if three masts are used they will not be equidistant, and in addition to the three vertical masts an oblique mast will be used, stretching forward of the stem. This oblique mast, and the aftermost mast, carry considerably less sail than the other two vertical masts. They have a dual role - to balance the other sails carried, and to facilitate ship-handling, since the sails spread at either end of the vessel act with the force of a lever about its centre of lateral resistance*. The sails spread on the other two vertical masts, each mast providing roughly equal thrust, constitute the major part of the sail area necessary to push the ship along.

*The centre of lateral resistance is the point at which the force applied at right angles to the keel would cause the ship to move sideways whilst maintaining its heading.

This is more the fruit of experience than theory, and in practice the masts are positioned as follows:

The foremast is situated 1/9th (4/36ths) of the vessel's length abaft the stem. The mainmast is somewhat aft of the midship point (1/36th to be precise). The mizen-mast is placed 1/6th (6/36ths) of the vessel's length forward of the sternpost. But there is nothing absolute about these distances: it is more a general rule from which the shipwrights may deviate, and sea officers also, who may make minor corrections to the positioning of the masts according to "feel" and their experience of the sea*; but it should be said that the number of exceptions, compared with the general rule, are rather limited.

*Commonly, it is the position of the foremast which is modified.

There is a big difference between the total sail area carried by the fore- and mainmasts combined, and that of the mizen-mast. Thus the total thrust generated by the wind from any point other than dead astern is always forward of the midship point.

Why should that be? Practical experience has led sailors to understand that the overall pressure of the water on the vessel's hull is equivalent to a single force acting at a point forward of midships (the centre of lateral resistance), without it being possible for all that to determine exactly where. Thus it is about this centre that the thrust of the sails on each mast must be in equilibrium, and the thrust of each mast should be in inverse proportion to its distance from the centre of lateral resistance. This explains therefore why the mizen-mast carries so little sail when compared with the mainmast, and the foremast rather less than the main also. The role of the sails set on the bowsprit is to restore a delicate equilibrium between the thrust of the mainmast and the mizen, and that of the foremast alone.

The dimensions of the masts are determined as a function of the sails which they are designed to carry, which explains the short length of the mizen when compared with the other masts. As far as the bowsprit is concerned, its massive section is dictated not by the amount of sail which it carries, but by the support which it must give to the heavy cordage holding up the vertical masts.

If as an example we take a vessel with a single mast, such as a cutter, the mast must be positioned at the point of intersection of the relative horizontal effect of the resistance of the water with the length of the underwater hull, that is with the wind astern*.

Similarly, if we strike a perpendicular from the vessel's centre of gravity (at the waterline), the point at which this vertical is intersected by the absolute effect of the resistance of the water is the height at which the various degrees of thrust imparted by each sail on that mast combine. By setting enough sail to take this height into account the vessel will maintain an even keel.

However, it should be recognised that it is almost impossible to determine the direction of the absolute effect of the resistance of the water, and for the time being (remember, we are in 1780) even the most scientific calculations have not revealed a proper understanding of the effect of the resistance of the water on the forward part of the hull.

It is known that the relative horizontal effect of the resistance of the water is on the same plane as the direction of the overall resistance, but since the position of the first cannot be defined, the second remains equally impossible to determine.

It should be noted also that the point of intersection of the resistance of the water and the perpendicular struck through the centre of gravity at the waterline varies according to the amount by which the wind is abeam*. In short, this so-called *point of perfection*, or *point vélique*, can only be guessed at, and an equilibrium arrived at through the use of multiple sails, handled empirically as circumstances change.

This does not prevent designers from trying to determine the *centre of effort*, i.e. the centre of gravity of all the planned sails spread on their respective masts with the yards at right-angles to the keel. But this calculation takes into account only the courses, topsails, topgallant-sails, mizen, and the standing jib.

*The relative horizontal effect is that which corresponds to the pressure of the water on the stem. To find the absolute thrust of the water on the stem with the wind on the quarter, three factors must be known: the fore-and-aft thrust, the lateral thrust, and the vertical thrust. The first two form two sides of a parallelogram, the diagonal of which (starting from the point of intersection of these two forces on the exterior of the lee bow) cuts the axis of the waterline inclined according to the degree of heel.

*Strictly speaking, these two lines can only intersect with the wind astern; as soon as it is abeam, they no longer intersect; the centre of gravity at the waterline shifts to leeward of its axis because of the heel, and the direction of resistance of the water, which starts on the lee bow, passes to the windward side without intersecting the perpendicular at the centre of gravity on the waterline.

Point of perfection: called by Steel (Naval Architecture) the ***point vélique.***

centre of effort.

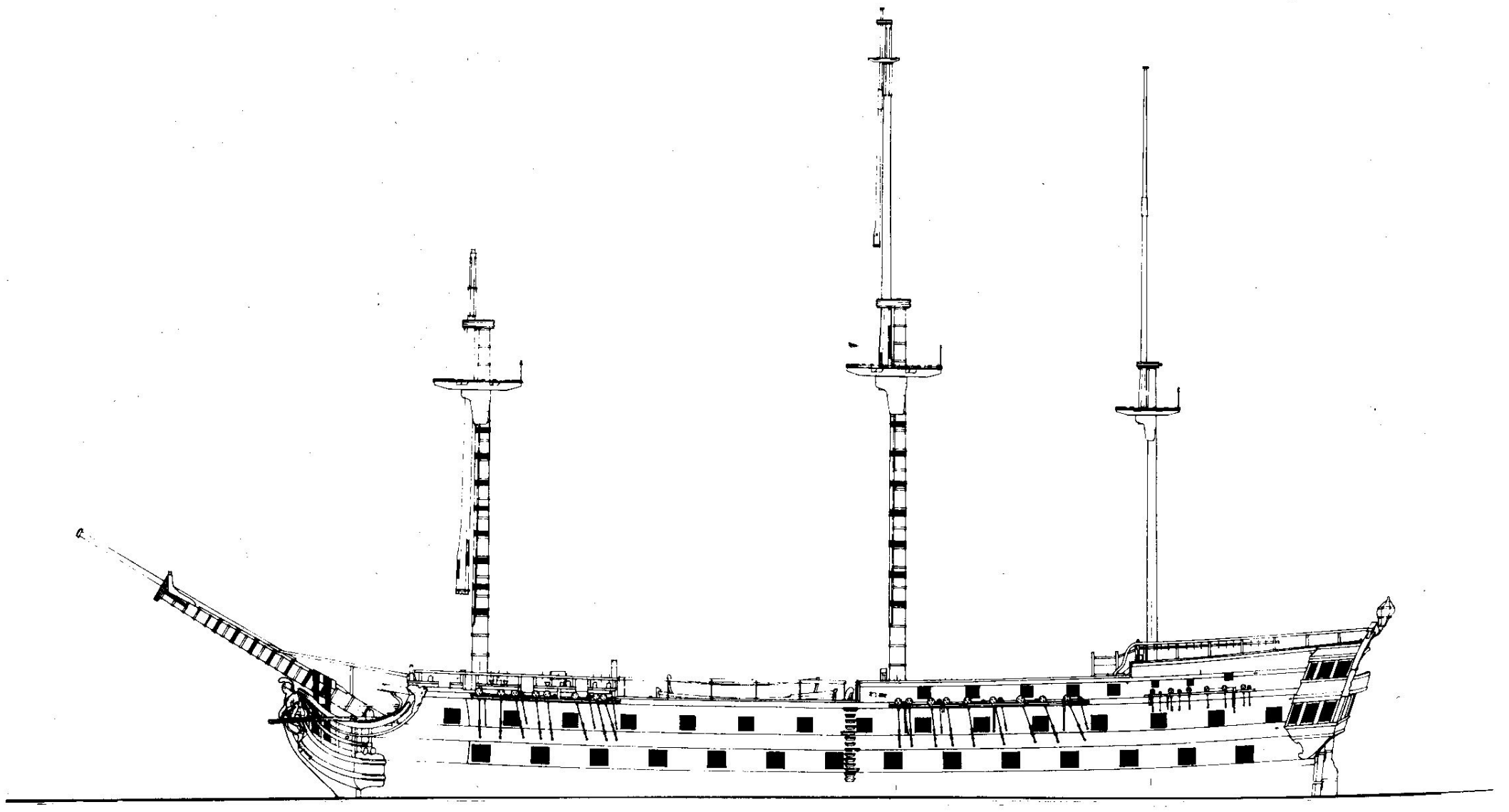
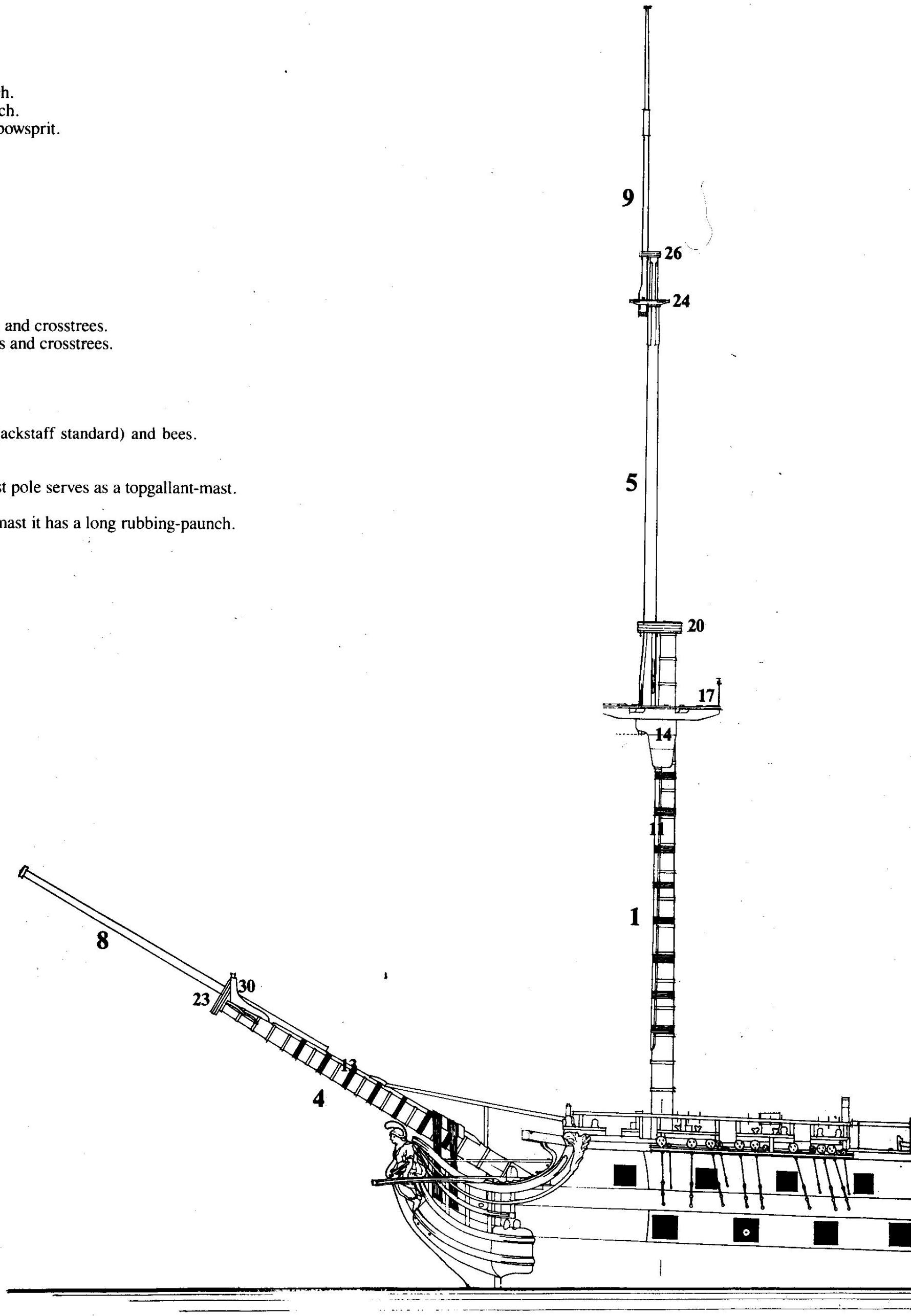


Fig. 215
The Names of the Masts and their Fittings

1. Fore lower mast.
2. Main lower mast.
3. Mizen lower mast.
4. Bowsprit.
5. Fore-topmast.
6. Main-topmast.
7. Mizen-topmast.
8. Jibboom.
9. Fore-topgallantmast.
10. Main-topgallantmast.
11. Foremast rubbing-paunch.
12. Mainmast rubbing-paunch.
13. Gammoning-fish of the bowsprit.
14. Foremast bibbs.
15. Mainmast bibbs.
16. Mizen-mast bibbs.
17. Foretop.
18. Maintop.
19. Mizen-top.
20. Foremast cap.
21. Mainmast cap.
22. Mizen-mast cap.
23. Bowsprit cap.
24. Fore-topmast trestletrees and crosstrees.
25. Main-topmast trestletrees and crosstrees.
26. Fore-topmast cap.
27. Main-topmast cap.
28. Mizen-topmast hounds.
29. Mizen-topmast pole*.
30. Sprit-topmast standard (jackstaff standard) and bees.

*On our 74 the mizen-topmast pole serves as a topgallant-mast.

If the mizen-mast is a made-mast it has a long rubbing-paunch.



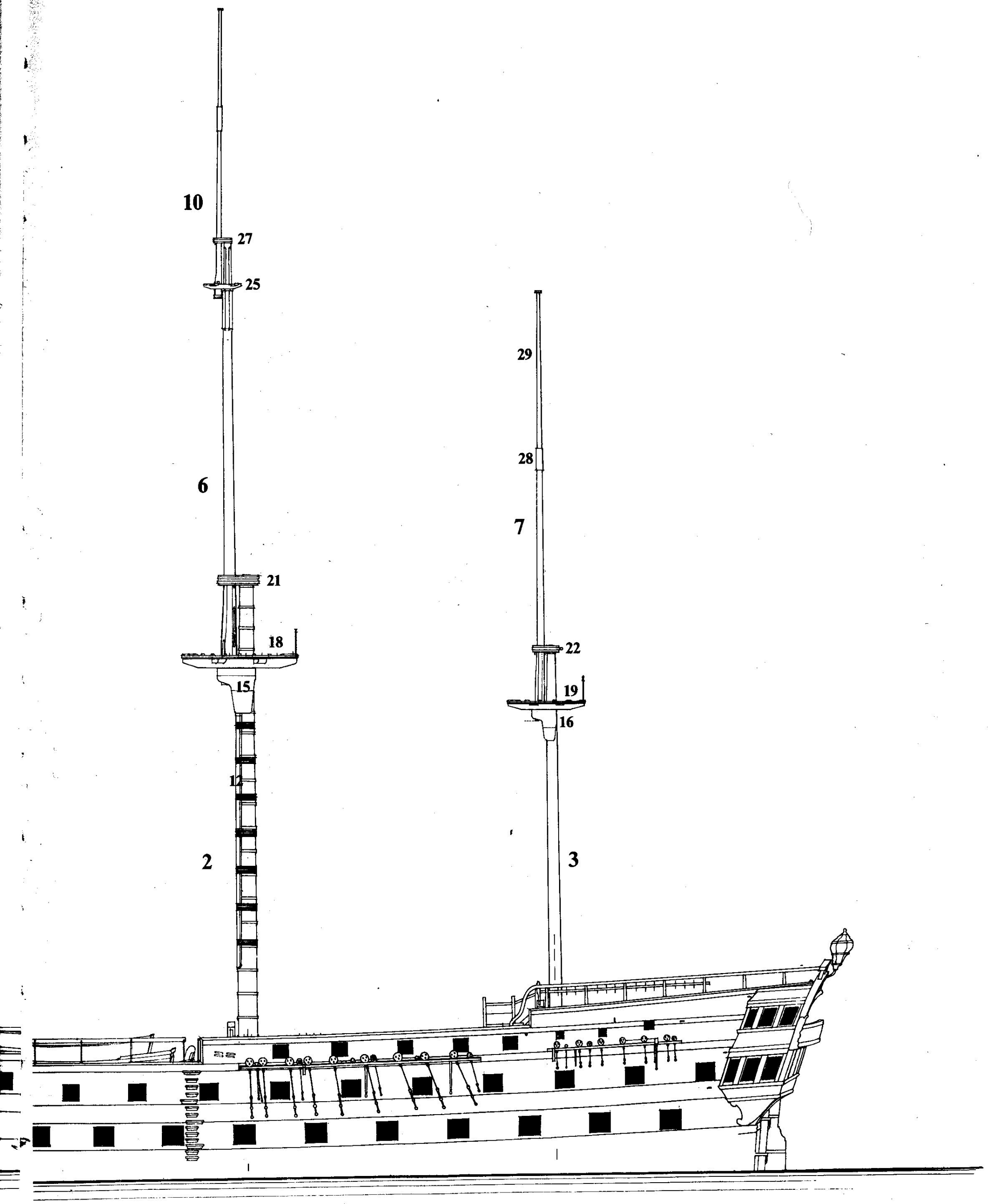
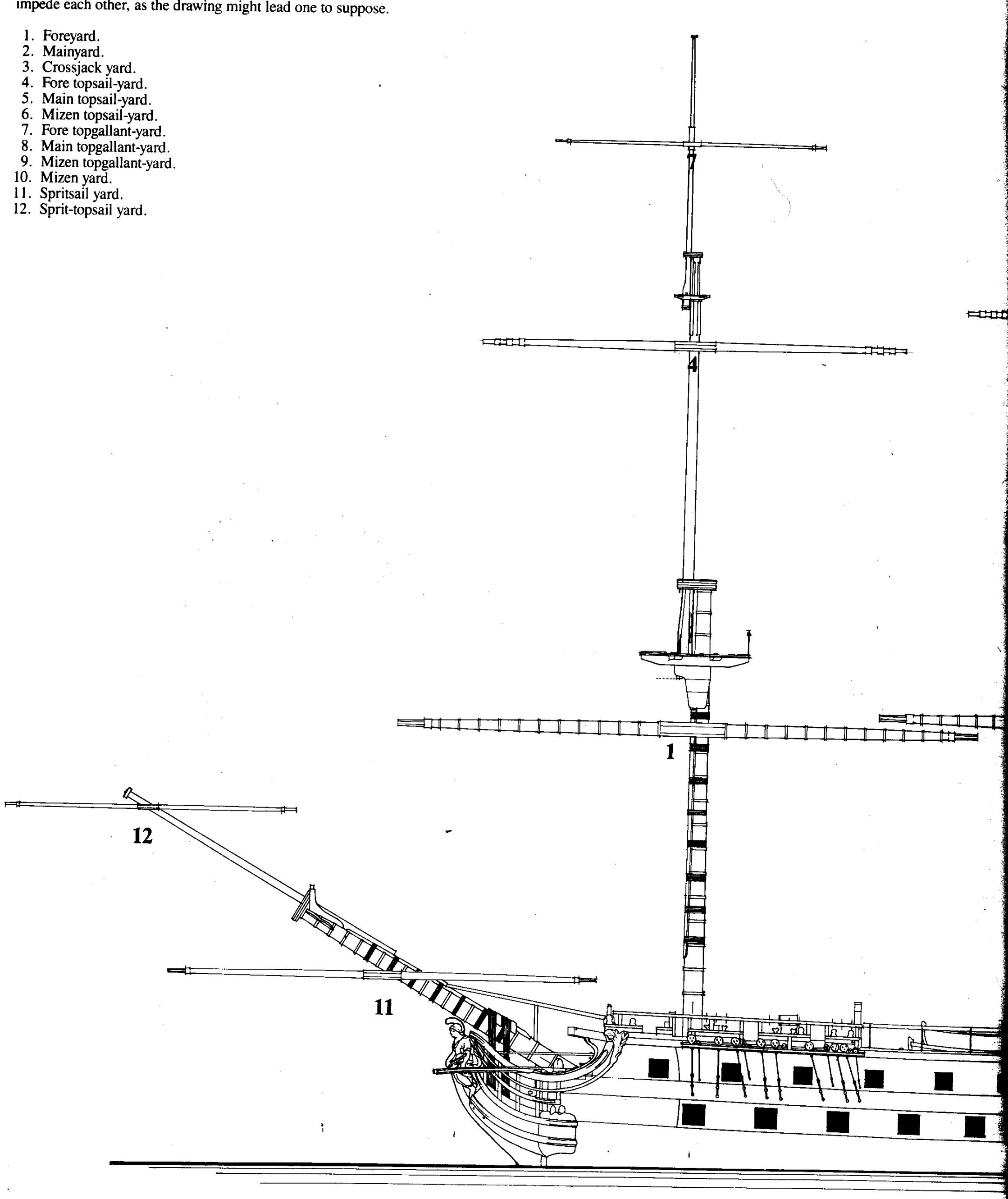
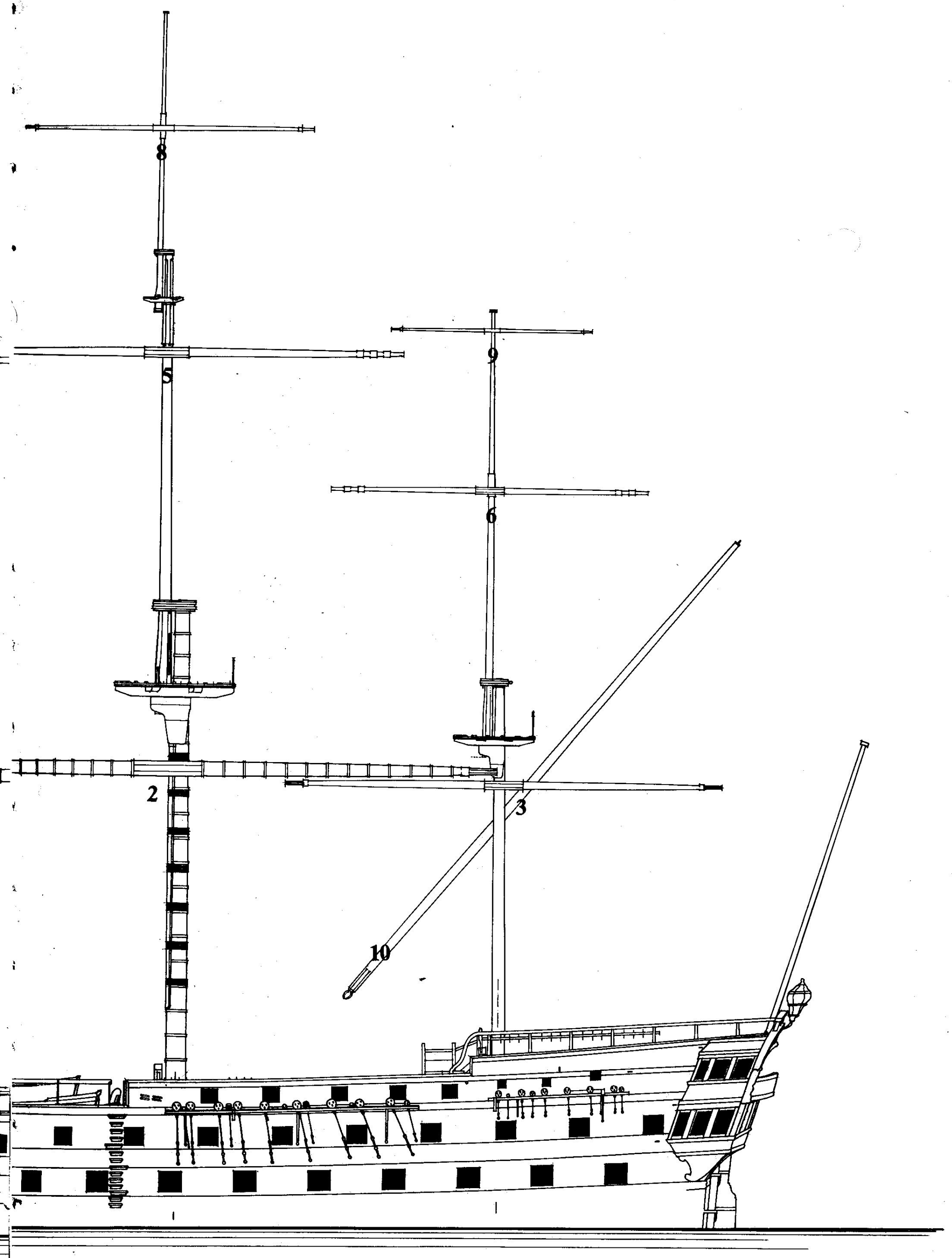

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Fig. 216
The Names of the Yards

This representation of the yards is wholly theoretical, since they are shown hauled parallel to the keel of the vessel which with the exception of the mizen-yard is never done. The lower yards do not therefore impede each other, as the drawing might lead one to suppose.

1. Foreyard.
2. Mainyard.
3. Crossjack yard.
4. Fore topsail-yard.
5. Main topsail-yard.
6. Mizen topsail-yard.
7. Fore topgallant-yard.
8. Main topgallant-yard.
9. Mizen topgallant-yard.
10. Mizen yard.
11. Spritsail yard.
12. Sprit-topsail yard.




8
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The next step is to find the centre of effort of each sail (see Figure 217). Then, from each of these points, a perpendicular is struck to the waterline and to any other vertical. A table is drawn up, and in the first column is entered the name of the sail, in the second its surface area, in the third the distance between its centre of gravity and the waterline, in the fourth the distance from the vertical, in the fifth the product of the surface area of the sail multiplied by the distance of its centre of gravity from the waterline, and in the sixth column the product of the surface area times the distance from the vertical.

These calculations are repeated for each sail, and at the end the figures in the fifth and sixth columns are added up and divided by the total sail area.

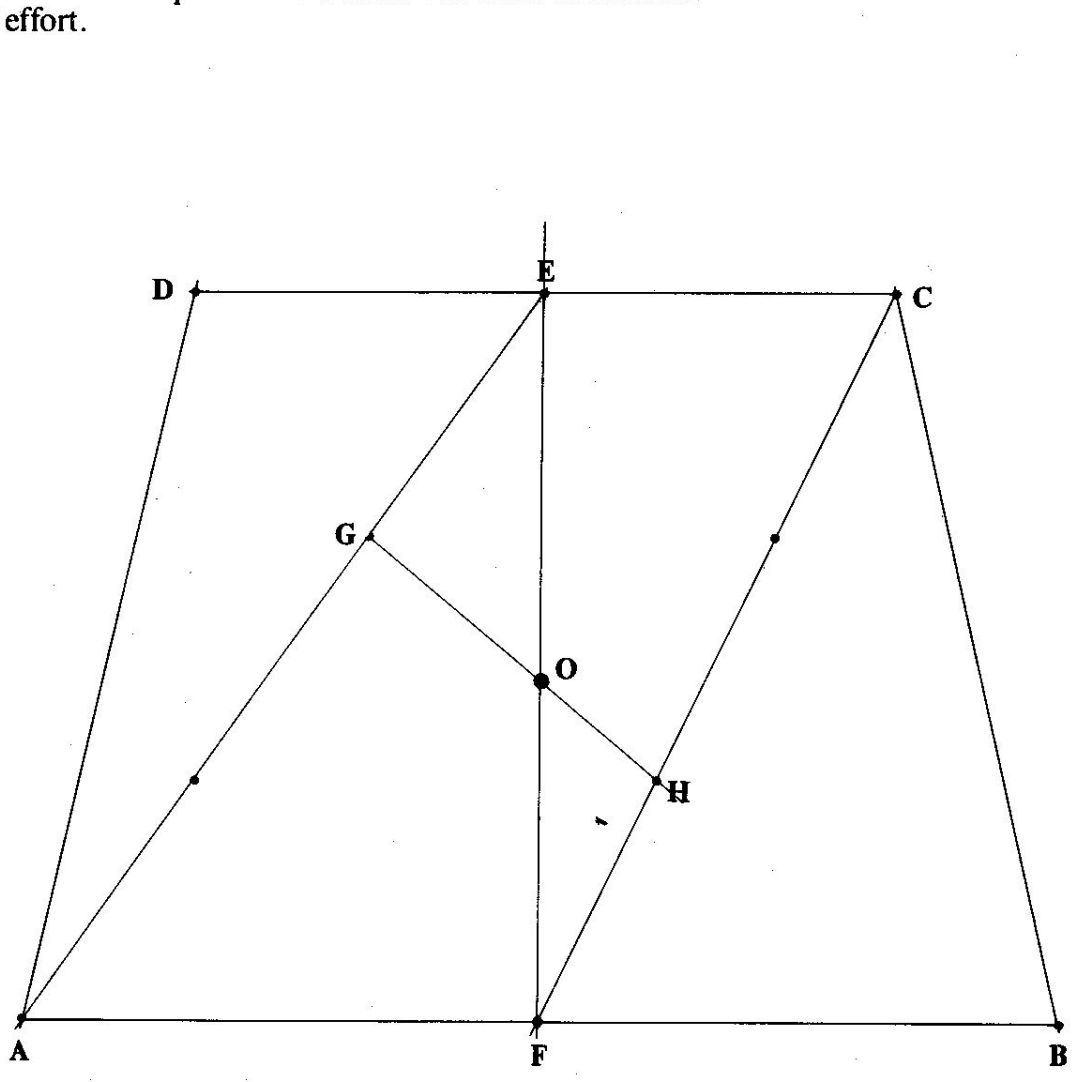
Then two lines are drawn: the first parallel with the waterline and at a distance equal to the first figure, and the second parallel to the original vertical line, and at a distance equal to the second figure. The point where these two lines intersect is the centre of effort.

Thus, for our 74, the centre of effort (as shown on Plate II of Volume I, marked CE) is 7 metres forward of the mid-point between the perpendiculars of the stem and sternpost, and 25 metres above the waterline.

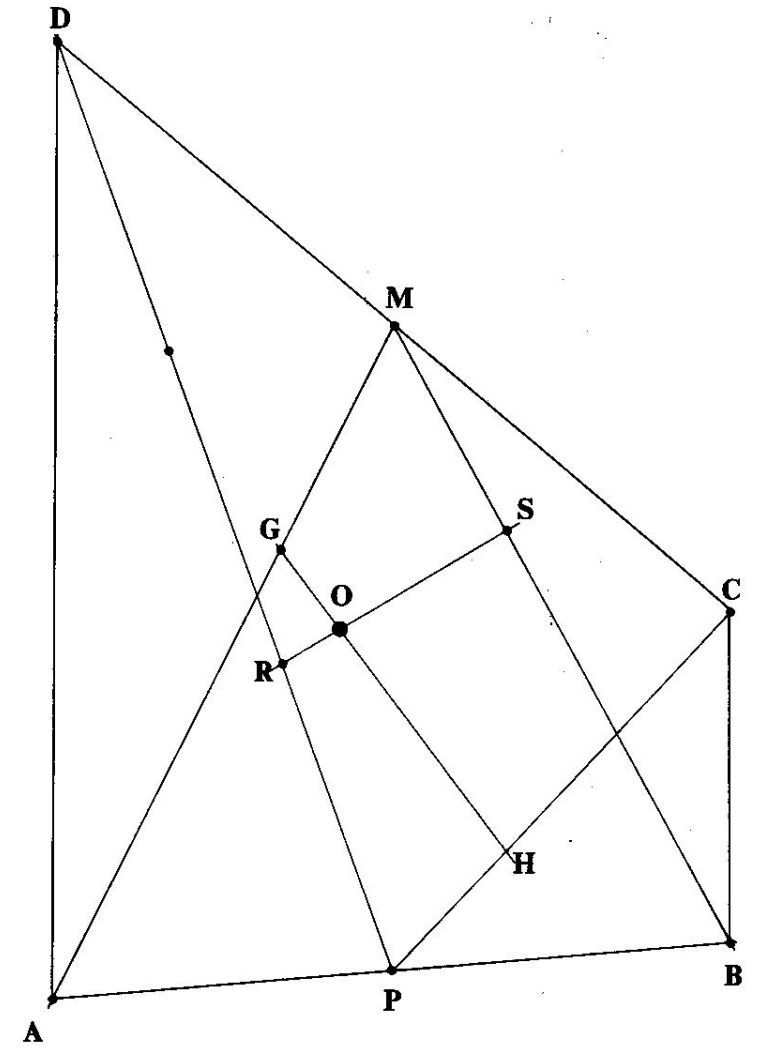
Fig. 217
Finding the Centre of Gravity of a Sail

On the fore-topsail ABCD draw a line from E, the mid-point of the head, to F, the mid-point of the foot. Draw lines AE and FC. Mark a point G on AE one third of its length from E, and a point H on FC one third of its length from F. Join GH. The intersection of this line at O with EF is the centre of effort.

On the mizen-course ABCD, let M be the mid-point of the head and P the mid-point of the foot. Draw lines MA and MB from M to the clew and the tack at A and B. Mark on these two lines two points G and S one third of their length from M. Once this is done, draw in the lines PD and PC, and mark in the same way points R and H one third of their length from P. Join GH and RS. The point where these two lines intersect at O is the centre of effort.



FORE-TOPSAIL



MIZEN-COURSE

I must confess that I prefer to think in terms of the centre of effort rather than the point of perfection, since it is more explicit; the height of this point, as already explained, should in theory be the same as the point of perfection, and represented by the intersection of a vertical line from the centre of gravity of the vessel with the direction of absolute resistance of the water on the hull.

Nevertheless, all this is once again only theory, and in practice seamen are able, by spreading sails in tiers, to vary the centre of effort to correspond with the point of perfection as it moves up and down depending on the direction of the wind and the degree of heel. Furthermore, it is perhaps not out of place to note that the power of the sails is translated into a horizontal thrust*, the direction of which must pass through the point of perfection, since otherwise the vessel would not be correctly trimmed fore and aft, the tendency being to scend under the leverage caused by the fact that the point of perfection is lower than the centre of effort.

*Provided the masts are vertical.

The masts may be raked slightly aft, or on the contrary be stepped vertically; in the latter case, if the vessel is upright, the direction of thrust of the sails will be horizontal as I have just stated, and since the thrust is not fragmented, the vessel will sail more rapidly.

If however the masts are raked, the vessel will come about more easily; since the sails are situated further aft, it will be easier *to brace the yards*, and above all, since the direction of thrust will be angled upwards above the horizon, the vessel will be easier by the head, will not scend at all unless steeply heeled, will pitch less, hold the wind better, and go about more easily with the wind on the bow.

To brace the yards: to turn the yards by rotating them horizontally.

With that I will conclude these general remarks about the masts and sails of our 74, in the hopes that they will make it easier to understand the problems of masting both large and smaller ships.

Now that we have some basic facts about the concept of masting we can turn our attention to the principles of their construction. I will continue to restrict myself to general principles, since this first section is designed only to provide an overview of the subject, so that the details may be more readily comprehensible later.

When we speak of masting, we refer to the spars of resinous softwood designed to support or spread the sails. These spars may be vertical or oblique, and horizontal. The first are the various masts, including the bowsprit, while the others are the yards* and the booms.

*Except for the mizen yard, which is crossed at an angle of 45° to 50° to the horizon.

The size of a seventy-four gun ship makes it necessary to divide up the masts into sections, since it is obvious that no single tree can provide masts of such a height. Furthermore, the requirements of sailing demand under certain circumstances that the height of the masts may be reduced, if only to lower the centre of gravity of the rigging. For this reason, the foremast and the mainmast are divided into three sections; the two upper sections are arranged to slide, so that they can be raised or lowered, or even struck altogether.

While dividing up the masts makes them heavier, it allows for greater flexibility in their use, and a greater margin of safety, since damage is restricted to one section only, and this may be replaced with spares*.

*The King's ships are always provided with a variety of spare spars, which will be listed and described in this Chapter.

The mizen-mast is arranged in the same manner, but on our 74 it is made up of only two sections. The bowsprit, because of its position and length, also requires only two sections.

An examination of Figure 215 will give the principal terms applied to the masts of the vessel. On the same drawing are shown a certain number of other elements relating to the masts, and so I will now explain briefly how the various sections of the masts are fitted together one on top of the other.

Mast cap.

The lower masts are fashioned to a tenon at the top on to which fits a flat timber called a *cap*, which is roughly oblong and has two holes in it; the first hole is square, and serves as the mortice to take the tenon on the top of the lower mast, while the other hole, in the forward side, is round; the upper mast (in this case the topmast) passes through this hole, and overlaps the lower mast by a certain distance; the section of the lower mast which is overlapped by the topmast is called the *mast head*.

Mast head.

Heeling: what is called the ***heel*** [q.v.] on other masts is called the ***heeling*** of the topmast.

The heel or *heeling* of the topmast must be securely fastened so that the topmast is secured in two places. In order to do this a solid fastening must be made to the lower mast: two timbers or *bibbs* are fastened, one on either side, to the mast, which provide a seating for the fore-and-aft timbers called the *trestletrees*, which are crossed by other timbers running athwartships called *crosstrees*; these timbers form a framework for a light decking, and the whole structure is called the *top*. The bottom of the heeling of the topmast, called the *block*, has a mortice running through it from side to side, and into this mortice fits an iron bar or *fid*, which is long enough to project on either side of the block and rest on the trestletrees; in this manner the lower end of the topmast is secured, while at the upper end of the head of the lower mast it is held in place by the cap.

Bibbs.

Trestletrees; Crosstrees.

Top.

Block; Fid.

Top-ropes.

This then is how the lower mast is extended by the topmast, which can be moved up and down by ropes called the *top-ropes*, which are single-block tackles made up of a fall passing through a sheave let into the block of the topmast, and to a block hooked up under the mast-cap; with this tackle rigged to the capstan and the fid withdrawn, the topmast can be lowered down the lower mast as required, or even removed altogether.

Fig. 218
Striking the Upper Masts

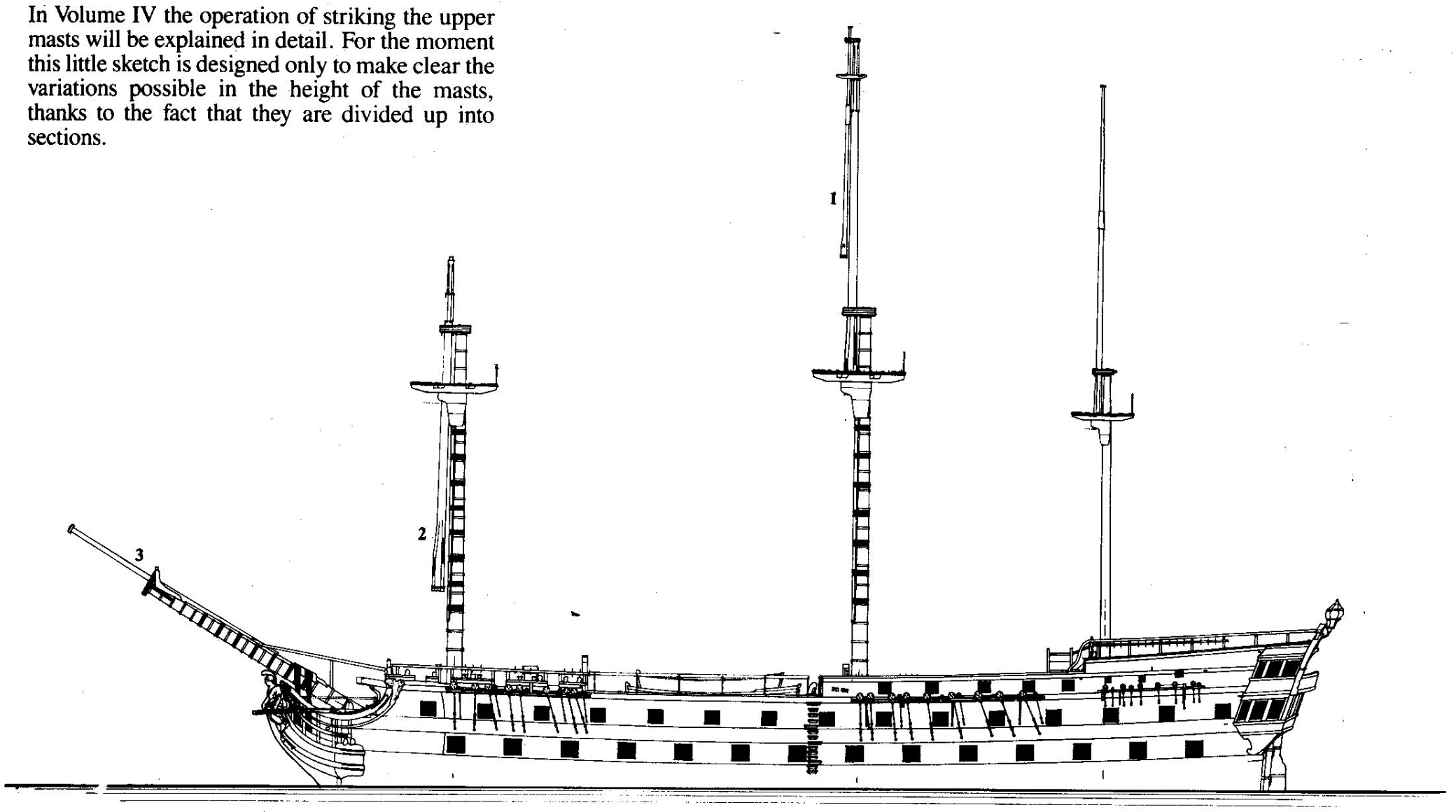
The main topgallant-mast has been lowered, and its head is about to pass down through the cap and then below the topmast crosstrees; at that point the topgallant-mast is said to have been "struck down".

The fore-topmast has been lowered down the lower foremast, and if made fast at this point it is said to be "struck"; if it is made fast when lowered only half-way down the lower mast it is said to be "half struck", whereas if it is lowered until the block rests on the deck it is said to be "fully struck down".

Before striking the fore topmast, the fore topgallant-mast has been struck down and stowed.

The projection of the jibboom varies between one third and two thirds of its length; here it is shown at its minimum projection.

In Volume IV the operation of striking the upper masts will be explained in detail. For the moment this little sketch is designed only to make clear the variations possible in the height of the masts, thanks to the fact that they are divided up into sections.



In exactly the same manner, the topmasts are extended by the topgallant-masts; the only difference is that the arrangement is of lighter construction: there are no bibbs, the topmast being merely worked to a greater thickness at the *hounds*, which end in a *stop* providing support for the *topmast trestletrees*, which are not covered by a decking. The mast-cap fitted over the tenon of the topmast is similar to the lower cap. The topgallant-masts are struck much more frequently than the topmasts, and the operation is performed in the same manner, except that there is no need for the capstan.

Hounds: the bottom of the masthead.

Stop.

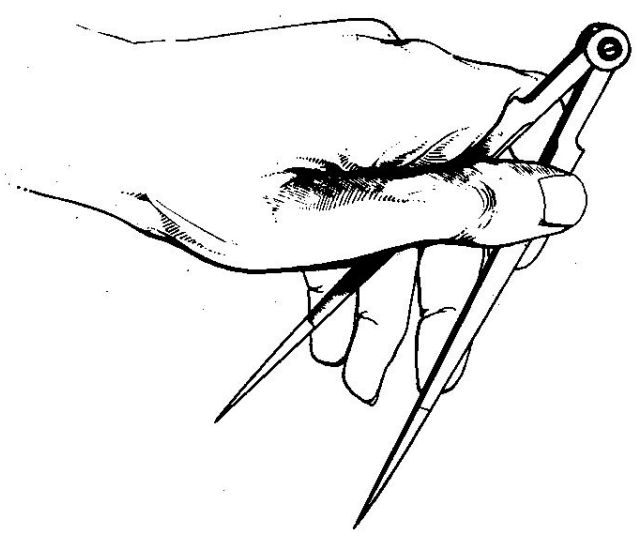
Topmast-trestletrees.

To help you understand the way the masts "telescope" together, I have shown on Figure 218 our 74 with its upper masts *lowered*, that is to say brought down half way, or right down and *struck*, which is when the top of the mast is lowered below the topmast trestletrees or the topgallant trestletrees; in Volume IV I will describe this manoeuvre, the purpose of which is to strike down an upper mast, either to change it or to stow it on deck.

Lowered.

Struck.

While the masts support the yards, each yard serves to spread its own sail, and on Figure 216 I have shown all the different yards and identified them by name. It will be noted that the mizen-mast is different from the other masts both in its vertical and horizontal components; thus the mizen carries a mizen topmast but no mizen topgallant-mast, and the nomenclature of the yards is also different.



2. Types of timber and mast-making

RESINOUS SOFTWOODS: ORIGIN, PRESERVATION, SELECTION

In Chapter IV (in Volume I) which was devoted to materials I have already given a certain amount of information about the resinous softwoods used by the Navy. I thought however that it might be useful to take up this subject again, and discuss it further, but still restricting myself to general facts.

The main timber used for masts in larger vessels is pine. Its light weight, the height to which it grows, and its elasticity, make it preferable to all other timbers for mastmaking.

I have already talked about the sources of supply for mast timber. As far as Pyrenean timber is concerned, most of the trees are firs rather than pines, and these have different properties: they are distinguished by their colour, by their grain, and by the length of their fibres. It is generally recognised that freshly cut fir with a tight grain makes an excellent mast timber. The elasticity which is so necessary for masting is one of the qualities which distinguish Pyrenean fir; but they also have the property of drying out faster than the timbers from the Baltic. Nevertheless, the French Navy draws on the Pyrenees for a large part of its requirements in mast timber, and to this end it has proved necessary to create a whole network of roads for transporting the timber, involving considerable engineering. The Navy itself is responsible for extracting the timber.

However, the type of resinous timber preferred by the Navy is that which the Russians obtain from the forests of the Ukraine and Livonia*; the trees are floated down the Dvina in rafts or *trains*, and sold in the port of Riga: see what I have already said on the subject in Chapter IV. I should add that these trees are cut before the sap rises, an essential precaution to prevent rot, since when the sap rises the pores open up, the mastwood becomes soft, and the resin is unevenly distributed around the fibres. When the sap has risen, the fibres close up again, the pores contract, and the resin stabilises, filling all the spaces with a substance which nourishes the tree and assures a long life.

*For an excellent treatment of the whole subject, see C.W. Bamford, *Forests and French Sea-Power, 1660-1789*, University of Toronto Press, 1956. There is a fascinating book on the extraction of mast-timber from the Pyrenees: *Mémoire sur les travaux qui ont rapport à l'exploitation de la mâture dans les Pyrennées*, written in 1776 by Leroy, the principal engineer responsible. It is unfortunately extremely rare. [Trans.]

Trains.

The trees are preserved by immersion in seawater, which is unable to penetrate the Baltic timber and keeps it fresh, preventing the evaporation of the resin so that trees remain sufficiently "nourished". Less resinous timbers however, such as those from the Pyrenees, from Savoy and from the Auvergne, absorb large quantities of water as soon as they are submerged, and then when exposed to the air again the water evaporates quickly, taking with it the resin which it contains; for this reason these timbers then become brittle and weak, but despite these problems it is still preferable to submerge them, since they are even more susceptible to the instability engendered by exposure to the air during storage.

Mast timber is thus buried in sand, in mud, or simply immersed in water; seawater is preferred to fresh water, but care must be taken to preserve the timber from the attack of marine borers (see what I have to say on the subject of the teredo in Chapter XV).

Mast-ponds.

I will not go into any explanations regarding the stocking of mast timber; it is sufficient to know that at Toulon the timbers are formed into rafts and weighted with stones until the wood lies a few centimetres below the surface of the water. At Brest they have large excavated areas called *mast-ponds* for keeping the store of mast timber; the mast-ponds can be flooded with seawater when required, while conduits of fresh water allow the ponds to be purged from time to time of ship-worm, which is only able to live in salt water. At Rochefort, the Charente river makes the storage of mast timber very much simpler, and there is no fear of ship-worm as at Brest.

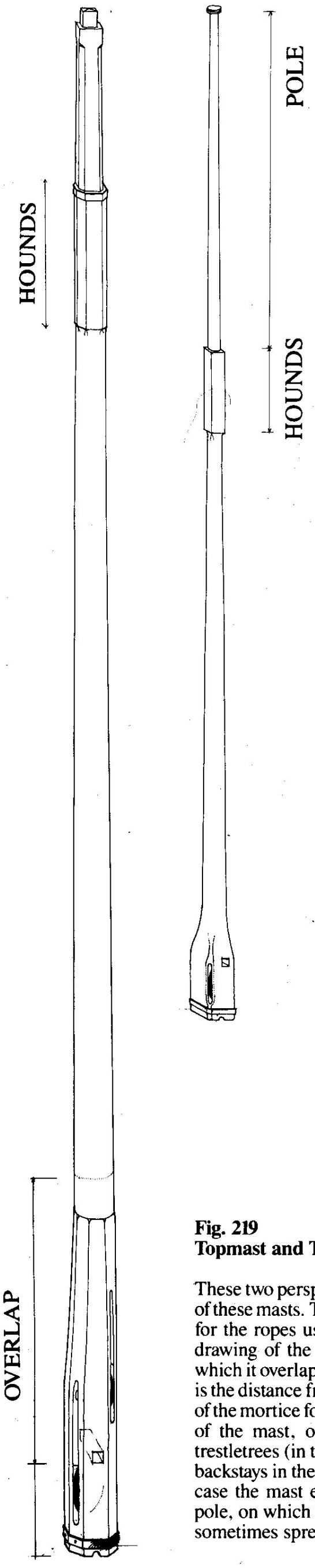


Fig. 219
Topmast and Topgallant-Mast

These two perspective drawings show the different parts of these masts. The block or heeling contains the sheaves for the ropes used to raise or lower the masts. On the drawing of the topmast I have marked the amount by which it overlaps with the head of the lower mast, which is the distance from the top of the mast-cap to the bottom of the mortice for the fid. The hounds are the thicker part of the mast, on the stop of which rest the topmast trestletrees (in the case of the topmast), or the stays and backstays in the case of the topgallant-mast; in the latter case the mast extends beyond the hounds to form the pole, on which a further tier of sails called the royals is sometimes spread, thus making four tiers in all.

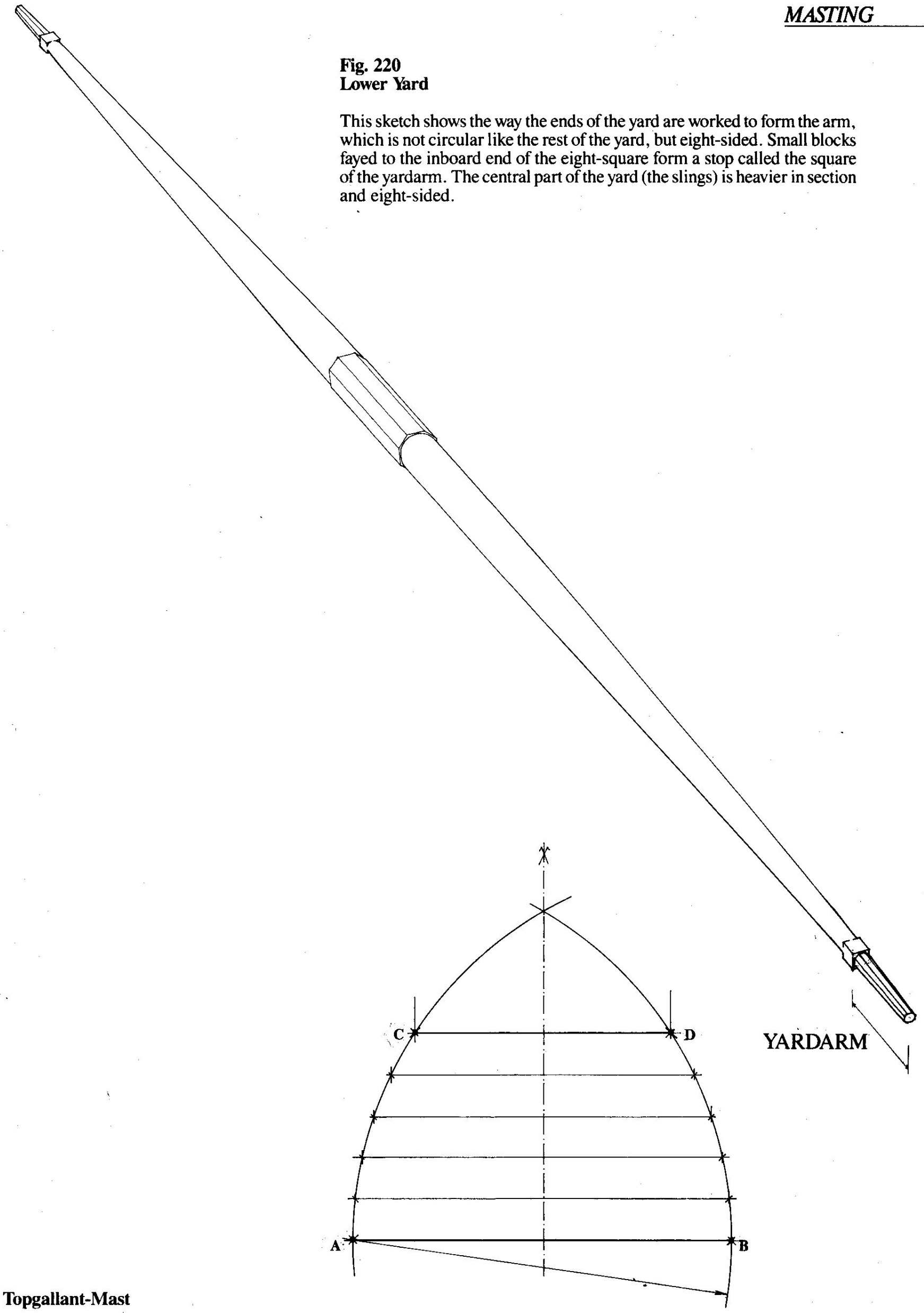


Fig. 220
Lower Yard

This sketch shows the way the ends of the yard are worked to form the arm, which is not circular like the rest of the yard, but eight-sided. Small blocks fayed to the inboard end of the eight-square form a stop called the square of the yardarm. The central part of the yard (the slings) is heavier in section and eight-sided.

Fig. 221
The "Quarter of Ninety" Method

The line AB represents the given diameter, and an arc is drawn from A of the same radius; the same operation is repeated from B. Parallel to AB is drawn the minimum diameter of the yard CD, the ends of which fall on the two arcs described. The vertical distance separating the two diameters is divided by the same number of sections as the mast, and through each of the points lines are drawn which are parallel to AB and CD; their points of intersection with the two arcs give the intermediate diameters (four in this drawing), but obviously the number of intermediate diameters can be increased as required.

I have already given some details about the "tasting" of masts and their classification, so I will not repeat myself. I should add that masts of 24 palms* and over, if well-shaped and clear, make topmasts for First Rates; if they are faulty they are used as *spindles* for the lower masts of such vessels; trees measuring 21 to 24 palms are used as topmasts for vessels of the lesser Rates, or as side-trees (see below) of made-masts if defective; trees of smaller diameter but with a true grain are used for mizen-masts and yards; those which have a large diameter but which are shorter can be used as gammoning-fishes (see below) for bowsprits; thus every size and shape can be used.

*Palms or hands: as stated in Volume I, a French palm measured 13 lines or 29 mm; in theory the length of the tree should equal three times the number of feet as there were palms at the given diameter; the given diameter was measured one sixth of the length from the butt.

Spindle: the central timber in a made-mast.

MASTMAKING

Measurement: I will assume that you are now familiar with the terms used to describe the various masts and spars, and the tables giving their proportions should therefore be readily intelligible; however, in order to complete your vocabulary you should also examine Figure 219, which illustrates a topmast, and Figure 220, showing a yard; the names of the various parts of these spars, and some additional information, are given on these two drawings.

It will be seen that masts and yards do not have the appearance of long cylinders of a constant diameter; on the contrary, in both cases the diameter changes regularly along the whole length, which is fairly obvious when one considers the degree of resistance demanded, so that the greatest thickness is needed at the point of greatest strain.

The table indicates the largest diameter* and the smallest diameter of each spar, but it is important that the diameter should taper harmoniously from one to the other along the length of the spar. For that, the following simple method is used*: first of all the spar is divided into a certain number of equal parts between the points of greatest and smallest diameter (these points are indicated in the tables); next a line AB is ruled equal to the radius of the given diameter; from point A an arc is described with the radius AB, and that is repeated from point B.

*Called the ***given diameter***.

*Called the "*quart de nonante*" (quarter of ninety) method.

*The English system appears to have been to divide the spar into "quarters", taking four diameters only; however, the pole of a topmast and the yardarms represented one "quarter", the remaining length being divided into three. [Trans.]

Next a line CD is drawn, parallel to AB and equal to the radius of the smallest diameter, so that the points CD meet the arcs already drawn in. The vertical distance between the two parallel lines AB and CD can then be divided by the same number of equal parts as were previously marked on the spar. Lines drawn through these points intersect the arcs, giving the same number of radii to which the spar is to be worked at each point; these points are known in French as *broches*.

Broches: so-called because the artificers in the mast-house cut ***graduating battens*** (Fr. broches) of a length corresponding to the distance between two marks for which the diameters have to be calculated; thus a spar divided into six parts will have seven diameters. The word *broche* tends to be used indiscriminately to describe both the batten and the point or diameter at which the batten is used.

Stick: shipwright's term for a length of mast-timber; masts made of a single stick were called ***pole-masts***, those made of several sticks ***made-masts***.

In the course of the next section I will explain other measurement details, in particular about the ends of spars, such as the butts of the lower masts, the blocks of the topmasts and the topgallant-masts and their upper ends, yardarms etc.

Pole masts: The length and given diameter of the majority of the spars used on our 74 enable them to be made of a single *stick*. This can however present problems of supply; indeed, while the mizen-mast, which demands a spar of 25 palms' diameter [72.5 cms], can be made of several sticks (see below), the same is not true of the topmasts, since as we have seen these must be able to move up and down freely; *made-masts* need to be bound together every so far with iron hoops, but the projection of these would prevent the topmasts being raised or lowered freely. Thus topmasts have to be made from a single stick, and furthermore, since they are subjected to greater strain and receive less support from their stays than the lower masts, they must be made of better quality timber.

For our 74, two sticks of 21 to 22 palms [61.6 - 64.6 cms] are needed for the fore and main topmasts, and since these spars risk being damaged during the commission, the Regulations for fitting-out provide for two spare topmasts as well; thus four and not two sticks of sizeable dimensions are required, and their length must be between 61 and 66 feet* [19.8 - 21.5 metres]. The shape of the topmast blocks means that filling-pieces must be fayed to the heeling or otherwise sticks of still greater diameter would have to be employed, which are even rarer and extremely expensive: indeed, there is a factor of two in the price difference between spars of 21 palms and 24 palms.

*Once again it should be emphasised that all dimensions are given in *French* feet and inches, not English measures. The French foot was 325 mm, or roughly 20 mm longer than the English foot. To avoid confusion, the metric equivalent is always given in brackets.

Making pole-masts presents no particular difficulties, and I repeat that the mast timber is delivered to the yards some considerable time after felling. The sticks are worked by the dockyard artificers, who strip them of their bark and a large part of the sapwood; the heeling is worked to an eight-square for a distance of 10 to 15 feet [3.25 - 4.88 m], and the remainder is worked to a round as the natural shape of the tree dictates. This is how pole-masts are shaped; obviously, from time to time the timber may have a curve, or a long *wane* or crack, in which case a triangular batten must be inserted called an *aris piece*, but it is mainly with made-masts that this practice is resorted to.

Wane.

Aris piece: Fr: *grain d'orge*. Strictly speaking an aris piece is only used to fill spaces between the trees of a made-mast, whereas the French term is more generally used to describe any triangular filling-piece. [Trans.]

It must be remembered that pole-masts are more flexible than made-masts, but are less likely to break; indeed, the greater the number of sticks used in a made-mast the more fragile it is.

I will not list here all the pole-masts and spars on our 74, since I shall be listing all the made-masts in the following pages.

Made-masts: Some of the spars on our 74 cannot be made of a single stick; this is most obviously true of the lower masts, if we consider that the diameter of the mainmast is 34 *inches* [92.1 cms], and its length is 104 feet [33.80 metres] *.

French inch: 27.1 mm.

*Until the American War of Independence the English Navy was able to obtain mast-timber even of these dimensions from New England, and so the practice of using made-masts was more widespread in France. The loss of the American colonies caused a temporary crisis, which was later compensated to some extent by the development of new sources of supply in Canada, which the French had never satisfactorily exploited. [Trans.]

In such cases it is necessary to resort to making the mast, using a relatively large number of sticks to make up a single mast.

I will take as my example the mainmast of our 74, and examine in simple terms the manner in which it is assembled.

The central part or *spindle* is made up of a single stick, but note that the spindle is used upside-down, if I may use the expression, in the sense that the butt forms the masthead. The stick forming the spindle is left in its natural shape to form the upper part of the mast, while below it is squared off (the square being within the circle defined by the masthead), and this square diminishes in size towards the bottom.

Spindle: masts made with a spindle have the masthead formed by a single stick, the smaller end of which tapers towards the bottom of the mast, where it is sided by other timbers rising from the the foot and tapering away towards the head, either above or below the point of overlap with the topmast. This assembly is called a ***spindle with heel-pieces***; another type of made-mast exists where the spindle forms part of the outside contour of the mast for its whole length, but we will not examine this latter type.

Once the spindle has been shaped, two further sticks are fayed to the fore and after sides so that the total thickness of the three timbers corresponds to the finished contour of the mast; unlike the spindle, the *fore-side tree* and the *aft-side tree* are laid with their butts towards the heel of the mast.

Fore-side tree; aft-side tree: also called the forward side and after side ***fishes***.

On either side two further timbers, the *side-trees*, are fayed to the treble thickness of the spindle and the fore-side and aft-side trees, so that four side-trees are required in all.

Side-tree.

Thus seven sticks are required in total to make up the mainmast: one for the spindle, one each for the fore-side tree and the aft-side tree, and four for the side-trees.

Heel-pieces: lengthening pieces; sometimes simply called ***ekeings***.

In fact, more than seven sticks will be required because they are too short, and thus it will be necessary to add *heel-pieces* of smaller sticks (see the table of sticks necessary to make up the ship's masts).

The various parts of the made-mast are held together by a series of interlocking joints so that they are completely unable to slide apart, but the mast must nevertheless be hooped so that the pieces cannot pull apart sideways as opposed to vertically*.

*Despite the use of large spikes, the length of which corresponds to two-thirds the diameter of the mast at the point at which they are driven.

Having mastered these general principles, let us now look in detail at the way the mainmast is assembled, which is shown in Plate XLIII.

Upper-tree: lengthening-piece of the spindle.

The spindle: The length of the stick used is of the order of 87 feet [28.29 m], so that an *upper-tree* must be added in order to arrive at the required length of 104 feet [33.82 m]. The difference being 17 feet [5.53 m], a stick of twice this length will be used, half of which represents the overlap. A scarph is fashioned at the lower end of the main-piece and at the upper end of the upper-tree; the ends of the scarph, at what is called the *snape*, are cut square and the timber of both the main-piece and the upper-tree is fashioned to the form of the snape. In order to prevent the two sticks from sliding apart at the scarph, the joint is *coaked*: long rectangles of timber are left standing proud, which are four to five feet long [1.30 – 1.63 m] by five inches [13.5 cms] wide; they stand an inch and a quarter [34 mm] above the surrounding wood*; four such coaks are left in the main-piece of the spindle, while four mortices of corresponding dimensions are cut in the upper-tree. The coaks are off-set one from the next by about 1 1/2″ [40 mm], but to allow the grain to follow the run of the coaks they are off-set alternately in a regular manner. The first coak is off-set to one side, the second to the other, the third is aligned with the first, the fourth with the second, and so on*.

Snape: the point or thin end.

Coaked: joined with ***coaks***.

*This is called the ***plain***.

*Coaks arranged in this manner were called ***running-coaks***.

The mortices in the upper tree are cut away to exactly the shape of the coaks. The timber is worked extremely accurately, and once the two parts of the spindle are fitted together with the coaks interlocking, tight enough to have to be forced together, it is extremely difficult to separate them*. It will be appreciated therefore that when the lower part of the spindle is shaped, account must be taken of the amount of timber necessary to fashion the coaks; the total thickness must correspond therefore to the finished section plus the thickness of the coaks.

*The faying surfaces are either tarred or painted with a solution of oil and white lead.

With the spindle made up to its full length, the fore and after faces are coaked, and at the point where the square section becomes circular at the head a snape is formed, cutting into the circular section by three or four feet [0.97 – 1.30 m]; the width of the coaks diminishes from 8″ to 6″ [217 – 163 mm] to match the taper of the spindle, the overall section of which goes from 18″ to 10″ square [488 – 271 mm]. The fashioning of the coaks reduces the cross-section by 67 mm (1 1/4″ on either side).

Fore-side and aft-side trees: The fore-side and aft-side trees are fastened to the corresponding faces of the spindle (when I talk of fore-side and aft-side I refer to that part of the mast which when stepped will face towards the bow or the stern). These timbers are the same breadth as the spindle, and they are much thicker at the heel of the mast than at the beginning of the masthead; indeed, the thickness of the spindle plus the thickness of the fore-side and aft-side trees equals the *given diameter* of the finished mast. The thickness must take into account therefore the depth of the coaks on the spindle. If the fore-side and aft-side trees are not long enough they are lengthened with heel-pieces, as I explained for the spindle.

Given diameter: the maximum thickness of the mast when it is finished.

The faying surface of the side-tree where it meets the spindle must be scored to match exactly the raised coaks on the spindle.

The spindle and the fore-side and aft-side trees are most carefully assembled until they form a single long timber which is rectangular in section below the masthead, the long side of the rectangle corresponding to the diameter of the mast.

Coaks are cut in the long sides of this rectangle: one chain of coaks is left proud on the spindle, and on either side of it a further chain is hollowed out of the wood astride the spindle and the fore-side or aft-side trees (the diagrams in Plate XLIII should make this sufficiently clear); timber must therefore be cut away from all three sticks. It will be seen that the coaks are staggered by half their length.

Side-trees: These are placed on either side and fayed to the surface of the spindle and the fore-side and aft-side trees, which have been worked in the manner just described. The breadth of the side-trees must be equal to the diameter of the mast, and thus it is not possible to use a single stick: two must be used, their breadth being half the breadth of the mast and their thickness varying as I have explained above for the fore-side and aft-side trees.

The two sticks forming the side-trees are fastened together along the middle, the edge of one stick being worked with parts standing proud, the edge of the other hollowed out; however, the side-trees are too thin at their head for coaks to be formed in the usual manner, and other more simple joints are formed called *tables*; in this case the timber is cut away along the edge of one of the sticks in a series of hollows, leaving at the same place on the corresponding stick material standing proud. There are thus four tables to be seen. The two sticks forming the side-trees once fayed together are worked on the face which will be fayed to the spindle with its fore-side and aft-side trees: chains of coaks are formed which carefully interlock. Note however that at the head the mast is so far reduced in section that there is room for only one chain of coaks, and this is fashioned in the spindle.

Tables

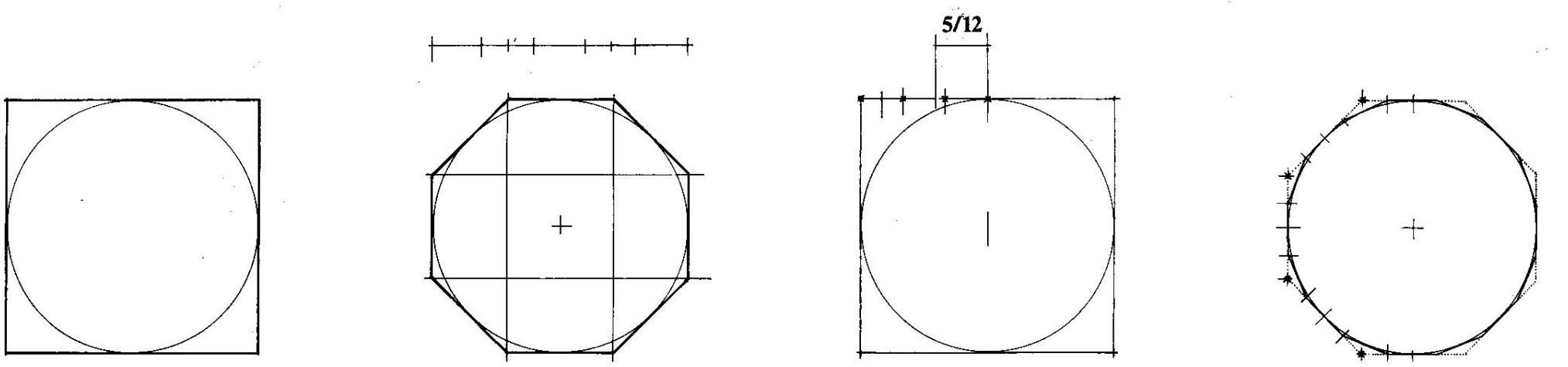


Fig. 222
Lining and Converting

The shape of the mast being described within a square, this square must be reduced to a polygon, first of eight sides, then sixteen, then thirty-two and even sixty-four sides, so as to arrive at a circular section by constantly removing the corners.

The side of the square is divided into five equal parts, and by taking one and a half parts from either edge an octagon is easily formed.

In order to form a sixteen-sided polygon, divide half of one side of the square (or the radius of the circle) into three equal parts, subtract half of one part and divide the remainder in two; this gives 5/12ths of the radius of the circle, which is the value of one side of a sixteen-sided polygon.

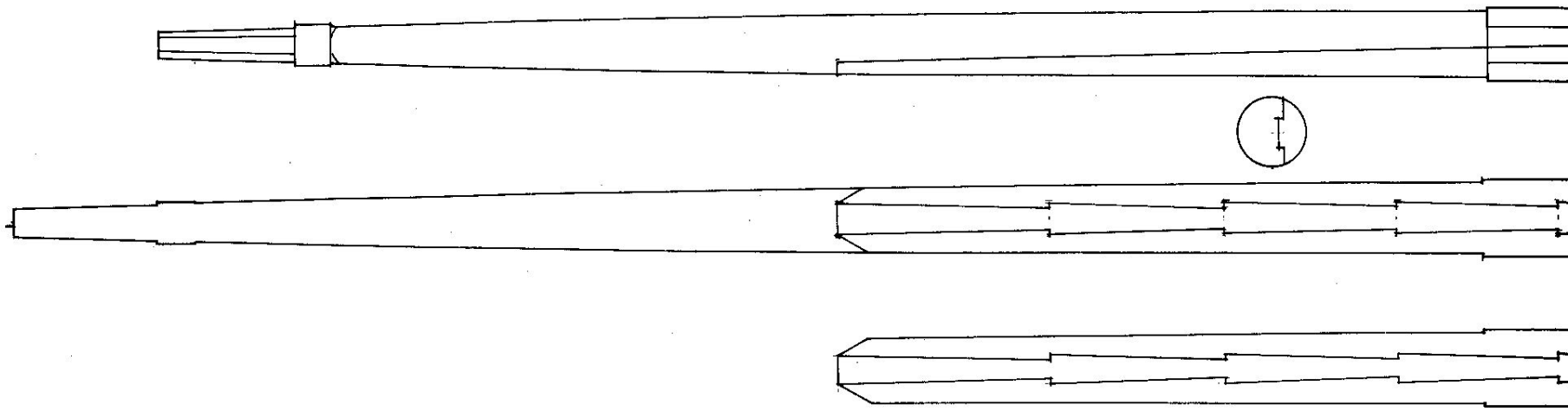


Fig. 223
Made-Yard

The mainyard and the foreyard in our 74 are each made of two sticks, but other methods of assembly exist using three, four or six sticks for yards.

The scarphs run half the length of the yard, and should be vertical when the yard is crossed; thus my drawing shows the yard seen from above.

Once the spindle has been enclosed by its side-trees, it forms a solid mass which is square in section (and as far as possible somewhat oversize), and the circular cross-section of the mast is drawn within that square. This shape must therefore be converted to an octagon, then to a polygon with sixteen, thirty-two and sixty-four sides*, finally removing the last corners with a draw-knife, thus rounding the mast perfectly (see Fig. 222).

*This operation is called ***lining and converting***. Steel's *Art of Making Masts* (1816) advocates using a mastmaker's square for lining. [Trans.]

The bowsprit* is not made in the same way as the mainmast or the foremast, while the mizen mast is generally formed of a single stick. It is relatively easier to work the bowsprit because it is made up of four sticks, each being a quarter of the circle forming the bowsprit; the surfaces are coaked, and Figure 224 shows the cross-section of the bowsprit at the *bed*.

*The bowsprit needs to be the strongest spar in the ship, and thus it is made of four sticks only, since as I have explained the greater the number of sticks the more fragile the spar will be. The use of four sticks to form a made-mast is the oldest form of assembly known.

*The ***bed of the bowsprit*** is its point of greatest diameter, where it rests on top of the stem.

The lower yards of the foremast and mainmast are made of two sticks, and Figure 223 shows how they are assembled.

Sometimes a shortage of suitable mast timber in the dockyards makes it necessary to use a greater number of sticks, so that instead of nine being employed for the mainmast as many as seventeen may be used; indeed, sticks of 27 palms [78.84 cms] are rare*. Furthermore, the master mastmaker must make the best use of the mast timber at his disposal in order to limit the wastage; his is a difficult task, demanding very great skill.

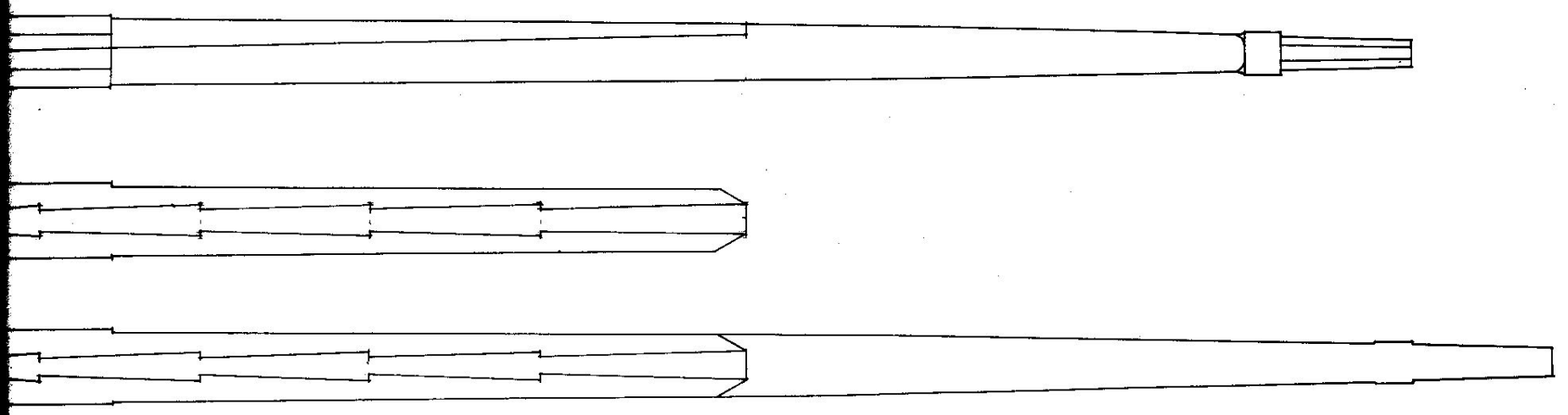
*It is extremely rare to encounter trees of 29 palms [84.7 cms], but some price lists include trees of 31 palms [90.5 cms]! The sizes which are relatively common are those with a diameter not exceeding 22 to 24 palms [64-70 cms]. For all that, the difference in price between a mast of 20 palms and one of 24 is a factor of nearly one to three.

Line: 1/12 of an inch, or 2.92 mm.

Mast-hoops: These are made of soft Spanish iron, which is relatively easy to work. The hoops are 3 to 3 1/2 inches maximum [81 - 94 mm] in breadth, by 4 to 5 *lines* [9 - 11 mm] thick; they are heated before being fitted, and for this purpose there is a forge in the mast-house where they are heated in a wood fire until they are as hot as possible without getting red hot*; they are carried to the work-place and driven on to the mast, starting with the largest hoop which must be passed over the heel of the mast. All the hoops are 3/4″ [21 mm] smaller in diameter than the mast at the point to which they are fastened; and it is by main force that either the wood must be peeled back or the iron must be stretched, in order to make up these 21 mm; to this end the hoop is driven on with an iron driver called a *poker*, which is hammered by eight or ten men, usually convicts. Both sides of the hoop are hammered simultaneously, and the careful synchronisation of blows from this sort of ram brings the hoop with great accuracy to its intended place; if the hoop should

*Mast-hoops are generally browned; in order to obtain this form of rust-protection, they are coated with tar while they are still hot. The liquid penetrates the pores of the iron, which have been opened by the heat, and this forms a sort of bronze-coloured coating extremely effective in preserving the hoops.

Poker: sometimes called a ***billiard***.



break, it is replaced by another, and is welded closed again in the forge to be used elsewhere. The use of the poker requires considerable skill from the man charged with guiding the head; one slip, and he runs the risk of serious injury.

The hoops are as a rule spaced 3 feet [97.5 cms] apart, and Plate XLIV shows their exact spacing for each of the various made-masts and yards.

This brings me to the end of this section; I have confined myself to no more than a summary explanation of how made-masts are put together, and far more could be said on the subject, but I would not wish to abuse your goodwill any further, and these basic principles must suffice for our purpose. It should be retained however that in our 74 the bowsprit, the foremast and the mainmast, together with the the two lower yards, are all made-spars, as can be seen from their hoops.

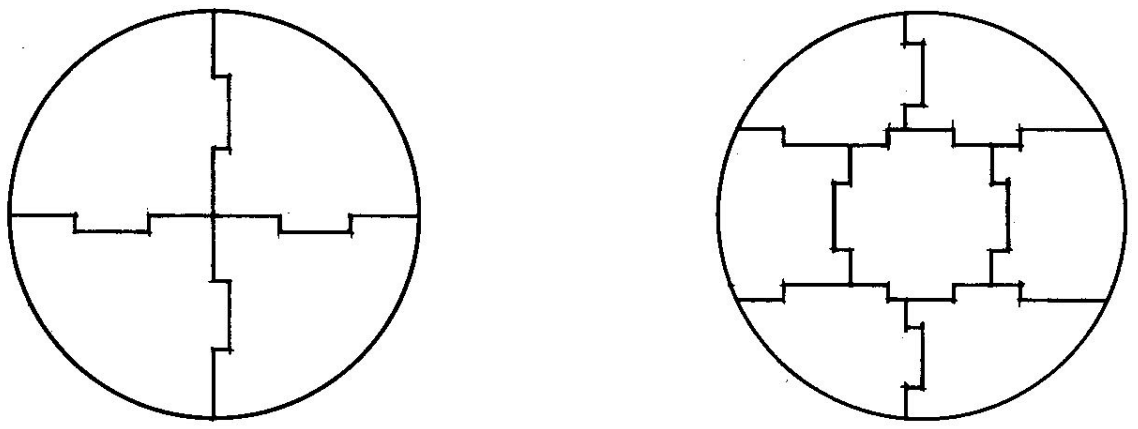


Fig. 224
Cross-section of the Bowsprit
This cross-section shows the bowsprit at the bed, over the stem; it shows how the spar is assembled from four sticks. On the right is a cross-section of the foremast, from which it will be seen that this mast is made up of seven sticks.

3. Standing masts

This is the term applied to the full set of spars for our 74, whether made-masts or pole-masts; the standing masts are those which are generally in place, to which must be added, as we shall see in the next section, a number of light spars designed to carry fair weather sails and which are used considerably less frequently.

LOWER MASTS AND SPARS (see Plate XLIV)

Bowsprit: The lower end of this spar is secured on the gundeck; the heel of the bowsprit is fashioned to a tenon which engages in a step running vertically from a gundeck beam to an upper deck beam (see Figure 225). The lower face of the bowsprit, which steeves 30° to the keel, rests on the forward face of this step. The bowsprit runs forward through a second step situated towards the bow, serving to secure it laterally, the tenon alone not being judged* sufficient for this purpose. Note that since the bowsprit is steeved its cross-section at the point of support by the step is elliptical, and the same is true of its section where it passes through the forward step (i.e. it takes the form of a cylinder cut at an oblique angle).

*English shipwrights disagreed, and were content with the after step alone. [Trans.]

Pillow.

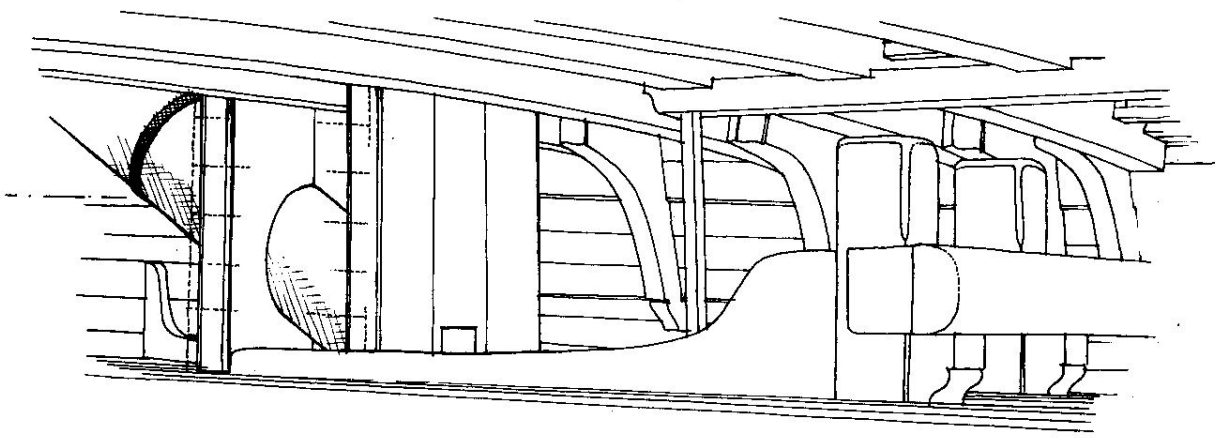
The position of the bowsprit is such that part of the heel rests directly on the planking of the gundeck; when there is more room, a rubbing piece or *pillow* of timber is inserted between.

Often the forward step is not solid but made of two stanchions or partners grasping the bowsprit on either side, in which case planks are nailed fore-and-aft between the two steps to reinforce them, thereby boxing in or "berthing up" the bowsprit, but this is not the arrangement adopted on our 74. We have seen how the bed of the bowsprit is fashioned on the stem, the false stem, the waterway and the uppermost breasthook: for the description I would refer you to Chapter VI (Volume I). These various timbers provide therefore further support for the bowsprit, and the bollard timbers form a sort of fork which prevents any lateral movement. Forward of the stem the only further bracing of the bowsprit is provided by two gammonings, which we will come to in Chapter XIV. I should emphasise that the bowsprit does not rest on the point of the knee of the head, which will be readily understood when one considers the extreme fragility of the timbers making up this decorative part of the ship.

The bowsprit of our 74 cannot be hooped abaft the forward step since the projection of the hoops might get in the way of the stepping or unstepping of the bowsprit.

The bowsprit passes up through the planking of the beakhead at the level of the collar-beam; and I should mention at this point that this beam serves to lock the bowsprit in place, both horizontally and in particular vertically.

Fig. 225
Forward and After Step of the Bowsprit



Water must be prevented from seeping down through the hole cut in the beakhead, and this is done either as I have already described with a strip of sheet-lead, or else with tarred canvas, nailed on with lead-nails or scupper-nails according to the case. The maximum diameter of the bowsprit is over the stem, a point which corresponds theoretically with two fifths of its length or 63 feet [20.49 m] from the forward end; this maximum diameter at the bed is 33 1/2 inches [90.8 cms], and the smallest diameter is half that. It should be noted that the diameter at the heel of the bowsprit is slightly less than at the bed, and the correct diameter is calculated using the "quarter of ninety" method.

The forward end of the bowsprit has a tenon of a special type, because of the position of the cap, but we will examine this in detail in the chapter devoted to the rigging of the masts and the various accessories which go together with the bowsprit. There are eighteen hoops, and the four lower ones are *mould-hoops* of a different shape, the upper surface of the bowsprit being flat rather than rounded at this point.

Mould-hoops: "are those that deviate from a circle; and which are made from moulds previously prepared". [Steel: op. cit.]

Foremast: In Figure 226 I have shown the step of the foremast, the heel of which is cut to the shape of a truncated pyramid with a square base; this fits into the box formed by the step, and the four faces of the heel being cut obliquely appear elliptical in shape where they meet with the circular section of the mast itself. It is the breadth athwartships of the step which determines the shape of the heel, and the lowest mast-hoop is placed just above the heel. Softwood wedges are inserted fore and aft of the heel, and ringbolts enable these wedges to be withdrawn so that if necessary the rake of the mast can be altered; the foremast of our 74, like the other masts, is stepped perpendicular to the keel*, and since the ship is trimmed by the stern the masts in effect rake somewhat aft in relation to the waterline.

*But sometimes they are stepped perpendicular to the waterline.

We have seen that there are partners where the mast passes through the decks, the diameter of the hole between them being larger than that of the mast. The maximum diameter of the foremast and the mainmast is at the level of the gundeck, and at this level they are secured with softwood wedges; there are twenty of them, and they have a concave shape on the inside, convex on the outside; they have a lip where they fit over the deck-planking of the gundeck, so that they can be removed with the aid of iron crows, assisted by blows from a wooden mallet on their lower end; these wedges are about three feet [97 cms] long. The mast-hoops need to take account of the position of these wedges, and in principle there should be no hoops at this point or just above, since these might interfere with the removal of the wedges.

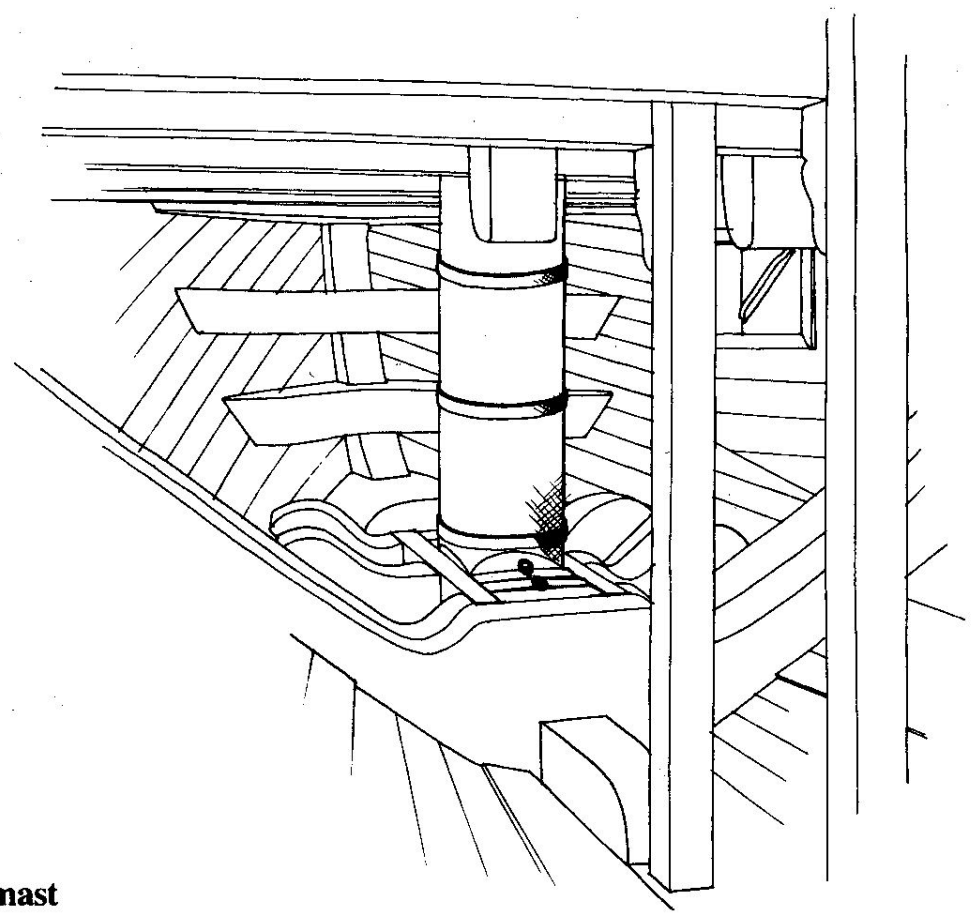


Fig. 226
Step of the Foremast

The foremast is 98 feet [31.87 m] long; its given diameter is 33 inches [89 cms], and its small diameter is two thirds of the given diameter; the square tenon at the head is five sevenths of the small diameter, and its height is determined by the thickness of the cap (see Section 5 of this chapter). The various other items of rigging belonging to the foremast will also be described in the same section. The foremast has twenty-nine mast-hoops (see Plate XLIV).

Mainmast: The explanations regarding the foremast apply equally to the mainmast. The step of the latter is arranged following the principles with which you will by now be familiar (see Figure 227).

The length of the mainmast is 104 feet [33.80 m], and its given diameter is 34 inches [92 cms]. I have explained how the foremast and the mainmast are wedged at their point of maximum diameter at the level of the planking of the gundeck. These masts pass freely between their partners on the other decks, but steps must be taken to prevent water running down through the gap; I have already mentioned the mast-coats, which are collars of painted canvas surrounding the masts over the upper deck, forecastle, quarterdeck and poop (in the case of the mizen); in Figure 228 I have drawn a mast-coat, and it will be seen that the lower edge of the coat is nailed to a margin board or collar of wood, the purpose of which is to prevent the canvas being damaged when the deck-planking is scraped or *holystoned*.

Holystone: blocks of sandstone or similar rough stone used to clean the decks. "So-called from being originally used for Sunday cleaning, or obtained by plundering churchyards of their tombstones, or because the seamen have to go on their knees to use it." [Smyth: *The Sailor's Word-Book*, 1867.] Small pieces used to get into corners are called ***prayer books***.

The mainmast has thirty-two hoops.

When speaking of the lengths of the lower masts it should be noted that the dimensions which I have given are the true lengths including the heel and the tenon. The table of dimensions for the masts gives the lengths as proportions of the midship beam, and the length is calculated from the top of the keel; thus the lengths must be reduced by the thickness of the floors, which makes a significant difference in the case of the foremast because of the steep deadrise; on Plate XLIV I have shown the height of the keel, which illustrates this difference. It should also be noted that the difference in height between the mainmast and the foremast is less than it might appear, for as we have just seen the deadrise of the floors towards the bows is such that the foremast must be stepped significantly higher than the mainmast.

Fig. 227
Mainmast-step

Fig. 228
Mast-coat

This is made of painted sail-cloth, with several cloths being stitched together to form a sort of skirt round the mast. The upper part of the mast-coat is either nailed to the mast with the help of scupper-nails, or else lashed with several turns of marline, the end of which may be looped in and out in a zig-zag to finish off the lashing (see page 209).

The bottom of the mast-coat is spread out over a wooden hoop nailed over the partners, and a becket is fastened round the circumference of the coat; scupper-nails are hammered in through the becket and the canvas so that there is no risk of the canvas being torn by the nail-heads. The wooden hoop keeps the canvas a little way off the deck, thereby protecting it from damage while the decks are being cleaned.

Mizen-mast: We have seen that the heel of the mizen-mast is stepped on the gundeck (a peculiarity of French ships*). The mizen is much shorter than the other two masts: its length is 73 feet [23.72 m] and its given diameter is only 22 inches [59.6 cms], while the small diameter is seven twelfths of the given diameter. The mast-step rests on beams 29 and 30 (see Figure 229); note also the iron straps reinforcing the sides of the step and the hole to allow any water to escape which might run down the mast and gather in the mortice of the step; this mortice is in the shape of a truncated pyramid and the heel of the mast is worked accordingly. No adjustment is possible, save by moving the step itself.

*At this time at least. It was not true throughout the century. [Trans.]

The mizen-mast is wedged at the level of the upper deck, and thus at its given diameter; the wedges are similar to those of the other lower masts, but there are only 16 of them. There are mast-coats at the level of the quarterdeck and the poop.

On our 74 the mizen is not a made-mast and thus it is not hooped; if it were, it would be necessary to avoid placing any hoops nearer than 6 feet [1.95 m] from the binnacle-compasses in order not to disturb the needles; for the same reason no iron nails or bolts must be used, only treenails or copper nails. It will be seen that the mizen-mast is hooped just above the heel and just below the tenon at the masthead*.

*If any doubts are expressed as to the strength of the pole-mast used for the mizen it can be strengthened by means of 10 or so hoops.

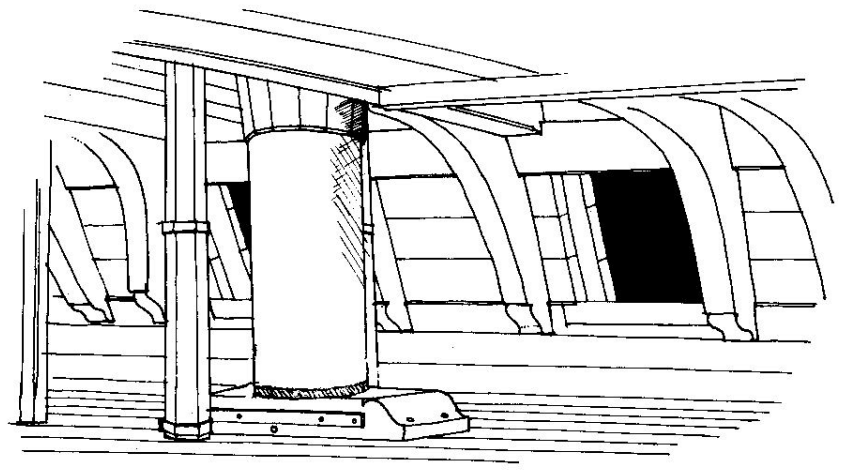


Fig. 229
Mizen-mast Step

UPPER MASTS (see Plate XLIV).

By upper masts I refer to those masts which are placed above a yard: thus the topgallants and topmasts fall into the same category. I shall describe them without concerning myself with how they are joined to the the lower masts; you are already familiar with the general principles, and the detail will be taken up in Section 4.

Fore topmast: The topmasts are not rounded for their full height; their heel or *heeling* is square in section, the siding being equal to the diameter of the lower mast at the beginning of the masthead; this term requires some explanation straight away: I stated that the great height of the masts means that they must be separated into a number of parts, three in the case of the foremast and mainmast. In order for these parts to be properly secured they must "overlap" on the forward side. It is the length of this overlap which is called the masthead, strictly speaking from the upper side of the trestletrees to the top of the tenon of the lower mast (see Figure 219).

Heeling: strictly speaking the heel of a topmast is called a ***heeling***.

Thus the side of the heeling is equal to the diameter of the lower mast at the lower end of the masthead, and it should also be noted that this diameter which falls several feet below the tenon of the lower mast is thus somewhat greater than the small diameter which is to be found at the top of the lower mast.

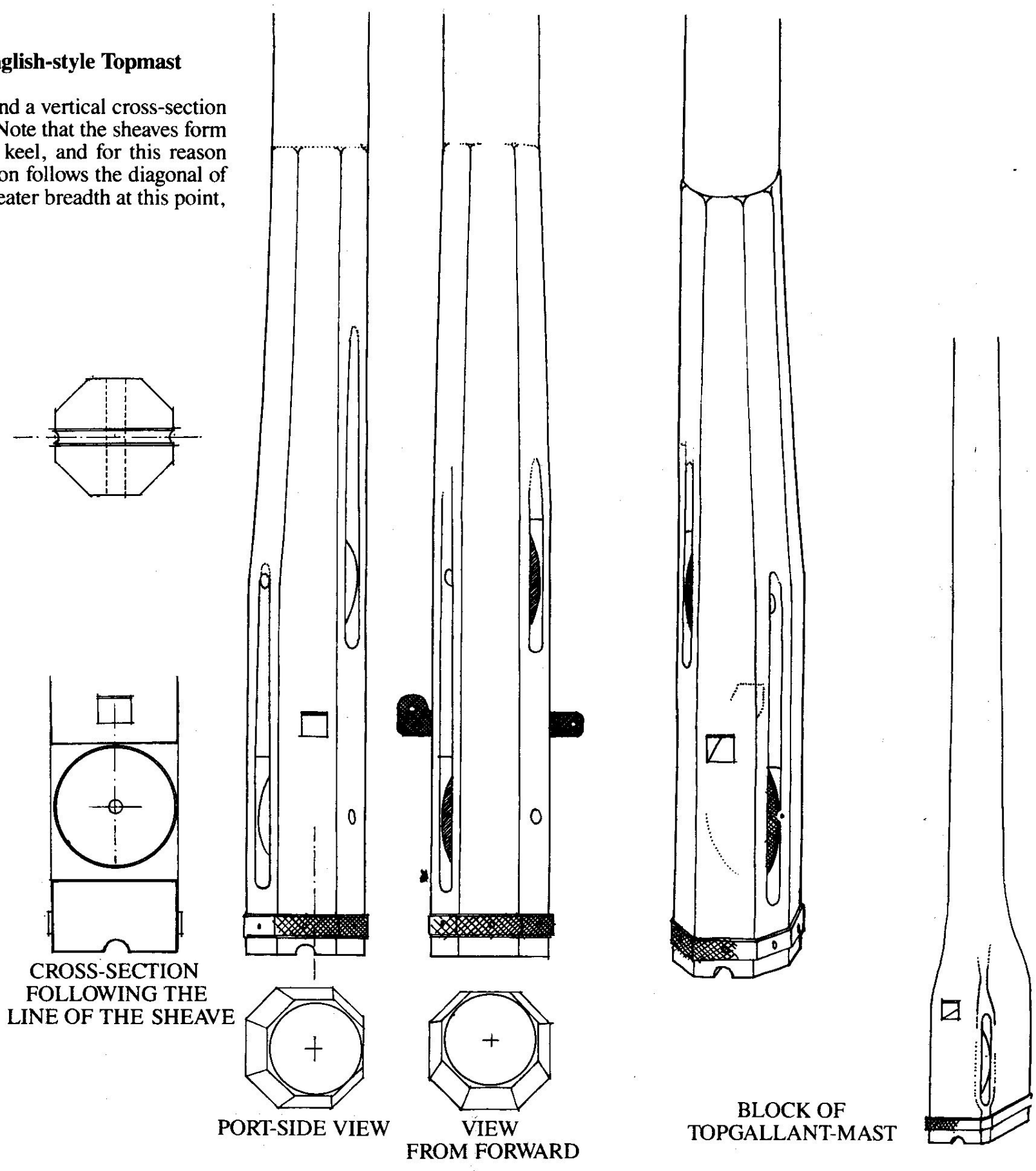
Block: the part above the heeling in which the sheave-holes or swallows are cut.

The mid-point of the foursquare of the *block* is placed forward of the axis of the topmast by the difference between the given diameter of the latter (which is 18 inches or 49 cms) and the siding of the block or the diameter of the lower mast at the start of the masthead. The sides of the block run up parallel to each other and the length of the block is determined by the space needed to accommodate the mortices for the bronze sheaves used to hoist and lower the topmast.

The block may be worked in one of two ways, according to whether the French or the English method is adopted; it is the latter which has been chosen for our 74, the two methods being shown in detail in Figures 230 and 231. In the English method the corners of the foursquare are chamfered so that the section becomes an irregular octagon, irregular because the base of the block is shifted forward. Mortices are cut across the diagonal of the block, or in other words at an angle of 45° to the fore-and-aft axis of the ship. The length of the mortices or swallows is determined by the diameter of the sheaves, which is equal to that of the lower mast at the start of the masthead, plus the diameter of the top-rope, and a further inch [2.71 cms] is then added. It will be noted that the sheave is not situated exactly at the mid-point of the swallow, for since the top-rope passes under the sheave it is unnecessary to leave any more room above the upper rim of the sheave than that needed for it to rotate freely.

Fig. 230
Close-up of the Block of an English-style Topmast

I have shown both a horizontal and a vertical cross-section at the level of the lower sheave. Note that the sheaves form an angle of 45° with the ship's keel, and for this reason therefore the vertical cross-section follows the diagonal of the block, which explains the greater breadth at this point, and also that of the fid-hole.



The lower swallow is situated in such a way that its port side faces forward and its starboard side faces aft.

The mortice of the swallow starts at a distance above the bottom of the block which is equivalent to half the length of the mortice, in order to retain sufficient timber below it. Four inches [10.8 cms] above the lower swallow a transverse mortice is cut, passing through the axis of the topmast; this is for the *fid*, an iron pin 5 inches [13.6 cms] deep and 4 broad; it is this fid which enables the topmast to rest on the trestletrees; the upper side of the fid-hole is lined with an iron plate.

Fid.

Situated half the length of the swallow above the fid-hole is a second swallow, arranged in the same manner as the first but at 90 degrees to it.

The scarcity of trees suitable for topmasts and the economy needed in fashioning them makes it necessary to form the extra thickness of the block by faying timbers to the stick, which are nailed to the topmast proper in order to obtain the thickness necessary on the forward side and to port and starboard to form the block.

The length of the block is thus dictated by the placing and the size of the swallows, as I have just explained. The part of the topmast which lies between the top of the block and the bottom of the mast-cap is also octagonal in section, forming the junction between the given diameter of the topmast proper and its block.

It will be noted that the free movement of the top-rope through the lower swallow demands that a score be cut in the block above the swallow; this is to prevent the *galling* of the rope as it runs up to the mast-cap. In the case of the upper swallow this score is shorter by reason of the *hance* fashioned at the top of the block.

Galling: chafing.

Hance or ***hancing:*** in this instance the fairing away of the thickness of the block. The term is used generally to describe any drop in level such as in the drift-rails, as we have already seen. The word is related to the word "enhancement", since an opportunity was often taken to embellish such points with a scroll or moulding. [Trans.]

To complete this description of the block, I should add that the sheaves are generally of bronze and the pins of iron, and that the bottom of the block is bound with an iron hoop; on the underside of the block is a score or *dead sheave* designed to receive a rope called the *preventer top-rope* which runs under the topmast as a safety measure when it is being hoisted or lowered.

Dead sheave; preventer top-rope.

Towards the upper end of the topmast there is a swelling called the *hounds*; these are octagonal in section, formed either from timber fayed to the mast or, if it is thick enough, worked to this octagonal shape in the topmast itself; the siding of the foursquare from which the eightsquare is worked should be equal to the diameter of the topmast at its mid-point (the given diameter is at the height of the mast-cap). The length of the hounds is roughly half the length of the masthead of the lower mast, which is 11 feet [3.58 m] , the upper end is reinforced with an iron hoop situated the length of the masthead from the head (including the tenon) of the topmast, or 6′4″ [2.06 m] ; this distance represents the amount by which the topgallant-mast overlaps the topmast.

Hounds.

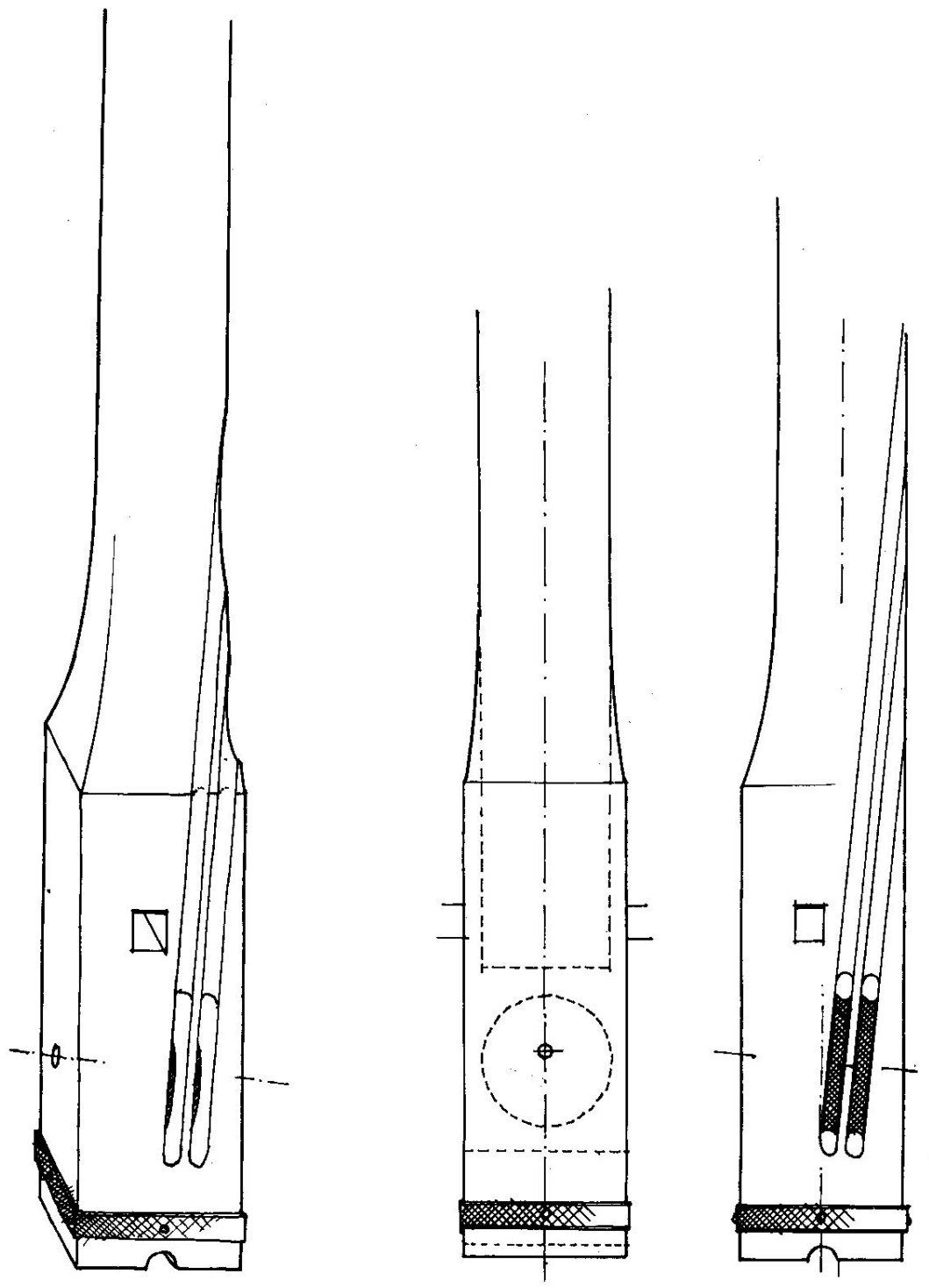
The hance of the hounds at the top* projects about 1 1/2 inches [41 mm] , enough to support the trestletrees of the topgallant-mast. Above the hounds the topmast retains its octagonal shape, which makes it stronger, whereas just below the mast-cap it is left square in order to provide a better support for the mast-cap.

*This hance is called the ***stop of the hounds***, since the crosstrees rest on top of it.

I am afraid these explanations have been somewhat lengthy for a simple topmast, and from the text alone they may seem somewhat complicated, but we have recourse to the drawings, and by dint of following text and drawings at the same time you will know exactly how a topmast is fashioned.

The fore topmast is 61 feet [19.84 m] long, its given diameter is 18 inches [49 cms] ; its small diameter is equal to seven twelfths of the given diameter which, as I have stated, is at the height of the mast-cap of the lower mast.

Fig. 231
Block of French-style Topmasts



This drawing shows the arrangement of a French-style topmast-block, which is an alternative to the English style described in detail in the main body of the text. I will not therefore describe the latter here.

The heeling of a French-style topmast is fashioned somewhat differently; the foursquare of the block is 1/16th of the length of the mast, the siding being equal to the radius of the lower mast at the base of the masthead. Two mortices are cut in it, and two scores, which are designed to accommodate the ropes (top-ropes) running round the sheaves in the swallows; these sheaves, which are of bronze, have approximately the same diameter as that of the topmast above the block. The swallows slope aft by 1 1/4 inches [34 mm] for each foot [325 mm], and are cut through from port to starboard. They are separated one from the other by a wall which is half the thickness of the swallows which in turn is equal to the thickness of the top-rope (2 1/2 inches or 68 mm), plus half an inch [14 mm]. These sheaves are inclined aft as are the scores or grooves extending upwards from them, because the top-ropes run up to blocks fastened on the after side of the mast-caps, which are then also of the French type (see Plate XLVI).

The thickness of timber remaining below the swallows should be equal to the diameter of the sheaves. The swallows are so positioned that the forward one crosses the axis of the topmast.

Note that the after face of the block is flush with the topmast, and that the fid-hole is moved forward somewhat to keep it clear of the top-rope in the first swallow.

French-style topmasts and mast-caps are becoming increasingly rare, in favour of the English arrangements. In Volume IV I will explain in detail the hoisting and striking of topmasts.

Main topmast: All the lengthy explanations already given apply equally to the main topmast, which is 66 feet long [21.46 m], with a given diameter of 19 1/2 inches [53 cms]; the masthead is 6′8″ long [2.17 m], while the masthead of the mainmast is 12 feet long [3.90 m].

Pole topmast: a topmast which is extended above the hounds to form what is called the ***polehead.***

Mizen topmast: Our 74 is peculiar in having a *pole topmast* on the mizen, the *polehead* of which extends above the hounds to form the mizen topgallant-mast. Thus the mizen is formed in two parts instead of three as is the case with the foremast and mainmast.

The explanations I have given for the other topmasts apply also to the mizen topmast, but the latter being much lighter the block has only a single sheave. It will be seen that the hounds of the mizen topmast, which are squared, only project a little way at the hance since there is no mizen topgallant, and therefore no need of any trestletrees. The stop of the hounds serves only to prevent the rigging from slipping down (see Chapter XIV); for the same reason the mizen topmast has no tenon, since there is no mast-cap, and instead it finishes in a *truck*.

Truck or ***mast-truck:*** round button protecting the end-grain of the mast, so-called by analogy with guncarriage trucks.

The mizen topmast is 62 feet long [20.16 m], its given diameter is 12 inches [32.5 cms] at the mast-cap of the mizen-mast; its small diameter beneath the truck is 4 inches [10.8 cms]. The length of the polehead is 22 1/2 feet [7.32 m], that of the hounds 3 feet [97.5 cms]; the hounds are square in section, sided 7 inches [19 cms]. The diameter of the sheave and the cross-section of the fid are proportionate to the size of the mast (see Plate XLIV).

The single sheave occupies the position of the upper sheave on the fore topmast, but there is no strict rule, and no reason why it should not take the place of the lower sheave; it is so arranged that its after side faces forward and to port.

In order to determine correctly the position of the hounds of the mizen topmast, the procedure is to establish the height of the mast from the table of dimensions and then deduct the notional height of the pole, which gives the position of the hance; the length of the hounds is equal to half the length of the masthead of the mizen topmast (see Table).

The height of the truck of the mizen topmast in our 74 cannot be equal to the height of a mizen topgallant-mast, since in order to strike the topmast (in other words to pass it down through the mast-cap), account must be taken of the height of the deck-planks of the quarterdeck; as a result the total height has to be reduced by about 4 feet [1.30 m].

TOPGALLANT-MASTS:
As I have just explained, there is no mizen topgallant-mast on our 74. However, I will include in this section the jibboom, since this spar can be considered in some respects to be the "topmast" of the bowsprit.

Fore topgallant-mast: The long explanations which I was obliged to give concerning the topmasts will enable me to restrict the explanations regarding the topgallant-masts, since they are similar and are hoisted and struck following the same principles. The block is the same breadth as the diameter, or strictly speaking the siding of the topmast just above the hounds. The block is left foursquare and has only one sheave placed diagonally according to the English method; in order to cut the swallow the corner is simply dubbed back, and the after side of the swallow faces forward and to port. In general, the sheave is placed in the lower part of the block, the swallow being cut at a distance from the heel which corresponds to half the length of the mortice.

The length of the block varies according to whether the single sheave is placed as I have just indicated, or above the fid. The given diameter of the topgallant-mast is at the height of the mast-cap of its respective topmast, and a hance joins the block to the topgallant-mast proper. The after face of the block is vertical, thus directly below the given diameter of the topgallant-mast. The topgallant-mast fids are of wood, and the sheaves may be of bronze or of lignum vitae; the pins are of iron and run in bronze coaks.

The fore topgallant-mast is 39 feet long [12.68 m], its polehead is 13 feet long [4.23 m], and its small diameter is equal to one third of the given diameter, at its upper end immediately below the truck. At the lower end of the polehead are the hounds which are square in section, the siding being equal to the given diameter of 7 1/2 inches [20.3 cms]; the length of the hounds is equal to half the length of the masthead of the topmast. A swallow is cut longitudinally towards the top of the hounds to take a sheave, which serves the yard halliards; in the case of the mizen topmast I should mention that this swallow for the mizen topgallant-yard halliards is cut somewhat below the truck. At the upper end of the topgallant-masts, at the top of the polehead, is a tenon designed to take the truck and the vane (these are described among the Master's stores in Chapter XI, Volume II, so I shall not repeat myself).

Main topgallant-mast: In every respect similar to the fore topgallant-mast, it is 42 feet long [13.66 m]; its given diameter is 8 1/2 inches [23 cms], and the polehead is 14 feet long [4.55 m].

I will summarise by saying that the upper masts are worked at their heeling to take the sheave or sheaves necessary for hoisting and lowering them; that they have hounds (which are the equivalent of the bibbs on the lower masts) on which the trestletrees or the shrouds are secured. Above the hounds the masthead overlaps the the mast above, or becomes the polehead at the top of the mast; this polehead can under certain circumstances (depending on its length) carry a small additional yard called the *royal yard*.

Royal yard: the royal yard spreads the royal or fourth tier of sails.

Stump topgallant-masts: these only carry a vane.

With the advent of the bad-weather season, the topgallant-masts are replaced by *stump topgallant-masts*, since during the stormy season topgallant sails are not bent. The stump masts are at most half the length of the topgallant-masts which they replace, and sometimes the spars of the ship's boats are used in winter.

Jibboom: The jibboom of our 74 is 44 1/2 feet long [14.47 m]; its given diameter is 13 inches [35.2 cms] and falls in the after third of the spar; the small diameter is four fifths of the given diameter and falls at the outboard end. The jibboom ends in a truck in which there are two small sheaves*.

*The jibboom also has a sheave at its inboard end, which is used to haul it out (see Chapter XIV).

Saddle.

Flying jibboom.

The projection of the jibboom varies but never exceeds two thirds of its length; it passes through the cap of the bowsprit and is offset to starboard in order to leave room for the rigging; a wooden *saddle* nailed to the bowsprit serves to chock the after end of the jibboom, and a heel-lashing of rope secures the jibboom to the bowsprit (see Chapter XIV). Sometimes the jibboom is itself extended by a *flying jibboom* so that a fourth headsail can be bent, but this is rare on a ship of the line.

Ensign.

*Save in very exceptional circumstances, when the ensign-staff may be used to bend a light triangular sail, using a boom extended over the taffarel fife-rail to spread the outer corner of this somewhat fanciful sail; it is used most commonly by frigates.

Ensign staff: This spar carries no sail*; its sole purpose is to fly the *ensign* or national colours, which we will come to in Volume IV.

The ensign staff is 44 feet long [14.31 m], which is by no means negligible; its given diameter at the heel is 6 1/2 inches [17.6 cms]; this reduces by half at the truck, which is gilded and carries two sheaves for the ensign halliards.

The ensign staff has its heel stepped in a small step nailed to the planking of the poop against the taffarel; a clamp with a hinged iron collar secures the staff against the taffarel fife rail (see Fig. 138). The ensign staff rakes aft parallel to the round aft of the stern.

———*———

To complete this section on the masts I would add that their rake is not imposed by any hard-and-fast rule, being often more a matter of individual choice. Thus in our 74, as I have already stated, the masts are perpendicular to the keel, which gives them a slight rake aft when the ship is in her usual trim, which corresponds to a greater draught aft than forward.

However, the mainmast might be the only mast to be perpendicular to the keel, with the foremast perpendicular to the waterline and thus truly vertical. The mizen may be raked somewhat aft beyond that given by the ship being trimmed by the stern. But once again this is up to the Captain to decide, as many ship's logs testify. As far as the bowsprit is concerned, its steeving may vary between 30 and 35 degrees with the horizon, but in our 74 it is steeved 30 degrees to the keel, at which angle the bowsprit passes under the collar-beam without it being necessary to trim or cut into the beam.

LOWER YARDS (See Plate XLV)

There are three lower yards, since the crossjack yard can be considered to be a normal lower yard despite the fact that no sail is bent to it*.

*Very occasionally a sail is bent to the crossjack yard; called a bonaventure mizen, this is just a frigate-captain's fancy and is recognised by no regulation.

Foreyard: Like the mainyard, the foreyard is a made-yard; see Figure 224 for their construction. These are the only yards made in this way, which explains why they alone are hooped.

As a general rule, all the horizontal yards have their given diameter situated at the middle and the small diameter at the ends. The middle part is called the *slings*, the length of which is equal to five times the given diameter. The slings are of octagonal section fashioned from a foursquare, the siding of which is larger than the given diameter of the yard by an amount which may vary from 1/2 to 1 1/2 inches [14 to 41 mm], depending on the length of the yard; outboard of the slings the yard is circular in section.

Slings.

The length of the foreyard is 84 feet [27.32 m] and its given diameter is 22 inches [60 cms]. The end of the yard is fashioned to what is called the *yardarm*; in the case of the foreyard the yardarms are 7 1/2 feet [2.44 m] long in total, so that each yardarm is half that length; the yardarm is worked to an eightsquare within the original circular section. The eightsquare meets the circular section of the yard at a point where it is left somewhat thicker for a distance equal to its given diameter, and square in section, so that the circular section is described within it: this is the *square of the yardarm*. One way of looking at the square is to consider it as a small cube separating the circular part of the yard on one side from the octagonal part of the yardarm on the other. The square of the yardarm prevents the ropes which, as we shall see later, are fitted over the ends of the yards from slipping along the yard. I would emphasise that the length of each yardarm is only half the figure given in the Tables, and that this length generally excludes the length of the square, so that only the part which is worked to an eightsquare is taken into account.

Yardarm.

Square of the yardarm.

Mainyard: In every respect similar to the foreyard; it is 92 feet [29.92 m] long, its given diameter is 23 inches [62 cms], and the yardarms measure 8 feet [2.60 m].

This yard carries 26 hoops, while the foreyard has only 24. As can be seen on Plate XLV there are irons fastened to the outboard ends of the yard and a wooden saddle near the slings; I merely mention these items in passing since they will be explained in detail in the next Chapter.

Sometimes there is a sort of batten with holes cut in it nailed to the forward face of the two larger lower yards; these *roband-strips* serve to prevent the various ropes fastened round the yard at the slings from galling.

Roband-strips.

Crossjack-yard: This lower yard is considerably smaller than the two others, but is otherwise similar. Its length is 61 feet [19.84 m], the given diameter 12 inches [32.5 cms], and the length of the yardarms 5 feet [1.63 m].

UPPER YARDS:

These are the yards to which the second and third tiers of sails are bent.

Fore topsail-yard: My explanations regarding the lower yards apply equally to all the upper yards, except for the fore, main and mizen topsail-yards, the yardarms of which are fashioned differently. The sails which are bent to these yards have *reefs* in their upper part, and the *reef-points* are made up of a row of thin ropes running across the sail; there are three rows of reef-points on the topsails arranged a certain distance apart. By raising the sail by means of these reef-points and folding it forward over the yard the drop of the sail can be shortened by one, two or three reefs; since the sails are trapezoidal in shape, the yard must be allowed to project over each row of reef-points so that the corresponding part of the sail may be suitably fastened.

Reef; reef-point.

The yardarms of the topsail-yards are worked for a longer distance than is the case with the other yards, and have three or four squares or extra thick points on them.

Briefly, the topsail yardarms of our 74 have three squares. These are arranged as follows: the length of the yardarm is divided into three equal parts; the outer third is worked to an octagonal or circular section, and the two other thirds are divided into two, one half of which is left proud to form the squares. At the inboard end of the yardarm is a third identical square forming the junction with the round section of the yard; the length of this third square is not included in the length given for the yardarm. In this way there are three stops for the rigging. These explanations will become clear if you examine Figure 232, which is taken from Plate XLV.

The fore topsail-yard is 61 feet long [19.84 m], its given diameter is 13 1/2 inches [36.6 cms], and its yardarms measure 10 feet 3 inches [3.33 m]. The topsail-yards have at their outboard end a vertical sheave-hole cut in them to take a small sheave; there are boom-irons as for the lower yards, and we will see how they are used in the next section.

Main topsail-yard: In all respects similar to the yard I have just described. It is 66 feet long [21.46 m], with a given diameter of 14 1/2 inches [39.3 cms]; the yardarms total 11 feet [3.58 m] in length.

Mizen topsail-yard: This is like the others, except that there is no swallow for a sheave at the yardarm, and squares are provided for two reefs only, since the mizen-topsail has one less row of reef-points than the two other topsails. I should say at this point that strictly speaking the topsail-yards should have four and three squares respectively, but often in practice the corner or upper clew of the sail and the first reef-point can be fastened at the same square; in Figure 232 I have shown a topsail yardarm with four squares. In the case of the mizen topsail-yard the yardarm is thus divided into two parts, the outer half being worked to an eightsquare and the other subdivided into two as I have already explained.

The mizen topsail-yard is 44 feet long [14.31 m]; its given diameter is 9 1/2 inches [25.8 cms], and its yardarms total 7 1/2 feet [2.44 m] in length; it is fitted with the same accessories as the other topsail-yards.

Fore topgallant-yard: Fashioned excatly like the mizen-yard, it is 39 feet long [12.68 m] with a given diameter of 6 1/2 inches [17.6 cms]; the yardarms total 3 feet 6 inches [1.14 m].

Main topgallant-yard: Like the previous yard. It is 42 feet long [13.66 m], with a given diameter of 7 1/2 inches [20.3 cms]; the yardarms total 3 feet 6 inches [1.14 m].

Mizen topgallant-yard: Like the previous yard. It is 28 feet long [9.11 m], and its given diameter is 5 inches [13.6 cms]; the yardarms total 2 feet 6 inches in length [81.3 cms].

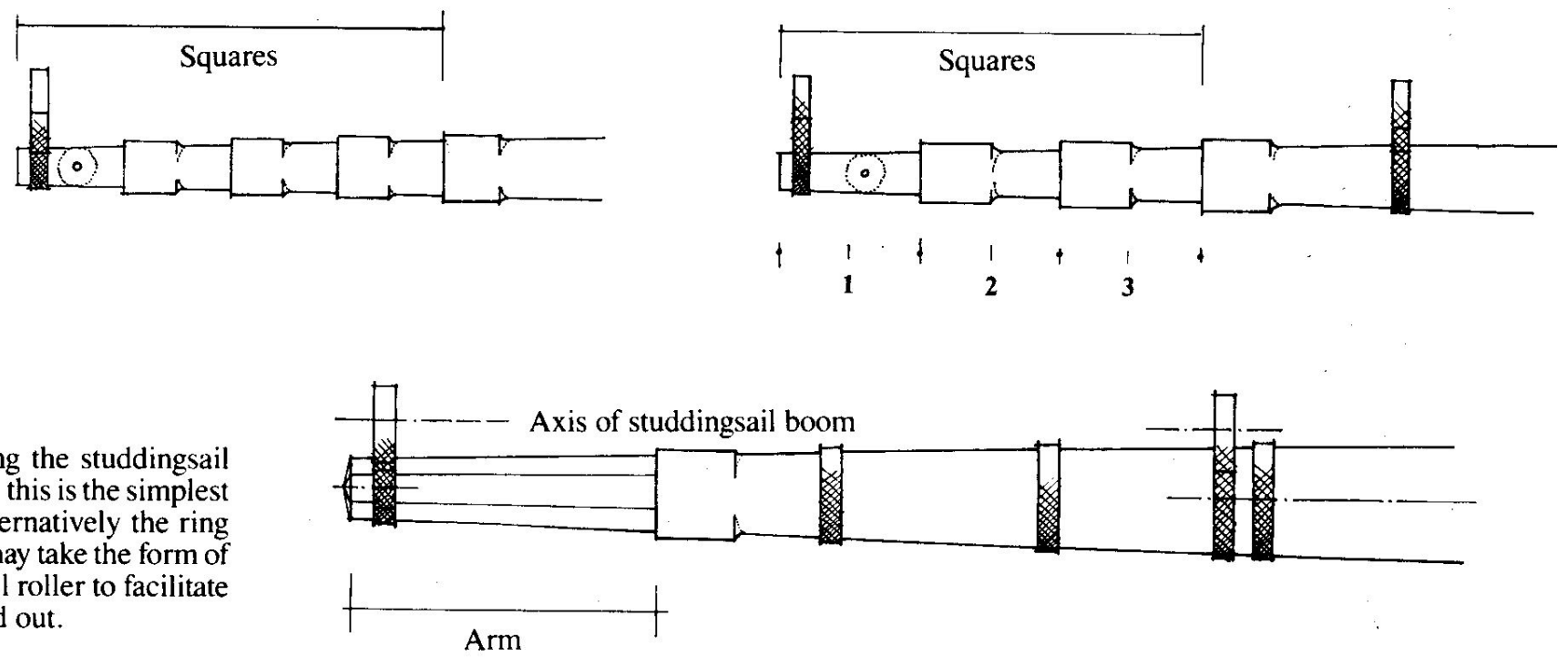


Fig. 232
Yardarms

This drawing shows the yardarms of the mainyard and of the main topsail-yard, the latter having three squares. I have also shown a yardarm with four squares. As I have said, the total length of the yardarm is divided in the one case into four equal parts, and in the other into three. One part forms the outboard end of the yard, while the others are sub-divided into two, each half being formed to the square through the addition of small pieces of wood nailed to the yard.

In Figs. 254 and 255 you can see how the sails are fastened at their upper corners to the yard; the ropes, called ear-rings, are unable to slip up the yard.

I have also shown in this drawing the studdingsail boom-irons (see the next section); this is the simplest and lightest arrangement, but alternatively the ring through which the boom passes may take the form of a stirrup and be fitted with a small roller to facilitate the movement of the boom in and out.

SPRITSAIL YARDS

The bowsprit carries two yards. The lower of the two, the *spritsail-yard* proper, serves mainly to spread the jibboom shrouds, but on occasions a sail is bent to it. The upper yard, called the *spritsail topsail-yard* is scarcely ever used since it only weighs down the jibboom, and its sail is very ineffectual, but the Regulations stipulate that a spritsail topsail-yard must be carried, so I have included it, even though it often remains on the upper deck with the spare spars, to be used as a spare if required.

Spritsail topsail-yard or ***sprit topsail-yard.***

Spritsail-yard: Fashioned exactly like the crossjack yard, it is 61 feet long [19.84 m], with a given diameter of 13 inches [35.2 cms]; the yardarms total 5 feet [1.63 m]. This yard can serve as a spare fore topsail-yard.

Spritsail topsail-yard: Like the spritsail-yard. It is 42 feet long [13.66 m], with a given diameter of 7 1/2 inches [20.3 cms]; the yardarms total 3 feet 6 inches [1.14 m]. This yard can serve as a spare main topgallant-yard.

MIZEN-YARD

This last yard is peculiar in that it is not placed horizontally but *peaked* at an angle of 45 to 50 degrees to the mizen-mast. On our 74 this angle is 50 degrees. The mizen-yard can be considered as a *lateen yard* fixed at 3/5ths of its length, the other 2/5ths forming the lower part forward of the mast, and this is what dictates the positioning of the slings*. The sail is bent to the part of the yard which is abaft the mast, which is to starboard. The lower end of the yard finishes in an eightsquare and a ball; this end is called the *lower arm*, or the butt. The upper or small end is sometimes called the *peak*, and finishes in an iron hoop and a spike.

Peaked: to peak the mizen-yard is to raise it, while when the other yards are peaked the arm is in fact lowered. Yards can also be ***peaked up*** or ***topped***, which has the same meaning.

Lateen yard: the yard of a ***lateen sail***, or triangular sail which was indeed the original shape of the mizen.

The mizen-yard is 84 feet long [27.32 m]; its given diameter is 15 inches [40.7 cms] and situated 3/5ths of the length below the peak, at the middle of the slings. The diameter at the lower arm is 3/5ths of the given diameter, and the diameter at the peak is half the given diameter.

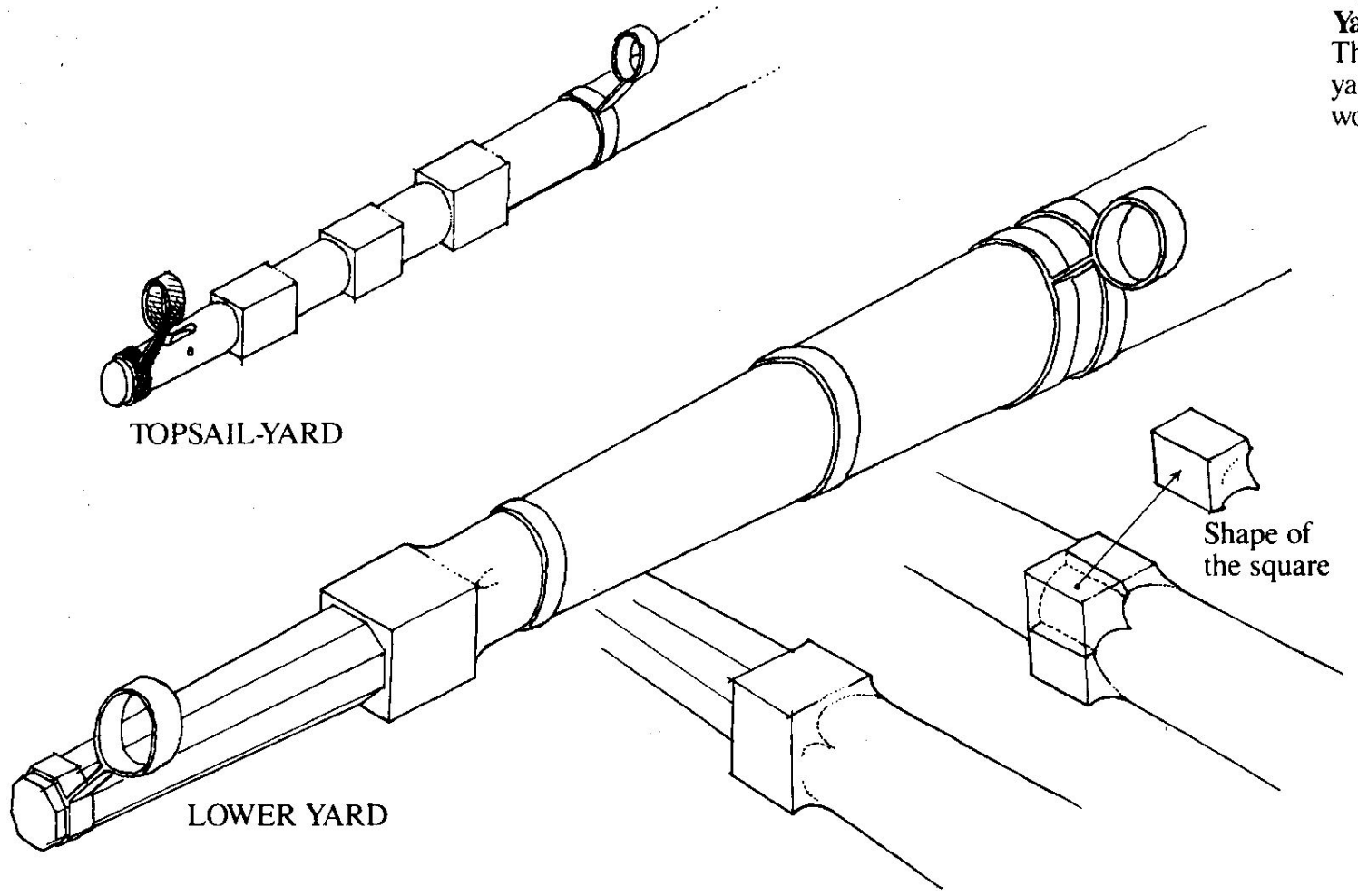
*The mizen-yard does not always have slings.

Lower arm.

Peak of the mizen-yard.

An alternative arrangement is that the given diameter falls two thirds of the length below the peak, and the slings may also be proportioned as on the other yards, their length being five times the given diameter and octagonal in section; at the peak there may be a square like the square of the yardarm of a lower yard.

Fig. 233
Yardarms
The drawing shows a round yardarm; sometimes they were worked to an eight-square.



4. Other Spars, and Spares

Apart from its principal masts and spars our 74 also carries a number of other spars for bending fair-weather sails. In addition there are the spare yards and topmasts which may be used as replacements in case of accidents while at sea. These spares are completed by a number of *roughtree masts*, all of which form part of the seagoing stores.

Roughtree masts.

EXTRA SPARS

The square, or more accurately the trapezoidal sails of our 74 can be supplemented by extra sails on either side called the *studdingsails*, and in order to spread these extra sails small spars must first be rigged. See Figure 234.

Studdingsails: pronounced "stuns'ls".

Studdingsail booms: The mainsail is supplemented by two studdingsails which are trapezoidal in shape, and their lower edge must be held outboard by a boom. This is a spar which finishes at the butt or thick end in an iron hoop and a hook which can be fastened to an iron strap with an eye which is situated as we have seen at the forward end of the main-channels. This spar is sometimes called the *iron-shod boom* or *swinging-boom*. Its given diameter is situated one third along its length starting at the channels and is equivalent to 1/54th of its length, which in turn is equal to the beam. The small diameter is immediately below the button which decorates the outboard end, being three fifths of the given diameter.

Iron-shod boom: Fr: *arc-boutant ferré.*
Swinging-boom.

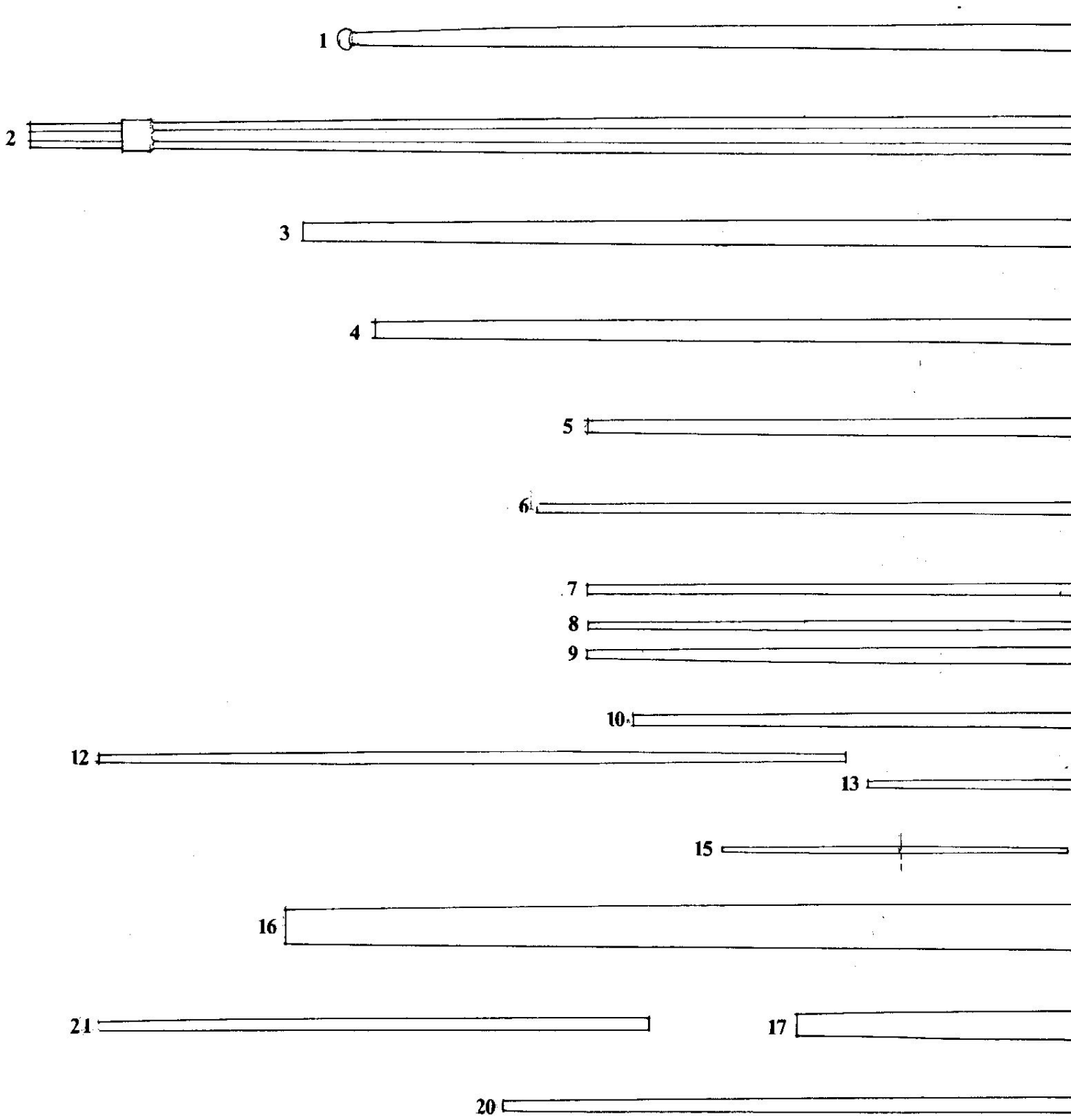


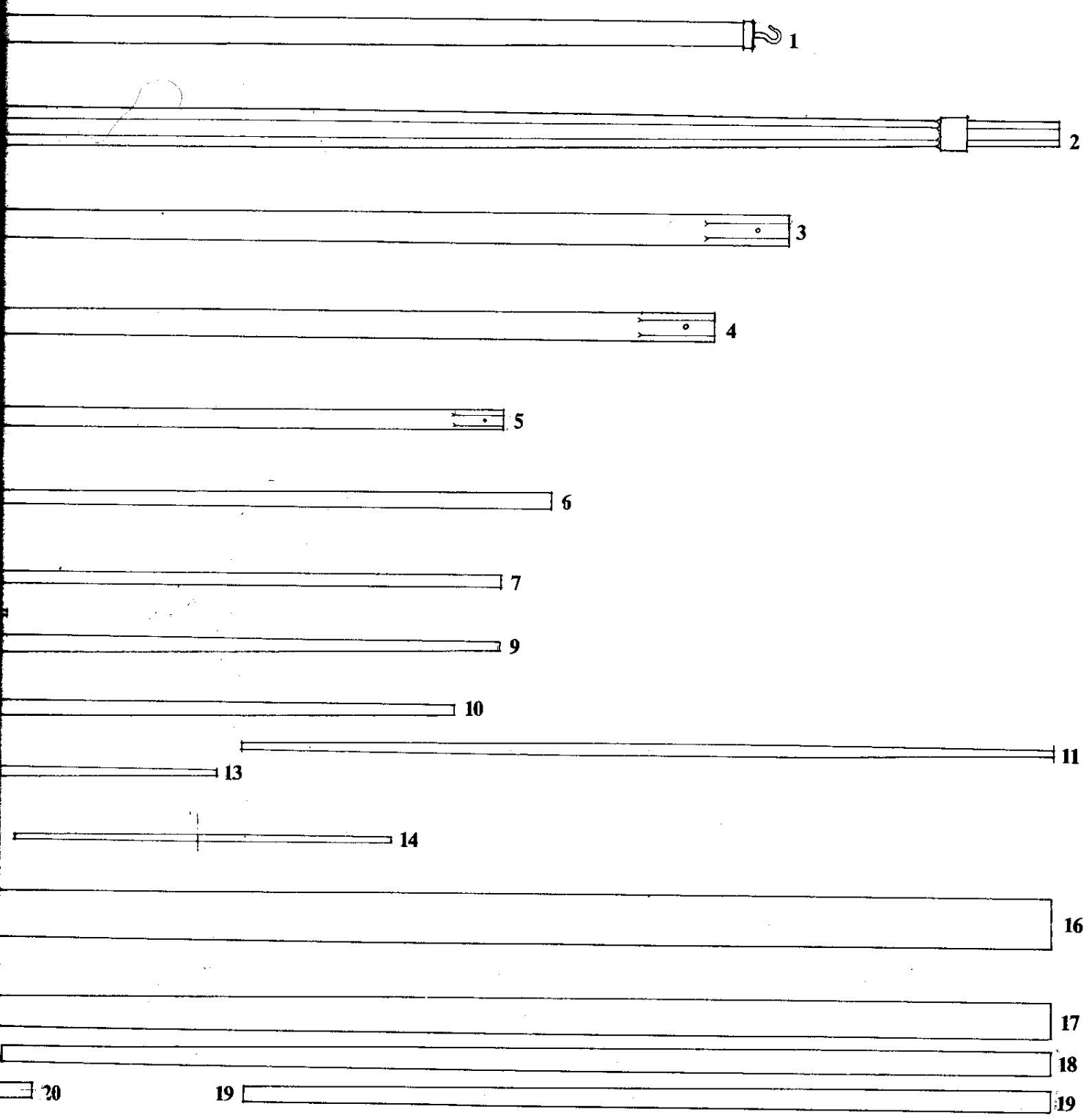
Fig. 234
Other Spars, and Spares

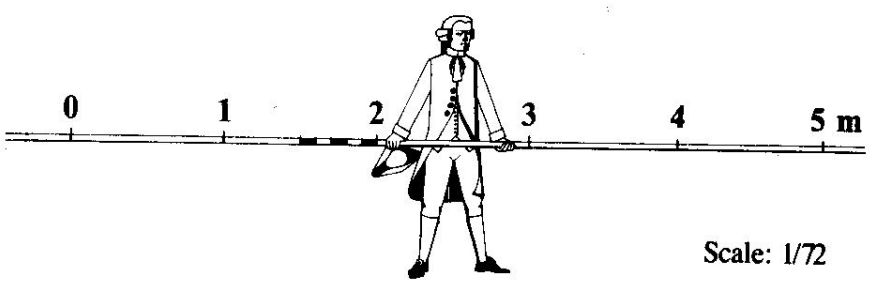
1. Swinging-boom for lower main studdingsails.
2. Boom for lower fore studdingsails.
3. Boom, main topmast studdingsails.
4. Boom, fore topmast studdingsails.
5. Boom, mizen topmast studdingsails (on crossjack-yard).
6. Boom, main topgallant studdingsails.
7. Boom, fore topgallant studdingsails.
8. Yard, lower main studdingsails.
9. Yard, lower main studdingsails (alternative).
10. Yard, lower fore studdingsails (alternative).
11. Yard, main topmast studdingsails.
12. Yard, fore topmast studdingsails.
13. Yard, mizen topmast studdingsails (on crossjack-yard).
14. Yard, main topgallant studdingsails.
15. Yard, fore topgallant studdingsails.
16. Handmast, 15 palms.
17. Handmast, 11 palms.
18. Spar, 8 palms.
19. Cant-spar, 6 palms.
20. Barling, 5 palms.
21. Boom, 4 palms.

The lower fore studdingsails are spread by a kind of yard called the fore studdingsail boom, the dimensions of which are identical to the crossjack yard; both have squares at either end, but the boom is octagonal in section. When the boom is not in use (and indeed it is only rarely used) it lies amidships on the forecastle, and when the lower fore studdingsails are set it is extended almost completely outboard so that it must be supported by a hook-tackle, as will be explained in Chapter XIV. Some Captains prefer to stow the boom, which can also serve as a spare mizen topsail-yard, with the spare spars on the upper deck.

Other booms: These spars extend outboard from the ends of the yards. Those fitted to the lower yards are half the length of the yards, and their given diameter at the inboard end is 1/54th of their length; the small diameter, which is at the outboard end, is three fifths of the given diameter. Two iron rings placed along the axis of the yard at the yardarm (see Plate XLV) hold the booms in place and allow them to slide in and out. When in use, the boom projects outboard beyond the yardarm by two thirds of its own length, which dictates the position of the *boom-iron* on the yard. You will see the boom-irons, or *studdingsail-irons*, fastened to the end of the yardarms; the octagonal mould-hoop (but it can also be round) is of hoop-iron. It is driven onto the yard and held in place by small iron wedges, and to this hoop is welded an iron strap with a ring at the end, through which the boom slides. Another iron is situated inboard along the yard at a distance from the end of the yard which corresponds to a quarter of the length of the boom. When the boom is run out it is secured not only by the irons but also by lashings of rope seized round the boom and the yard.

Boom-iron: or ***studdingsail-iron.***





Scale: 1/72

When the studdingsail-booms are run inboard, they rest within the two hoops with their small end* flush with the end of the yardarm and the other end resting on a small crescent-shaped *saddle* of wood nailed to the yard, and they are secured with a lashing. The inboard end of the lower yard studdingsail-booms is worked to a foursquare*, and a hole through the middle takes the rope of the lashing.

*The *small.*

Saddle.

*Or a hexagon.

The boom-irons are so positioned that a gap is left on the fore-side of the yard which is wide enough to allow room for the ropes such as the robands and gaskets which are used when furling sail or taking in a reef.

The topmast studdingsail booms are used in the same manner and are arranged in the same way. Their length is equal to half that of the yard, their given diameter is 1/72nd part of their length, and the small diameter is three fifths of the given diameter. The mizen topsail-yard carries no studdingsail-booms, but there are booms fitted to the crossjack yard; like those of the lower yards, these have a given diameter which is equal to 1/54th of their length. I should also add at this point that lower studdingsails are no longer used on the mizen.

*Alternatively, the lower studdingsails may have a complete yard, the length of which is equivalent to a third of the length of their respective yards.

The topgallant-yards may be fitted with small spars serving as studdingsail booms, to which the topgallant studdingsails are fastened, but often the small yards to spread these sails are fastened directly to the topgallant-yardarms, which is simpler in view of the limited spread of these studdingsails. If booms are used they are made fast with a few turns of rope to the yardarms and removed entirely when not in use, for it should be noted that topgallant studdingsails are only rarely used.

Studdingsail yards: The studdingsails are bent to short spars, with the exception of the lower fore studdingsails, where the head of the sail is spread by the boom itself, but this is not a hard-and-fast rule. The lower main studdingsails have only a half-yard, the length of which is equal to only half the spread of the studdingsail (see Chapter XIII), plus some small squares*.

The topmast studdingsail yards are one third the length of their respective yards; their given diameter is equal to 1/60th of their length, and the small diameter is half the given diameter.

The topgallant studdingsail yards are a quarter the length of their respective yards; their given diameter is equal to 1/72nd of their length, and their small diameter is half the given diameter.

SPARE SPARS: (see Figure 234)

Palms: these are diameters, which is confusing since English ***hand-masts*** are masts bought in the round and measured in hands' circumference, whereas those bought squared and measured by the diameter were called ***inch-masts***. The French *palme* measures 29.2 mm. Strictly speaking, masts measuring less than 6 English hands' circumference (15.2 cms diameter) should be called ***spars***, graded by size: ***cant-spars*** (16.5 – 17.8 cms diameter); ***barlings*** (14.0 – 15.2 cms); ***booms*** (11.4 – 12.7 cms); ***middling spars*** (8.9 – 10.2 cms); and ***small spars*** (6.4 – 7.6 cms). [Trans.]

Worked spars: According to Regulations, our 74 is supplied with spares as follows: a main topmast and a fore topmast, which are stowed as we have seen on small chocks placed on either side of the ship's boats on the upper deck. In Volume IV I will describe the evolutions necessary for replacing a topmast.

Also supplied are: a main topsail-yard and a fore topsail-yard, which are stowed on the channels (see Plate XXVI, Vol.II). In addition there is a spar of 17 palms [49.9 cms].

Roughtree masts and spars: The list is as follows: one *hand-mast* of 15 *palms* [44 cms], a second of 11 palms [32 cms], a hand-mast of 8 palms [23 cms], and nine *inch-masts* of 4 to 6 palms [12 – 18 cms]. All these are intended as spares. On our 74 they are placed next to the spare topmasts, while the yards are placed in the channels. However, this arrangement may vary from ship to ship; an alternative for example is to stow them so that they rest on the breastworks of the forecastle and quarterdeck on either side of the ship's boats. This arrangement leaves the space under the longboat unencumbered, so that specially shaped chicken-coops may be placed there instead*.

*I would emphasise however that some spars are interchangeable since they are the same size.

5. Mast Furniture

In this last section of Chapter XII I will describe the various fittings or *furniture* which accompany the masts, and which are a necessary part of their setting-up. It will be easier to follow my explanations if you examine Plate XLVI, as well as the various Figures mentioned in the text.

Furniture of the masts.

RUBBING-PAUNCHES:

These timbers can be considered as strengthening-pieces for the lower masts; fayed to the forward side of the masts they serve to stiffen them, but the *rubbing-paunches* also serve to guide the topmasts when they are hoisted or struck, as we shall see in the following pages. Originally the rubbing-paunches were extremely short, but in recent years there has been a tendency to lengthen them, and indeed some people extend them down almost as far as the planking of the quarterdeck or upper deck. The length of the rubbing-paunches is in fact somewhat arbitrary, since some people make them only half the length of the lower masts calculated from the plankshеer to the beginning of the masthead.

Rubbing-paunch: also called a ***front fish***, although according to Lees [op. cit.] the former term is more correct after iron hoops were introduced.

In our 74 the rubbing-paunches run well down in order to strengthen the lower masts.

Foremast rubbing-paunch: This is shown in Figure 240 (see page 50), and it is 49 feet long [15.93 m]; its breadth at the top is equal to the space between the trestletrees, or in other words the thickness of the heeling of the fore-topmast. The thickness of the rubbing-paunch is such that the heeling of the topmast is held 5 inches [13.6 cms] away from the masthead of the lower mast. Both breadth and thickness reduce towards the lower end. The rubbing-paunch is made of oak, its after face being hollowed out in order to fay exactly to the forward face of the lower mast, and it is scored to receive the mast-hoops*. The forward face of the paunch is flat for the distance which corresponds to the length of the bibbs (see below), while below the bibbs it is worked to a convex shape; in Figure 240 I have shown various cross-sections of the rubbing-paunch of the foremast, which indicate its shape clearly. The paunch is fastened to the lower mast with nails*, but more particularly with *wooldings* of rope wound round and round, and in order to prevent the wooldings from being frayed by the topmast, and to ensure that no projection hinders its movement, scores are cut in the way of each woolding. Care is taken to space out the wooldings more or less evenly, avoiding the mast-hoops of the lower mast. Nevertheless, such long rubbing-paunches are new, and on our 74 no account was taken of the wooldings when the mast was hooped; in future it will be more common to space the hoops slightly wider apart and to arrange the wooldings so that they fall half-way between the hoops, which is aesthetically more pleasing.

*These hoops are not therefore round, and have the special name of ***mould-hoops***, because they are shaped to a mould.

*Some people think nails are unnecessary, except at the top.

Wooldings: Steel [op. cit.] suggests 13 turns.

I should add that the wooldings are made up of five or six turns of rope, made fast with scupper-nails, and that a plain wooden hoop is nailed to the mast above and below the turns of rope.

Mainmast rubbing-paunch: All the explanations given above apply equally to the mainmast rubbing-paunch, which is shown in detail in Plate XLVI. It is 51 feet long [16.57 m].

Mizen rubbing-paunch: Often this is extremely short, running down scarcely below the bibbs, but sometimes it is longer like the rubbing-paunches of the other lower masts, even though the mizen is not subjected to the same strains as the other masts. I have shown both arrangements on Figure 241 (page 51), so that both the long and the short rubbing-paunch can be examined in detail.

Gammoning-fish.

Gammoning-fish of the bowsprit: Examine Figure 243 (on page 55); note that the *gammoning-fish* of the bowsprit lies on top of that spar and is about half its length; its width is equivalent to half the diameter of the bowsprit, and its thickness is a quarter of its breadth. Note that the gammoning-fish ends somewhat short of the head of the bowsprit, precisely at the point where the spar is flat on top instead of being circular in section. This gammoning-fish is fayed to its spar in exactly the same way as the rubbing-paunches. There are a number of other items to do with the bowsprit which I will describe at the end of this section.

TOPS AND LOWER MAST CAPS:

Tops.

Towards the head of the lower masts are relatively light platforms called *tops*, which serve the double purpose of spreading the topmast shrouds better and at the same time of supplying a vantage-point from which musket-fire is directed in close-combat which can be extremely effective, providing as it does plunging fire down onto the decks and half-decks of the opponent, accompanied sometimes by the throwing of grenades. Furthermore, the tops allow the crew to be as it were "on the spot" for working the rigging.

Foretop: The description of the top which I am about to give is valid for all three tops of our 74, which are essentially similar. Following on from that I shall describe the mast-caps, since they are closely associated with the tops.

Bibbs: they were constructed quite differently on English ships, although the purpose was the same.

Let us start by examining the *bibbs* (sometimes called the mast-cheeks), which are an essential adjunct to the tops since they support the framework on which they are erected. I have explained the definition of the masthead, which in the case of the lower masts corresponds to that part which is overlapped on the forward side by the heeling of the topmast; this distance should be taken as the distance between the top of the tenon of the lower mast and the top of the trestletrees; thus, knowing that the masthead of the foremast is 11 feet in length [3.58 m], we can calculate the position of the top of the bibbs by measuring off this distance from the top of the tenon and adding the thickness of the trestletrees. The bibbs are of oak and are nailed to either side of the lower mast; they are made up of three pieces of timber, the lowermost piece having the grain placed end-on (vertically). The two upper pieces are joined together by three blind ragged bolts, while the lower piece is secured to the middle piece by means of a wide tenon which fits into a mortice cut in the lower edge of the middle piece.

The upper part of the bibbs projects forward in order to provide better support for the crosstrees (see below), while the forward part of the middle piece is fashioned to a curve below the point where it joins the upper piece*; the shape of the bibbs will become clear from examining Figure 235.

*This curve is designed to leave access to the butt of the heeling of the topmast, in order that the preventer top-rope may be fitted.

The length of the bibbs is equal to at most half the length of the masthead of the lower mast, and at least 2/7ths of that length. Their fore-and-aft length on top is equal to at least twice the diameter of the lower mast measured at the hounds, but what counts is that they must support fully the fid of the topmast, and since on our 74 this is placed further forward because of the shape of the block of the topmast, the bibbs are accordingly longer in their fore-and-aft dimension. At the lower end this is 7/15ths of the length on top. Their thickness at the top is equal to that of the trestletrees (1/144th part of the length of the topmast). This thickness reduces progressively down through the two lower pieces of the bibbs, so that at the lower end it is only 7/16ths of the thickness of the trestletrees.

Cant-pieces.

The outer edges, except along the top, are rounded or smoothed off. The bibbs are fastened on either side of the lower mast, but their fastening demands a flat surface, and this is obtained over the length of the bibbs by squaring off the rounded section of the mast with the insertion of *cant-pieces* fayed and nailed to the mast. Six to eight strong bolts run through the bibbs and are driven for two thirds of their length into the mast, thereby fastening the bibbs, and care must be taken to ensure that these bolts are so placed as to avoid meeting those driven in from the other side, and to avoid forcing apart the side-trees of the lower mast.

The bibbs thus form a projection on either side of the lower masts and provide a solid foundation for the oak bars placed across them in a fore-and-aft direction called the *trestletrees*. The mid-point of the trestletrees coincides with the forward side of the lower mast at that height. The trestletrees are one quarter the length of the topmasts, their height is equal to one twelfth of their length, and their thickness athwartships to 1/36th, being thus the same as the upper edge of the bibbs*.

Trestletrees.

*Some people make the height of the trestletrees equal to 5/72nds of their length and their thickness athwartships half that, or 5/144ths (i.e. 1/30th). As for the crosstrees, their breadth is equal to the height of the trestletrees and their thickness is the same.

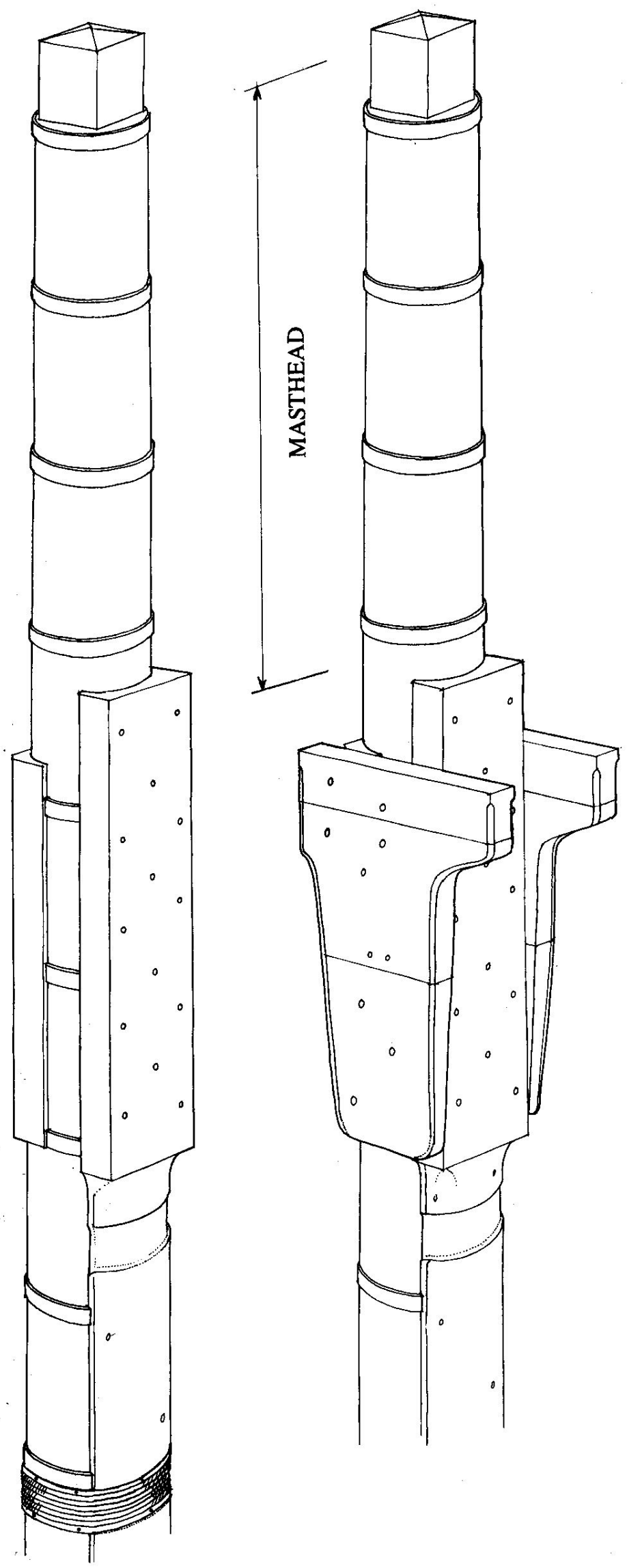


Fig. 235
Bibbs and Rubbing-Paunch

The left-hand drawing shows a filling-piece fastened to the after side of the lower mast in order to receive the starboard bibb. The same drawing shows the rubbing-paunch, of which the squared-off stop can be seen; equally visible is the way its inner face has been worked to fit the fore side of the lower mast. I have shown a woolding at the bottom of the drawing, but the upper woolding has been omitted in order to show how the convex outer face of the paunch is scored so that the woolding will not project beyond the paunch.
The drawing on the right shows the bibbs in place. Note the difference in height between the top of the bibbs and the top of the rubbing-paunch.

The fore and after ends of the trestletrees are faired away underneath, and the exposed edges are rounded off.

Crosstrees.

The *crosstrees* are placed at right-angles to the trestletrees (whence their name), and while the latter are laid on edge, the crosstrees are laid flat. Their length is equal to one third of the length of the topmast, their breadth is 1/18th of their length, and their thickness 1/38th part.

The crosstrees are so placed that the after one touches the mast* and the fore one has its after edge immediately forward of the heeling of the topmast. The crosstrees are laid over the trestletrees, and since they must lie flush with them, scores equal to two thirds of their depth are cut in the crosstrees and further scores equal to one third in the trestletrees themselves. Thus the upper faces of both crosstrees and trestletrees are level. Six iron bolts fasten the trestletrees to the bibbs.

*With the after crosstree in this position it may obstruct the shrouds so that they rub against its forward edge; in which case it may be preferred to shift it aft somewhat.

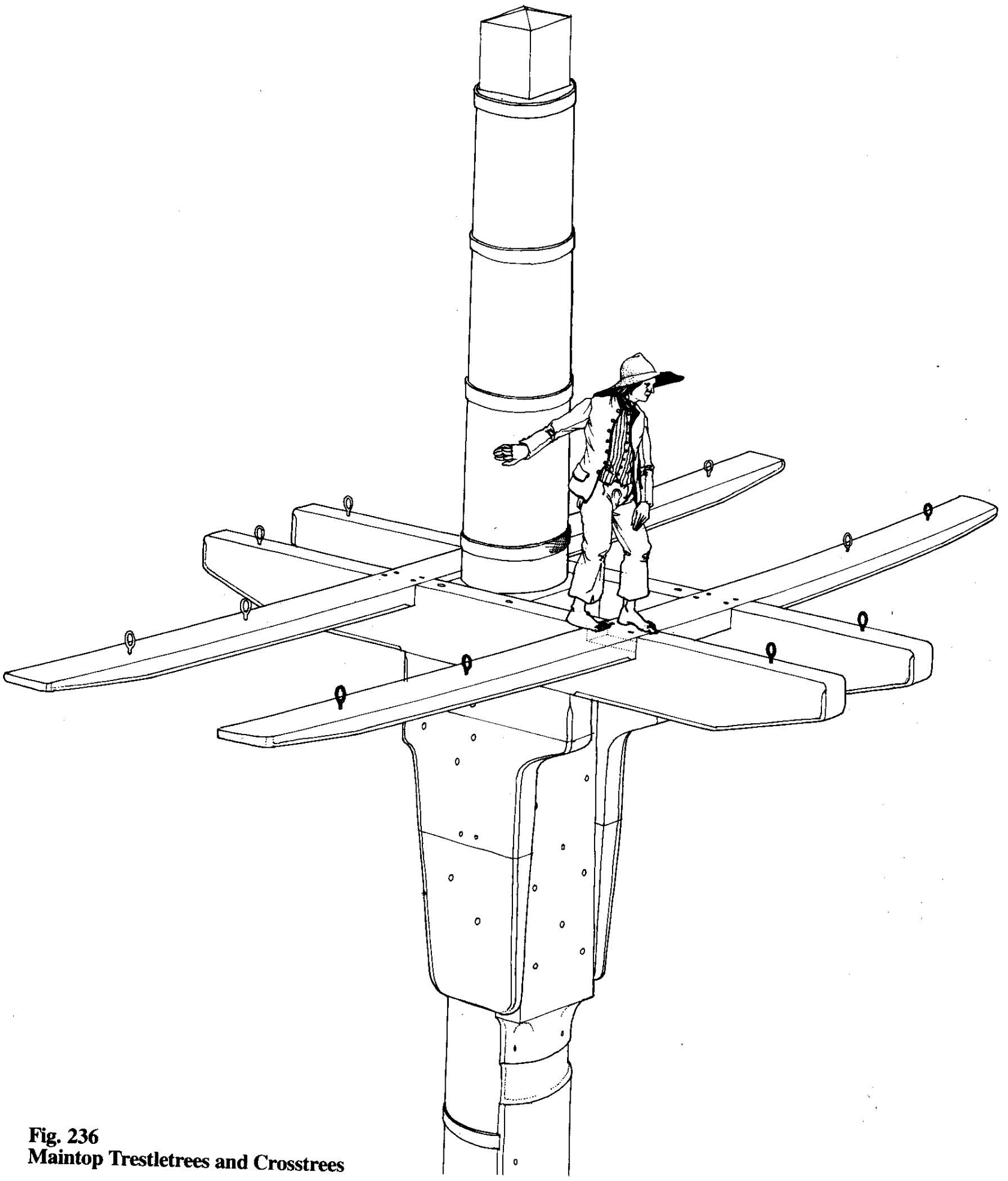


Fig. 236
Maintop Trestletrees and Crosstrees

The trestletrees have been laid over the bibbs and the crosstrees over the trestletrees. The top of these timbers lies flush with the stop of the rubbing-paunch. A faint dotted line shows how the trestletrees are cut away to receive the crosstrees. Note the eyebolts which serve to fasten the tops in position.

The block of the topmast fits into a kind of framework formed on either side by the trestletrees, on the forward side by the fore crosstree and on the after side by the rubbing-paunch, the top of which lies flush with the upper face of the trestletrees and crosstrees. The topmast-fid lies across the upper face of the trestletrees, while below the fid-hole the block is held by the framework I have just described. From this it is now possible to understand how the topmast can be moved up and down, being guided on the one hand by the mast-cap (see below), and by the framework provided by the trestletrees, crosstrees and rubbing-paunch; thus there is no risk of the topmast galling the *head-rigging** or hitting the mast-hoops of the lower mast.

*This explains why the thickness of the rubbing-paunch must be slightly greater than the diameter of the shrouds which are fastened round the masthead, forming what is called the ***head-rigging*** (see Chapter XIV).

While the trestletrees are flat, the crosstrees on the other hand have a slight upwards curve to them: the fore crosstree curves up by two thirds of its breadth, and the after crosstree by half of its breadth, but in fact this is not a hard-and-fast rule and the natural compass of the timber often dictates the amount of curve.

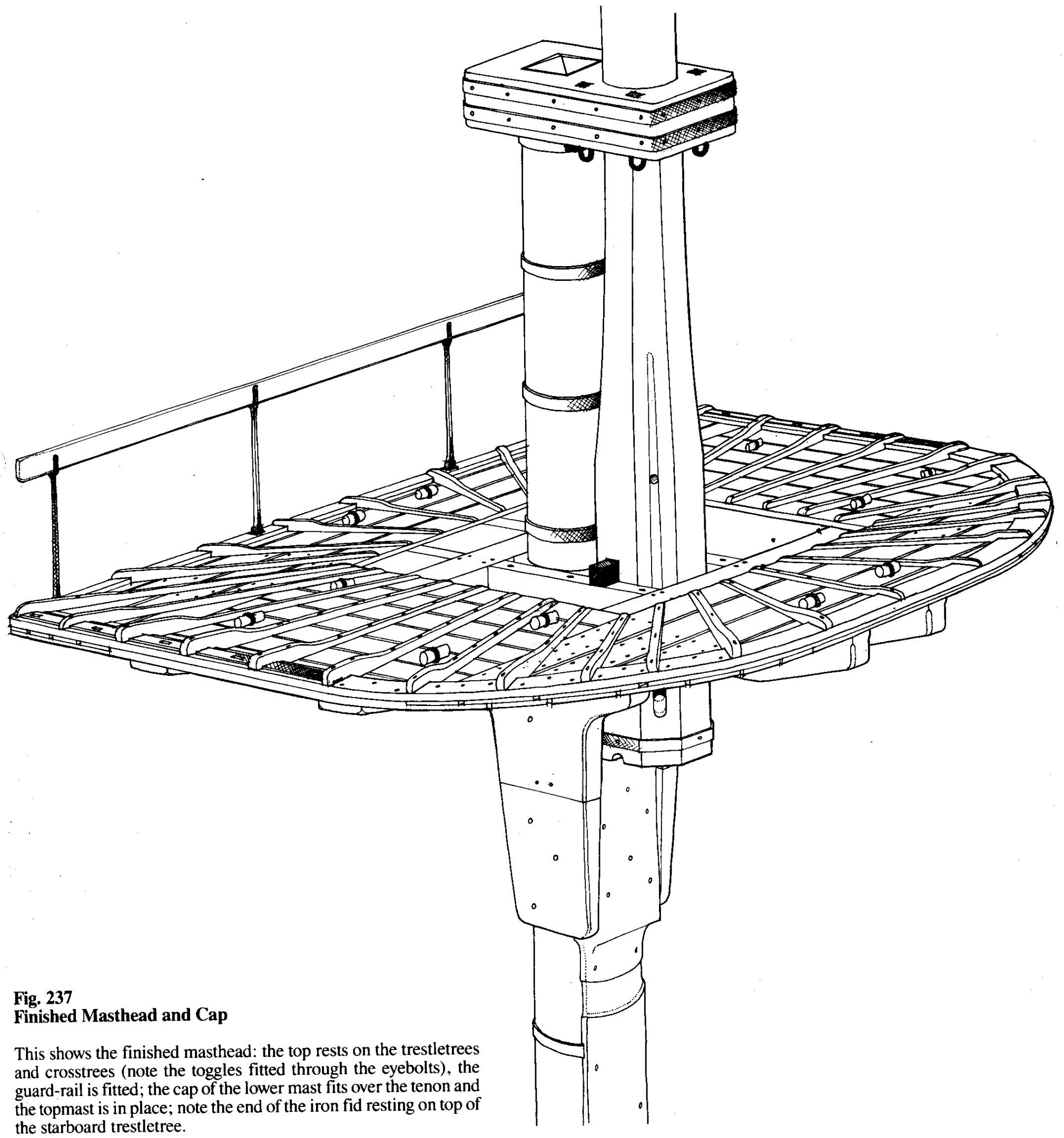


Fig. 237
Finished Masthead and Cap

This shows the finished masthead: the top rests on the trestletrees and crosstrees (note the toggles fitted through the eyebolts), the guard-rail is fitted; the cap of the lower mast fits over the tenon and the topmast is in place; note the end of the iron fid resting on top of the starboard trestletree.

The outline of the curve of the forward edge of the top is drawn out with the aid of a very basic geometrical calculation (see Plate XLVI). The ends of the crosstrees are hanced in a wedge-shape, and the sharp edges are rounded off.

Figure 236 shows the top at this stage of my explanations.

We can now move on to examine the fashioning of the top, which it will be recalled is designed to provide an adequate spread to the topmast-shrouds, while in so doing it forms a large platform which is helpful both in sail-handling and when the ship is in action*.

*The top is sometimes called the ***fighting-top***, although not at this period, and in all events less frequently than modern fiction would have us believe! [Trans.].

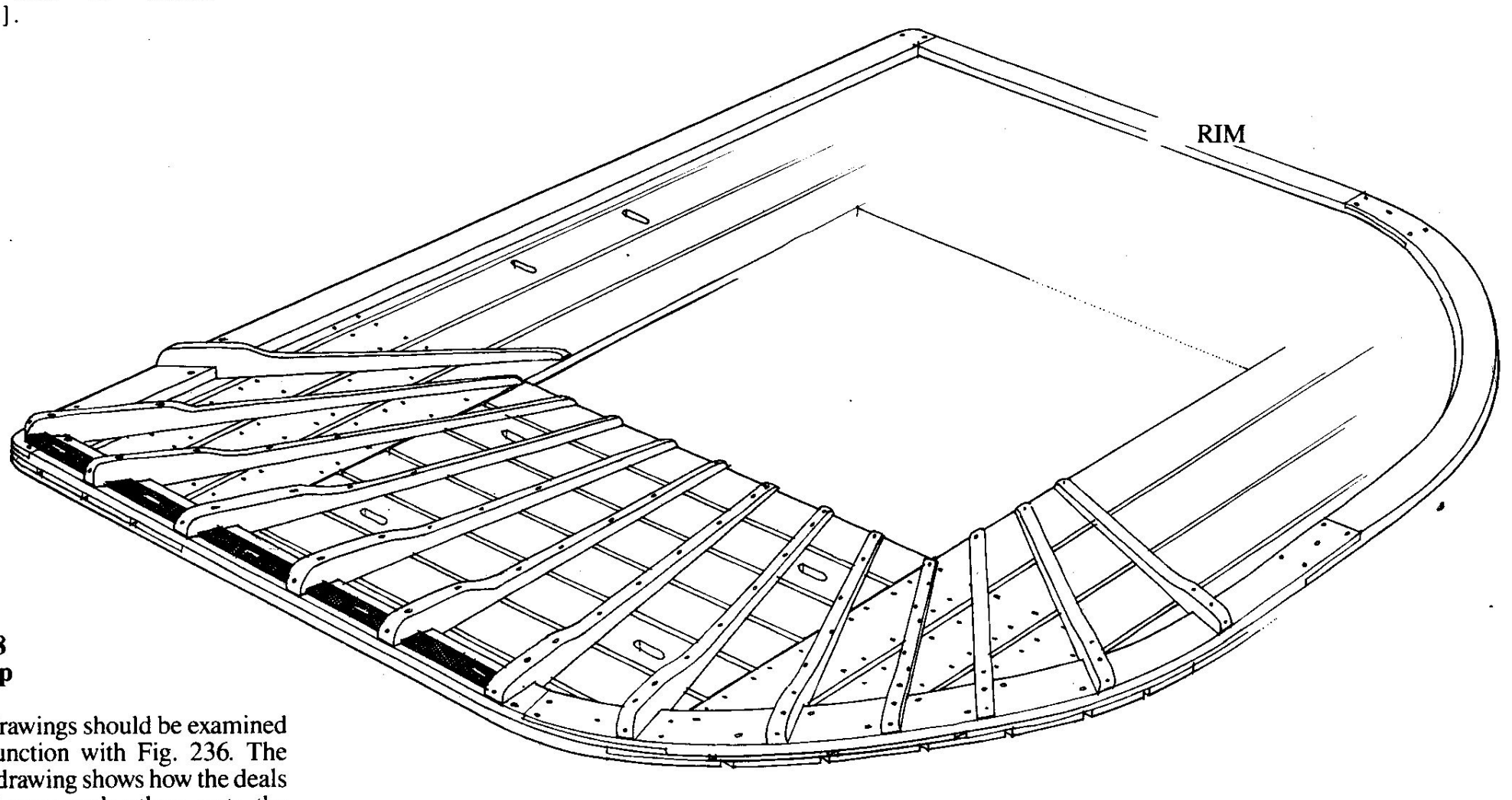
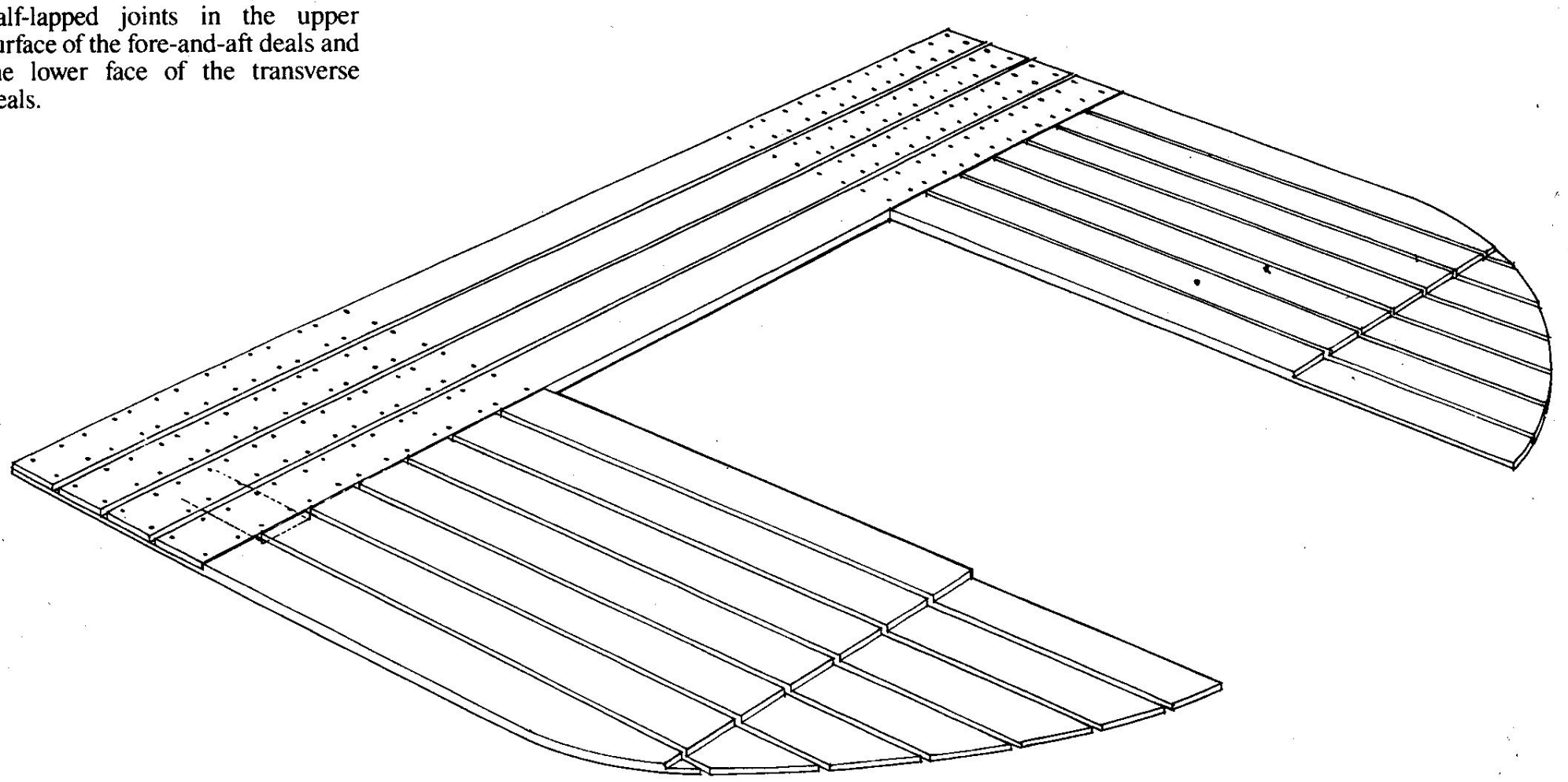


Fig. 238
Maintop

These drawings should be examined in conjunction with Fig. 236. The bottom drawing shows how the deals are laid over each other; note the half-lapped joints in the upper surface of the fore-and-aft deals and the lower face of the transverse deals.



The upper sketch shows how the rim of the top, a sort of border, is fayed to the deals. An iron futtock-plate is nailed to the rim to take the iron straps forming the deadeye-bindings of the topmast-shrouds. The battens radiate out across the top and note how they are lapped over the rim, so that they must be made thicker at their outboard end. I have shown the holes in the deals through which the eyebolts on the trestletrees and crosstrees pass.

The size of the tops varies according to the mast, the width being a quarter of the length of the topmast, which is considerable; the overall dimensions of the tops are determined by the length of the trestletrees and the crosstrees, the ends of which they overhang by one or two inches [2.7 – 5.4 cms]. The general shape of the tops is that of a rectangle with the longer side placed athwartships, the forward edge is rounded, following the outline illustrated in Plate XLVI. The shape of the forward edge is determined in the following manner: the half-breadth and half-length of the top are each divided into sixteen equal parts (the fore-and-aft divisions and the transverse divisions are not equal, since the starting dimensions are different).

Starting at the mid-point they count off four divisions, and from this point (for example, on the fore-and-aft side), a series of radiating lines is drawn to each of the points marking the transverse divisions. The same operation is repeated from the fourth transverse division. The two groups of radiating lines intersect each other, and by taking the point where the first line of one group crosses the last line of the other, then the point where the second line crosses the second-to-last line, and so on, eleven points are thus obtained which exactly define the contour of the forward quadrant of the top.

To construct the top, once the shape has been drawn out, deals are arranged round a square opening called the *lubber's hole*, the side of the square being equal to half the fore-and-aft dimension of the top, one quarter forward of the mid-point and one quarter aft. First, two rows of six deals are placed fore-and-aft on either side of the hole, and then the hole is closed off on its other two sides by two more rows, this time of four deals, laid athwartships; these deals are 2 1/4 inches thick [61 mm] and are made of fir, so-called Prussia deals. At each corner the deals cross each other, and in order to obtain a single flat surface the deals are scored over each other, the transverse deals being laid on top and fastened by four nails driven in at each score.

Lubber's hole: it was a matter of pride for the topmen to clamber onto the tops from outboard using the shrouds. Use of the hole in the middle signified that the seaman was inexperienced, hence a ***landlubber***, although contrary to popular belief it was often in fact easier to use the shrouds.

Next a sort of frame is arranged around the perimeter; made of elm and fayed and nailed to the fir deals, this is called the *rim*; it is 8 1/2 inches wide [23 cms] and it is the same thickness as the deals. The ends of the timbers forming the rim are half-lapped one to the other. On either side athwart the mast a flat iron strap called a *futtock-plate* is nailed, measuring 4 inches [10.8 cms] wide and half an inch [14 mm] thick; the futtock-plate runs from the after end of the top to the point where the sides begin to curve. Small rectangular openings are cut along the length of the plate, through which the *deadeye-straps* for the topmast shrouds pass; the rim and the deals are pierced likewise.

Rim of the top: sometimes called the ***gunwale***, although this appears to refer more commonly to the after rim only.

Futtock-plate.

Deadeye-straps or ***deadeye bindings***: iron straps surrounding the deadeyes similar to a rope strap round a block.

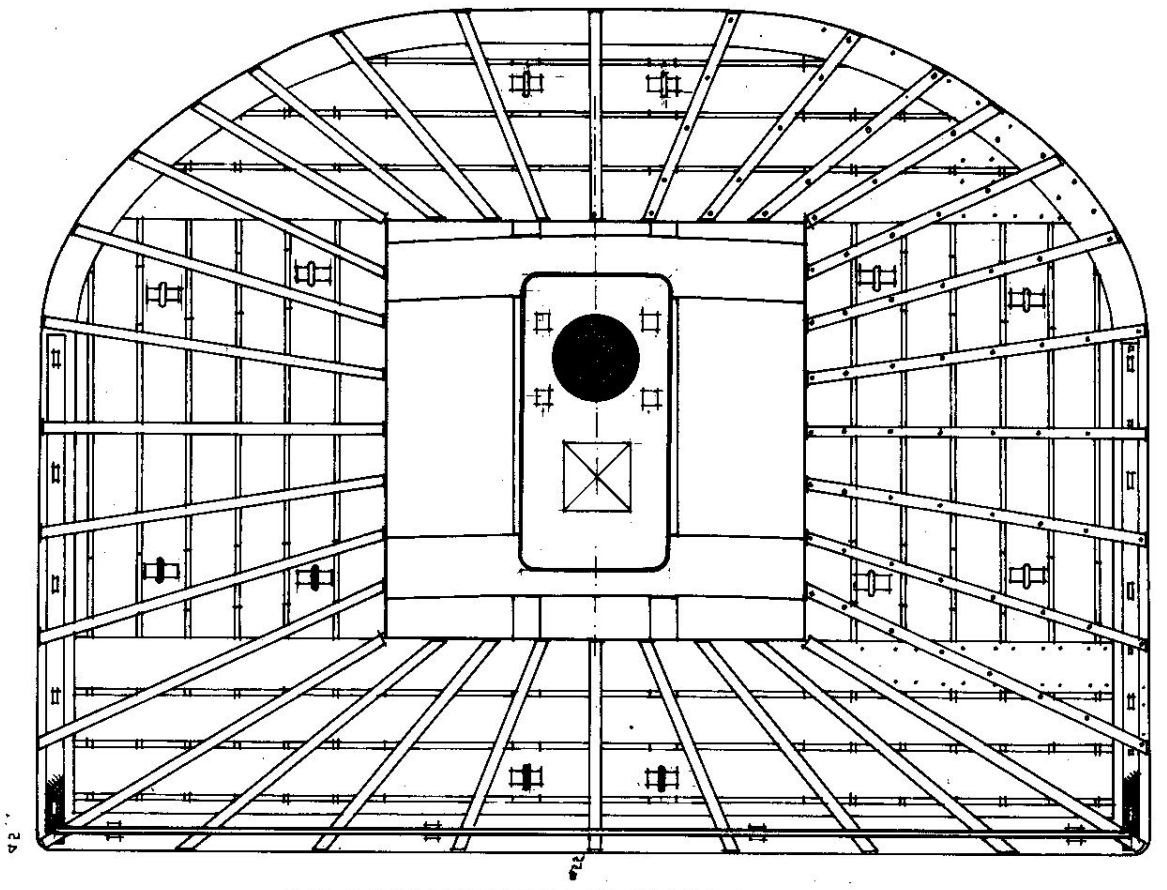
The top is as yet insufficiently rigid, and thus it is reinforced by 28 radiating *battens* of oak; these timbers are arranged according to a simple plan which consists of dividing the sides of the lubber's hole and the sides of the rectangle forming the top into the number of parts demanded by the number of battens required (see Plate XLVI); these radiating battens are the same width (2 1/2 inches – 6.8 cms) throughout their length, but their thickness increases progressively towards their outboard ends, partly to provide more effective stiffening, and partly to ensure that there is enough timber for the lap-joint over the rim, with or without the futtock-plate.

Battens: timbers between 1 and 3 inches in thickness. These timbers have no special name.

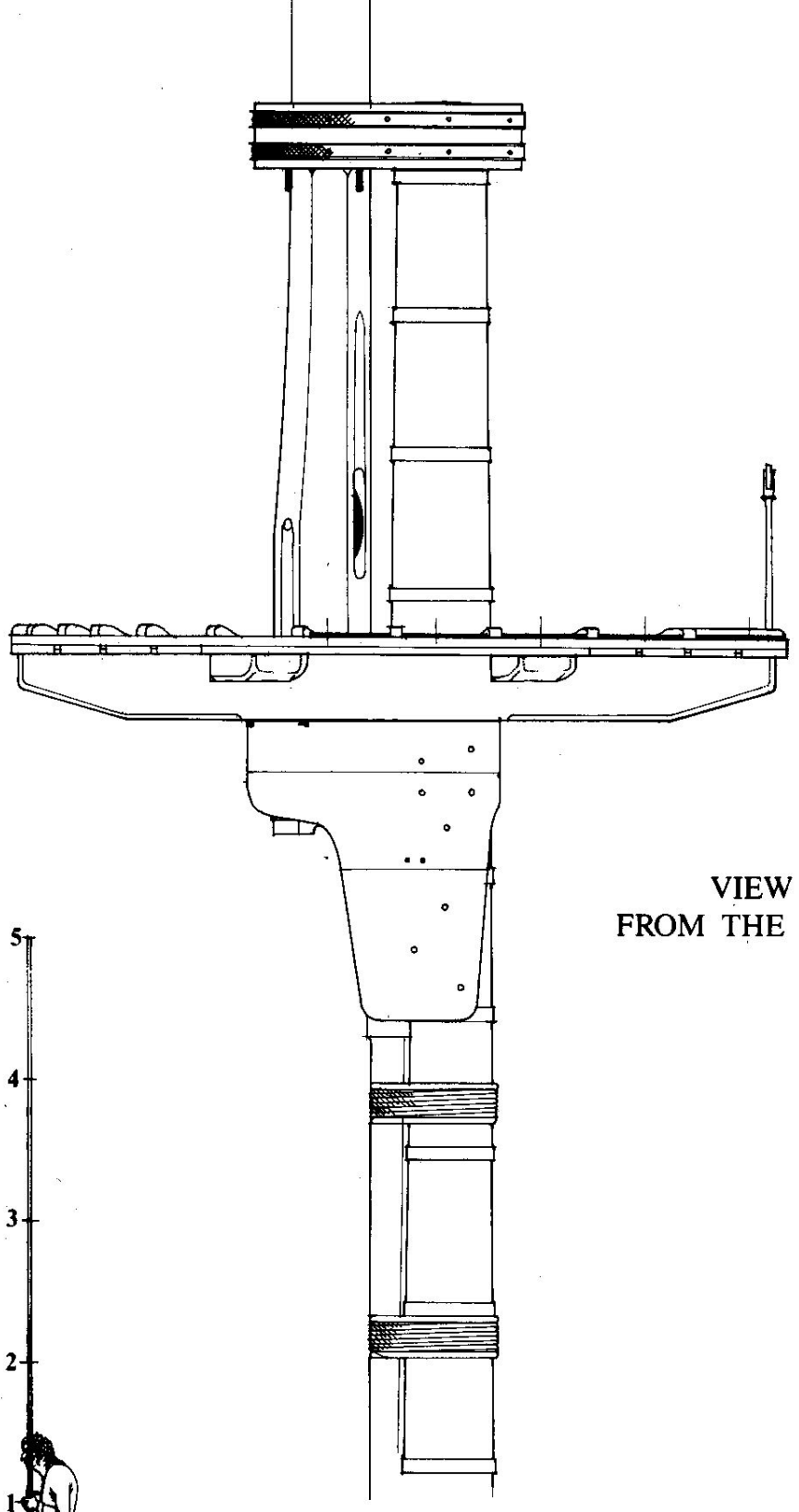
With the top thus complete, the next step is to hoist it over the trestletrees and crosstrees (see Volume IV). Once placed there it must be secured; each trestletree and crosstree has a number of eyebolts driven into it and forelocked on the underside; the shank of the bolt is just long enough for the eye to project above the deals of the top, the eye being aligned with the fore-and-aft axis. The deals of the top have small holes in them corresponding exactly to the position of the eyebolts, and once the top has been hoisted into position with the eye of the bolt flush with the deals a toggle or strong wooden pin is inserted into the eye and driven home forcibly; the top is thus suitably fastened to the trestletrees and crosstrees by a dozen or so toggles; the fastening is secure, and easy to remove.

Fig. 239
Mainmast Fittings

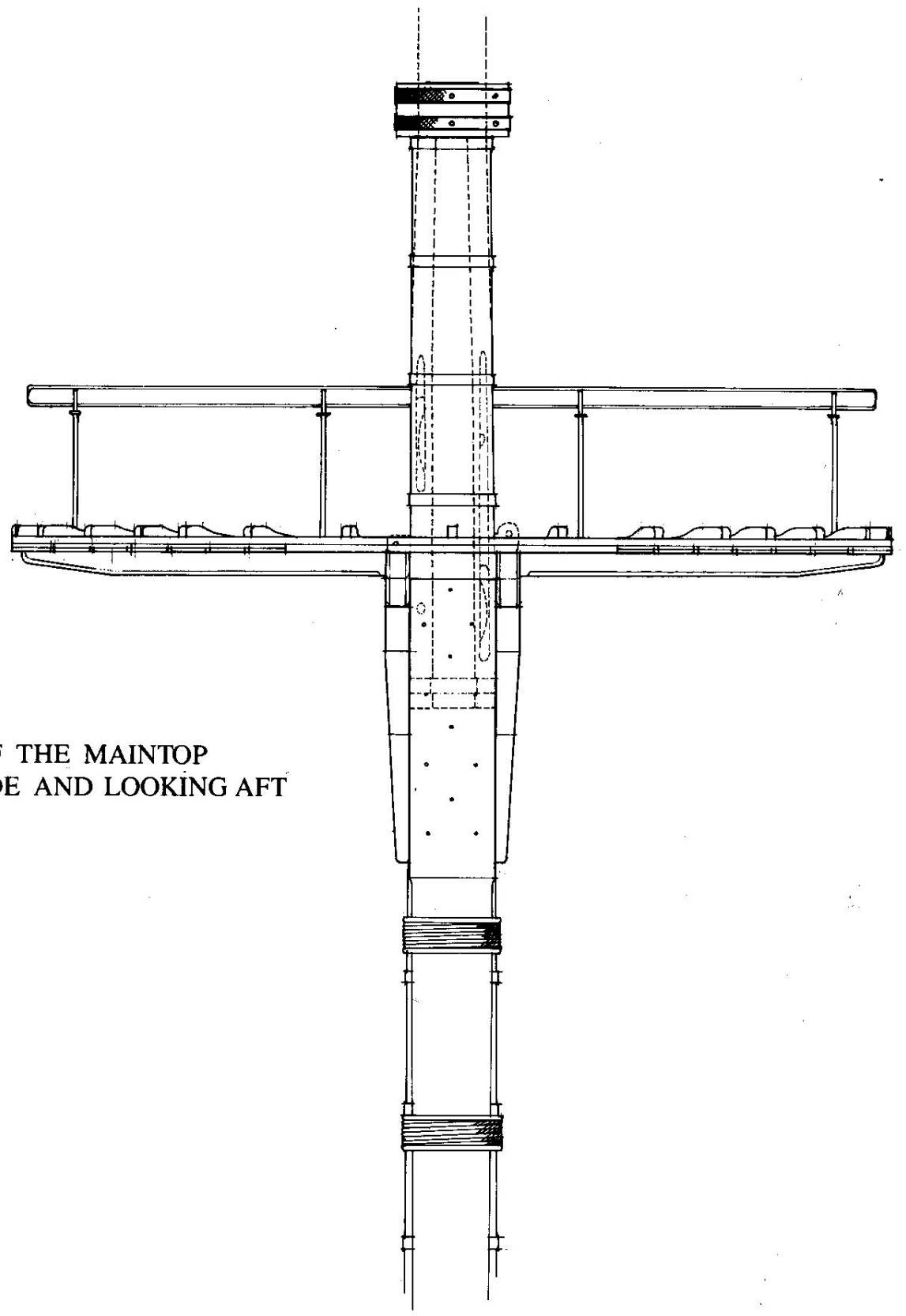
This Figure shows the various accesories or fittings placed over the lower mast and the topmast. It follows on from Plate XLVI.



VIEW OF THE MAINTOP FROM ABOVE



VIEW OF THE MAINTOP
FROM THE SIDE AND LOOKING AFT



Scale: 1/72

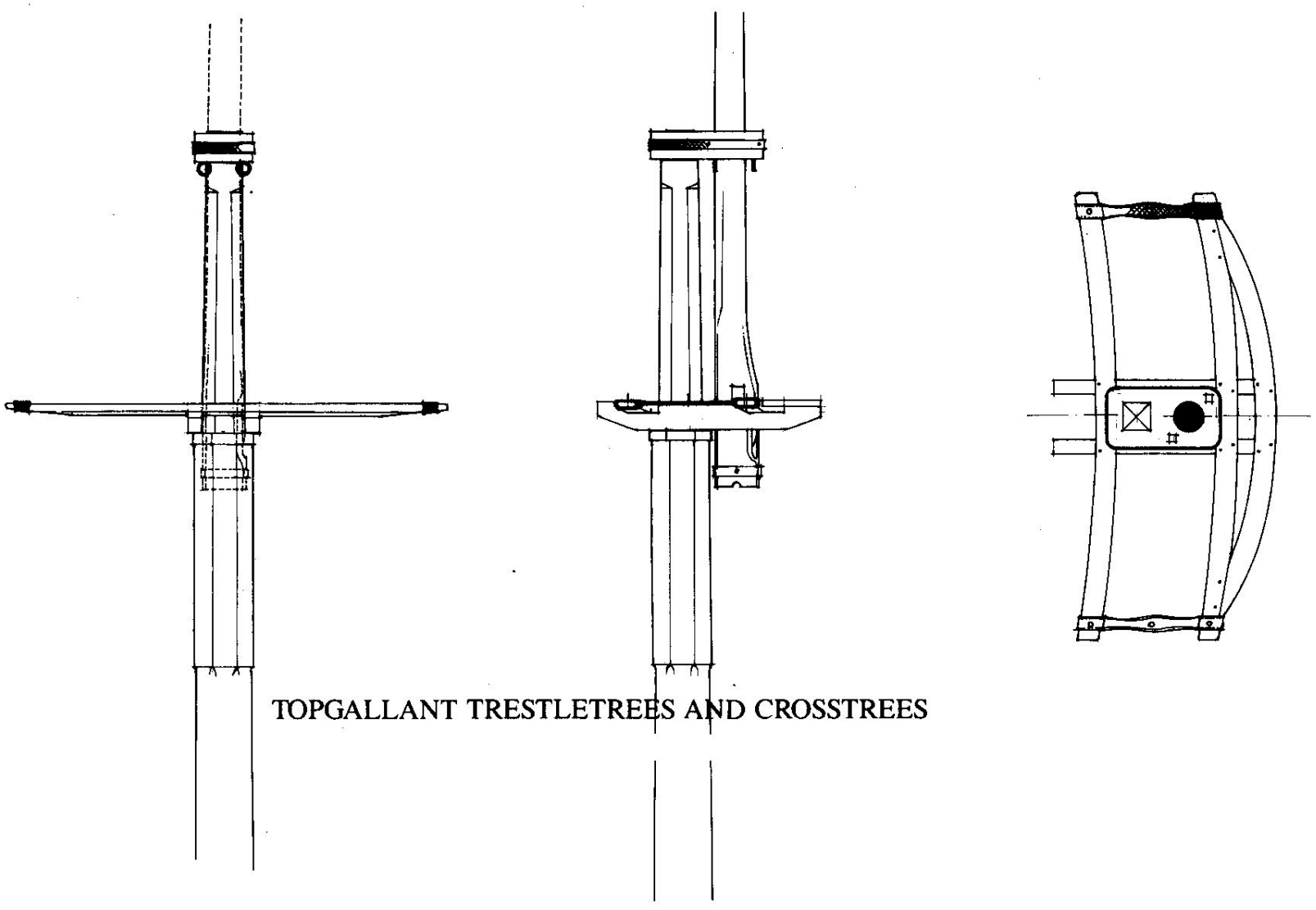


Fig. 239a
Topmast Head

Four iron stanchions similar to those of the gangways are placed along the gunwale at the after side of the tops, and these support a breastrail or bar. This breastrail is supplemented by a netting. The tops are *barricaded* when the ship goes into action with lengths of rope, planks (sometimes metal-lined), hammocks etc. The rim of the tops is decorated with "top-armour" (see Volume II, Master's stores) on certain occasions, such as the Feast of St Louis for example.

To barricade the tops; top-armour, despite its name, was purely decorative.

Maintop: All the explanations which I have just given apply equally to the maintop. Its dimensions are larger, but they are calculated in exactly the same manner, whether it be for the bibbs, the trestletrees or the crosstrees. The platform is composed of seven deals where there are only six in the foretop, and they are 2 1/2 inches thick [6.8 cms]; the rim is wider, at 9 inches [24.4 cms], and thicker also. There are more battens, 32 in all, and their breadth is increased to 3 inches [8.1 cms].

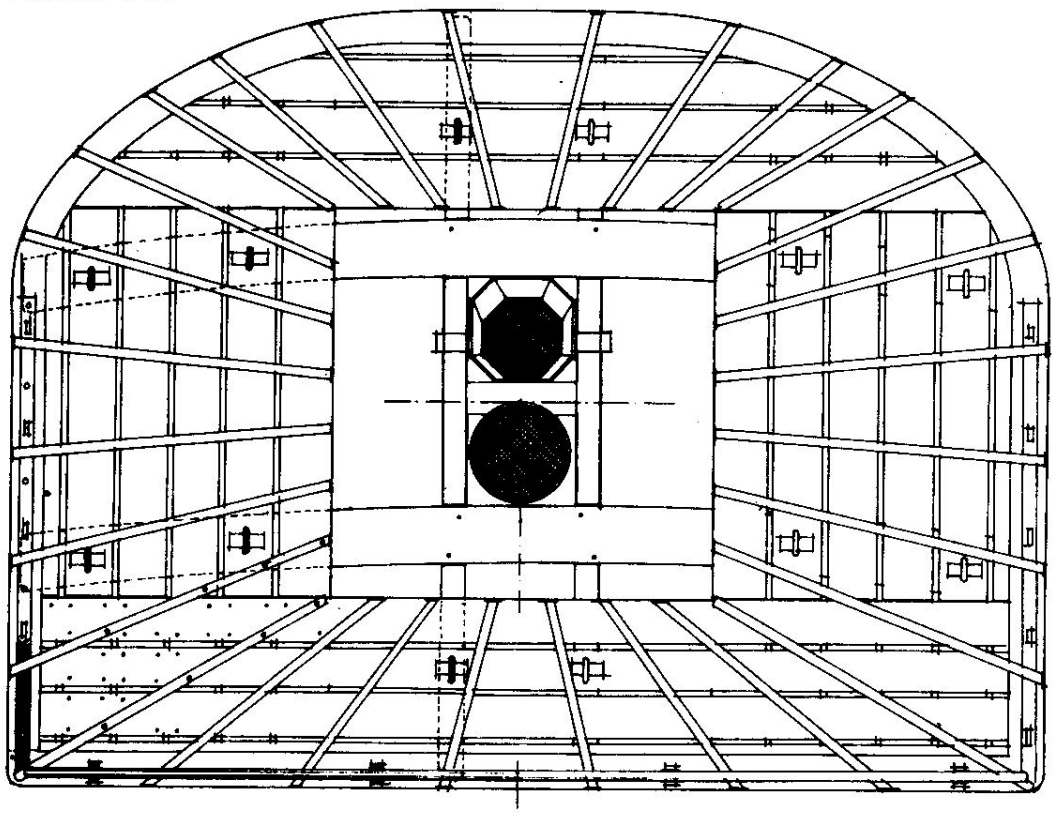
Mizen-top: Similar to the other two tops, its dimensions are based on an assumed length for the mizen-topmast of 44 feet [14.31 m]. The platform consists of five deals fore-and-aft and three athwartships (on either side), while their thickness is only 1 1/2 inches [4.1 cms]; the rim is 7 inches [19.0 cms] wide and 2 inches [5.4 cms] thick; there are only 20 battens, which are 2 1/4 inches wide [6.1 cms].

Instead of four stanchions there are three only, and the top is secured to the trestletrees and crosstrees by eight toggles.

The drawings on the following pages of all three tops make it easy to examine them in detail and compare their relative sizes.

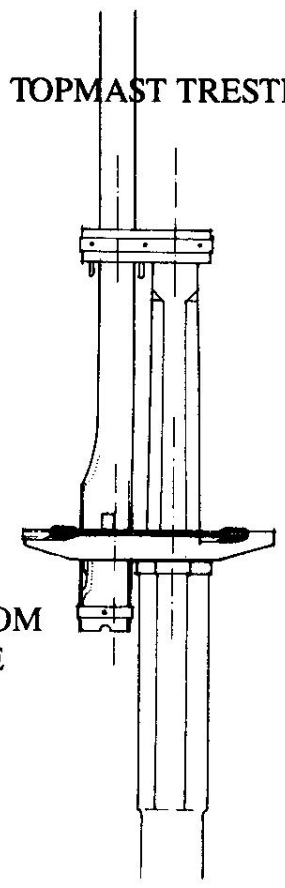
Fig. 240
Foremast Fittings

Scale: 1/72

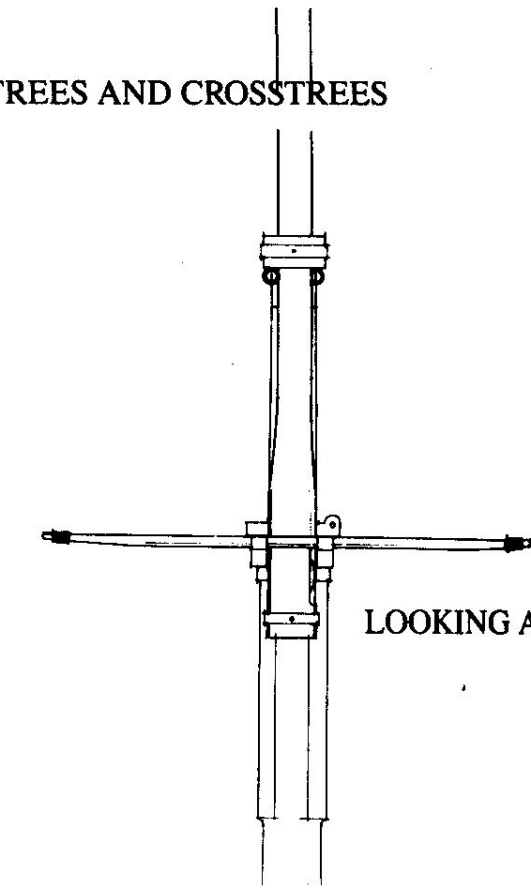


VIEW OF THE TOP FROM OVERHEAD

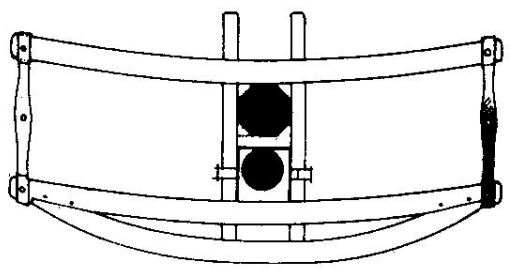
TOPMAST TRESTLETREES AND CROSSTREES



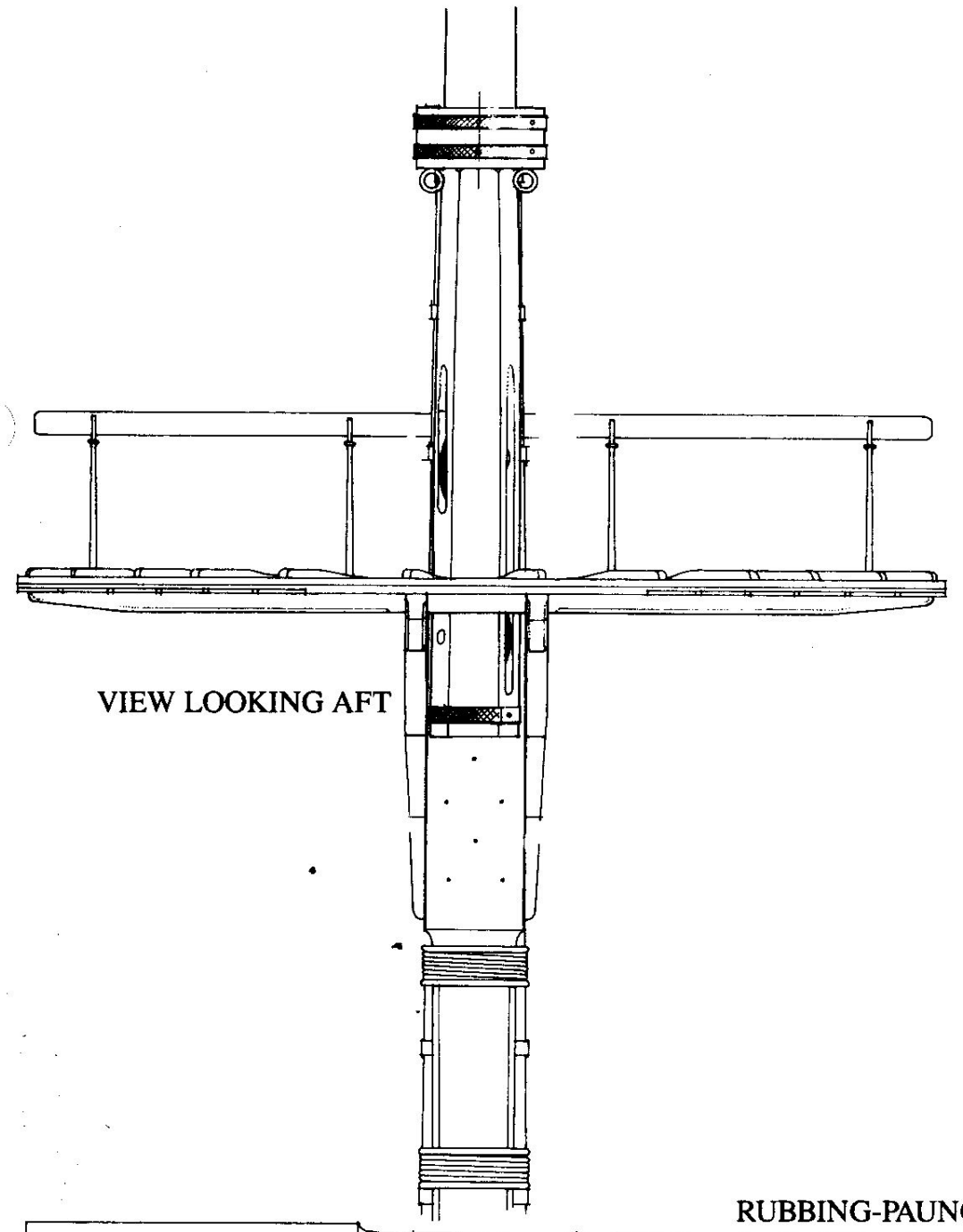
SEEN FROM
THE SIDE



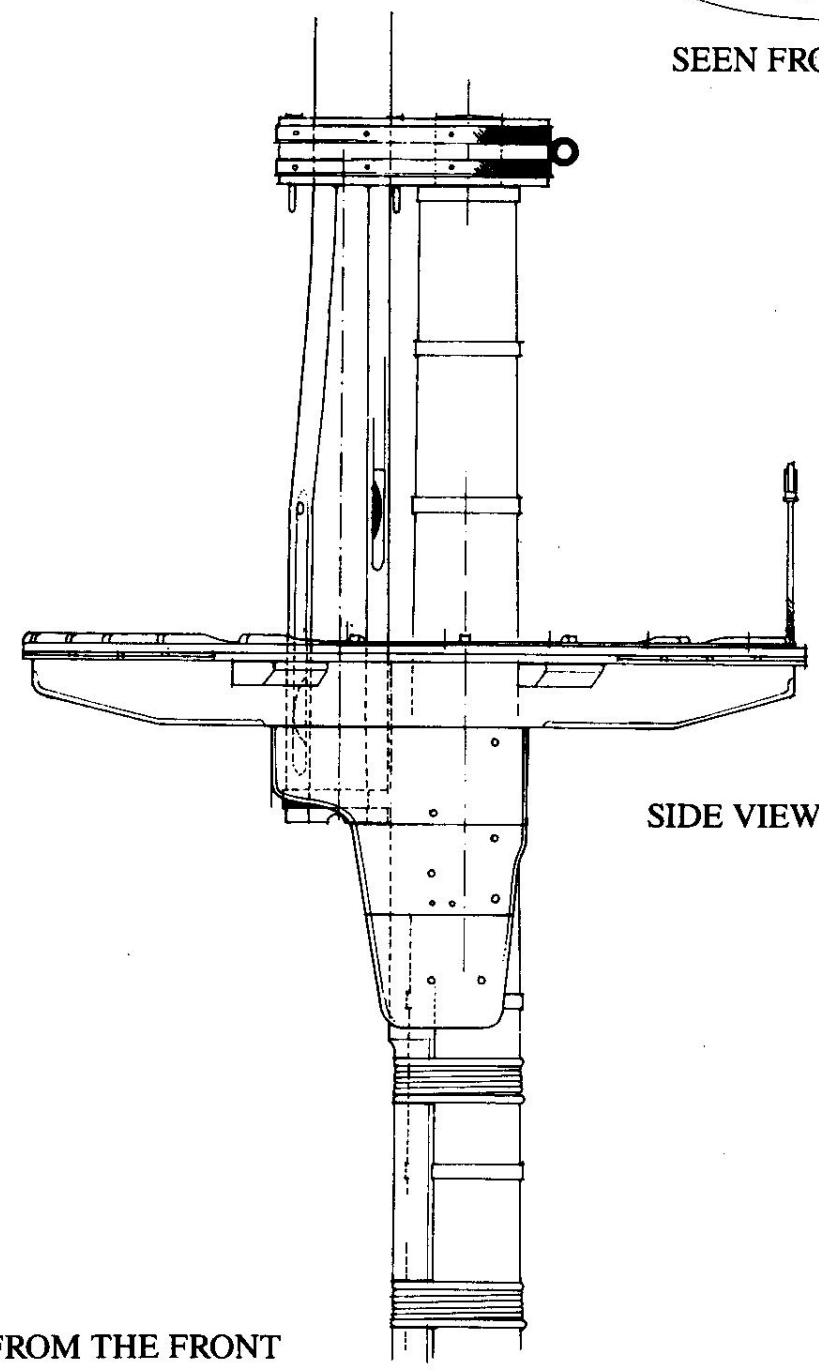
LOOKING A



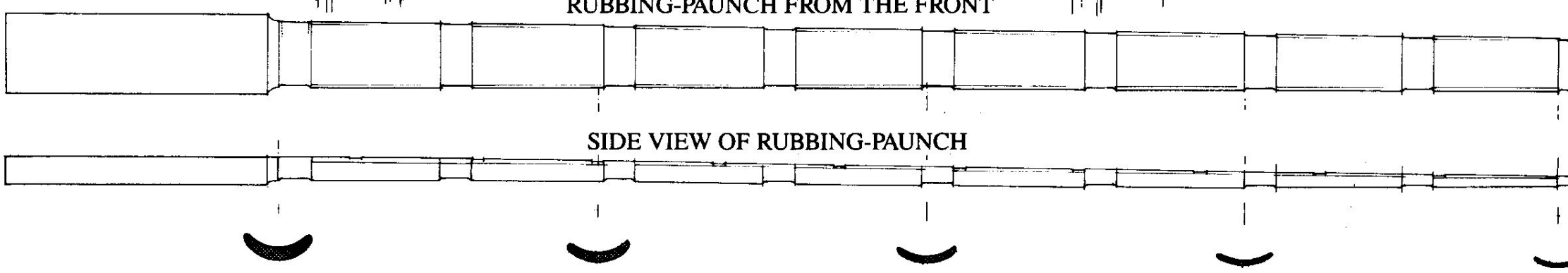
SEEN FROM OVERHEAD



VIEW LOOKING AFT

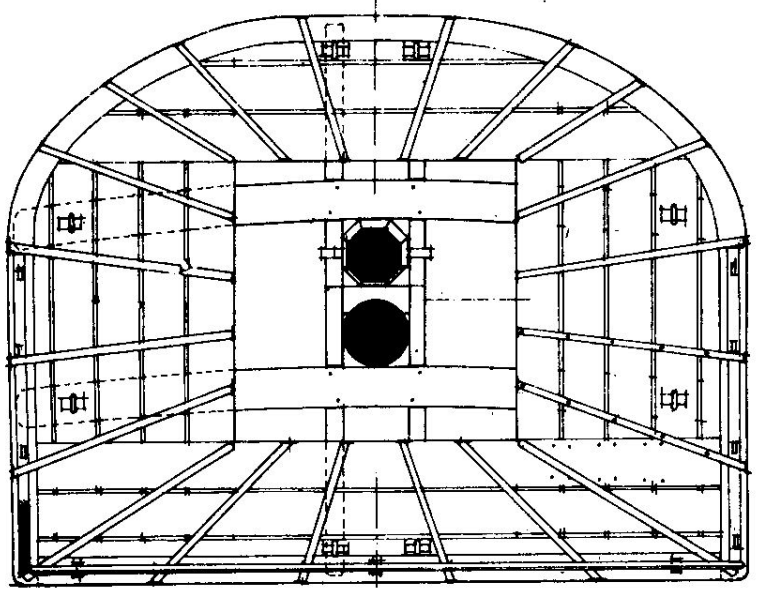


SIDE VIEW

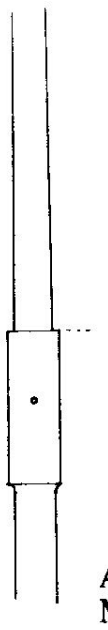


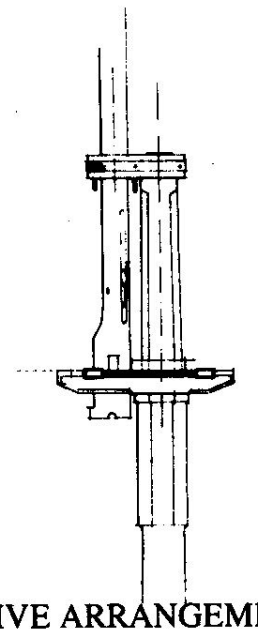
RUBBING-PAUNCH FROM THE FRONT

SIDE VIEW OF RUBBING-PAUNCH

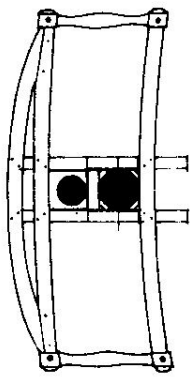


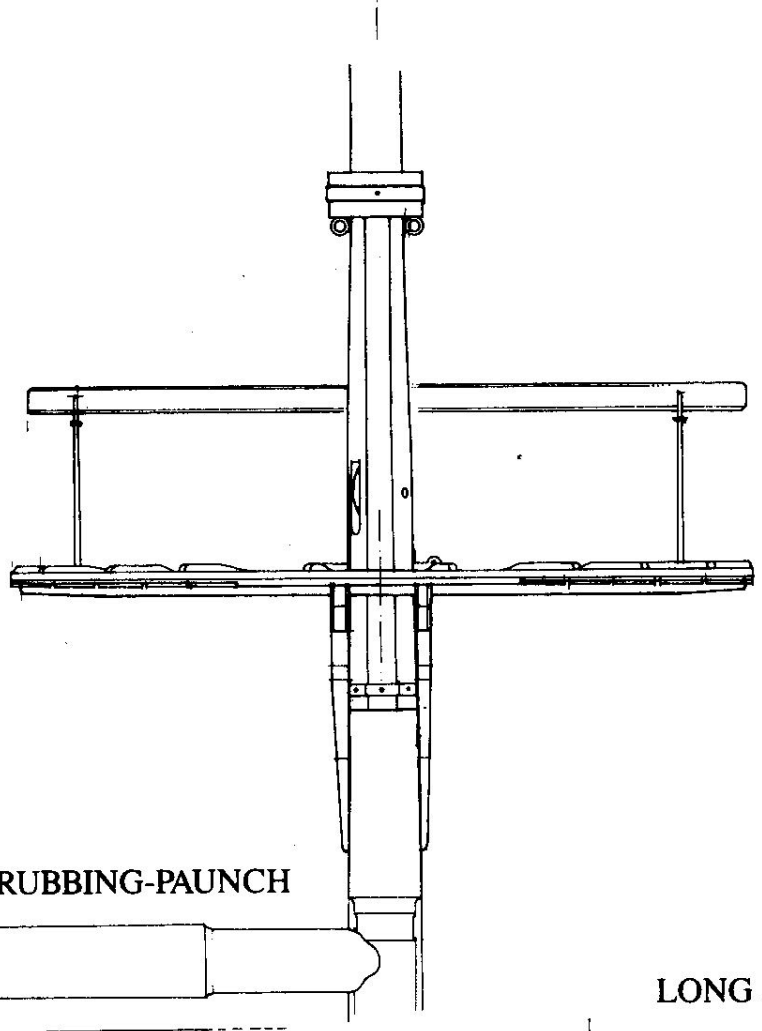
VIEW OF THE TOP FROM OVERHEAD

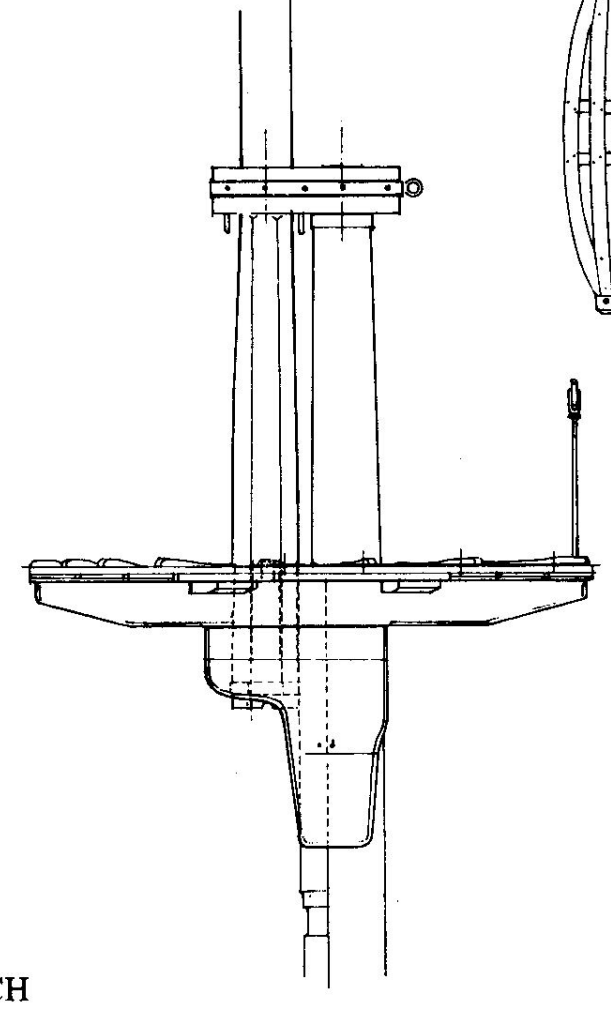




ALTERNATIVE ARRANGEMENT FOR
MIZEN TOPGALLANT-MAST







SHORT RUBBING-PAUNCH

LONG RUBBING-PAUNCH

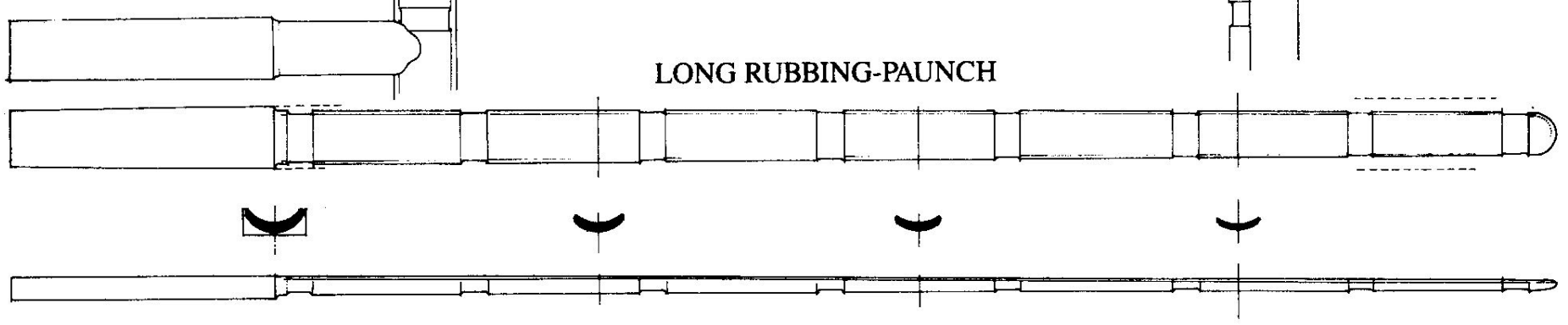




Fig. 241
Mizen-mast Fittings

This drawing groups together the various items which relate to the mizen-mast; I believe they are clear enough for further explanation to be superfluous. I have shown an alternative arrangement of trestletrees and crosstrees for the mizen topgallant-mast; as you can see, they are set up in the same manner as for the other topgallant-masts.

Scale: 1/72

Foremast cap: We are already familiar with this item, but we will now examine it in detail. On our 74 the mast-caps are of the English type, characterised by the fact that the top of the head-tenon lies flush with the upper surface of the cap, which is therefore morticed through its complete thickness to receive the head-tenon.

*Minimum, and maximum four times that diameter.

The cap is made of elm, which is knotty and durable; its length is equal to 3 1/2 times* the diameter of the topmast (at the point where is passes through the cap); its breadth is half its length, and its thickness half that again. The cap is bound by two iron straps fastened with nails. The round hole through which the topmast passes must be set back from the front of the cap by a distance equal to the radius of the hole, and the distance separating the topmast hole and the mortice for the head-tenon is governed by their respective diameters (see the remarks relating to the topmasts). The hole for the topmast has four eyebolts around it on the under side which are clenched on top of the cap; these eyes will take the tackle-falls and hooks of blocks, or else lashings*.

*See Chapter XIV, section 4.

Capshore: small pillar or stanchion supporting the cap.

The mast-cap projects some distance forward of the head-tenon of the lower mast, and to prevent it sagging it is sometimes supported under its forward edge by a small *capshore*.

We have seen how the topmast is held fast at the bottom of the masthead, and further up, at the top of the masthead, it is secured by the mast-cap. Often while at sea the topmast and the lower masthead may be fastened together additionally by two lashings. Naturally these lashings must be removed whenever it is necessary to strike the topmasts, and they are generally removed in harbour for aesthetic reasons.

Mainmast cap: Similar to the foremast cap; its proportions are governed by the same rules.

Mizen-mast cap: Similar to the two other caps. It should be noted however that since it is smaller it needs to be hooped with only a single iron strap. An eye is welded to the strap on the after side of the mast-cap.

TOPMAST TRESTLETREES AND CROSSTREES, AND UPPER MAST-CAPS:

The topgallant-masts are set up on the topmasts along the same lines as the topmasts are set up on the lower masts. However, everything must be much lighter, and I have already stated that no bibbs are necessary, the trestletrees being supported directly on the stop of the hounds of the topmast. There is no need for a top at such a height, and furthermore the weight and purchase offered to the wind would make such a structure extremely dangerous; thus there are only trestletrees and crosstrees.

Fore-topmast trestletrees and crosstrees: The two trestletrees are a third of the length of the lower mast trestletrees, and their scantling is in proportion. The mid-point of the trestletrees is aligned with the forward face of the hounds of the topmast. The two crosstrees laid athwartships are half the length of the lower mast crosstrees, and are proportionately smaller in section; the crosstrees are laid flat and rest in scores two-thirds of their depth cut in the trestletrees, and since the crosstrees themselves are scored on their under side to one third of their thickness both trestletrees and crosstrees lie flush on the same horizontal plane.

The crosstrees curve up, and the amount of curve is equivalent to their breadth; the curve is drawn out in the same way as for the lower mast crosstrees. They are laid in such a manner that the after crosstree touches the hounds of the topmast, and the after face of the forward crosstree is directly over the forward face of the heeling of the topgallant mast. It will be seen that the arrangement is

similar to that on the lower masts, but since there is no rubbing-paunch the after part of the framework enclosing the heeling of the topgallant mast is formed by a small cross-piece inserted between the trestletrees, scored down over them and resting on the stop of the hounds on the forward side. Eight nails driven down in pairs where the trestletrees and the crosstrees join to fasten them together, and the whole structure rests on the stop of the hounds.

At the forward ends of the trestletrees a third crosstree is fastened, and this curves back in such a way that it is fastened with a mortice and tenon joint to the forward face of the second crosstree; this special crosstree has the same purpose as the rounded forward edge of the tops, namely to reduce the tendency of the sails to be frayed. This crosstree is not as thick as the other two, but it is fastened in the same way to the trestletrees, being scored down over the top and nailed.

Iron stays.

Iron stays with flat collars at their ends join the ends of the crosstrees on either side, and these iron stays broaden out at their mid-point to allow a hole to be fashioned, through which the centre topgallant-shroud passes; similarly the collars also have holes through them (and the ends of the crosstrees over which they are fitted), to take the two other shrouds, the head of the topgallant masts being supported on either side by three shrouds.

Main-topmast trestletrees and crosstrees: These are similar to those of the fore-topmast and proportioned in the same way.

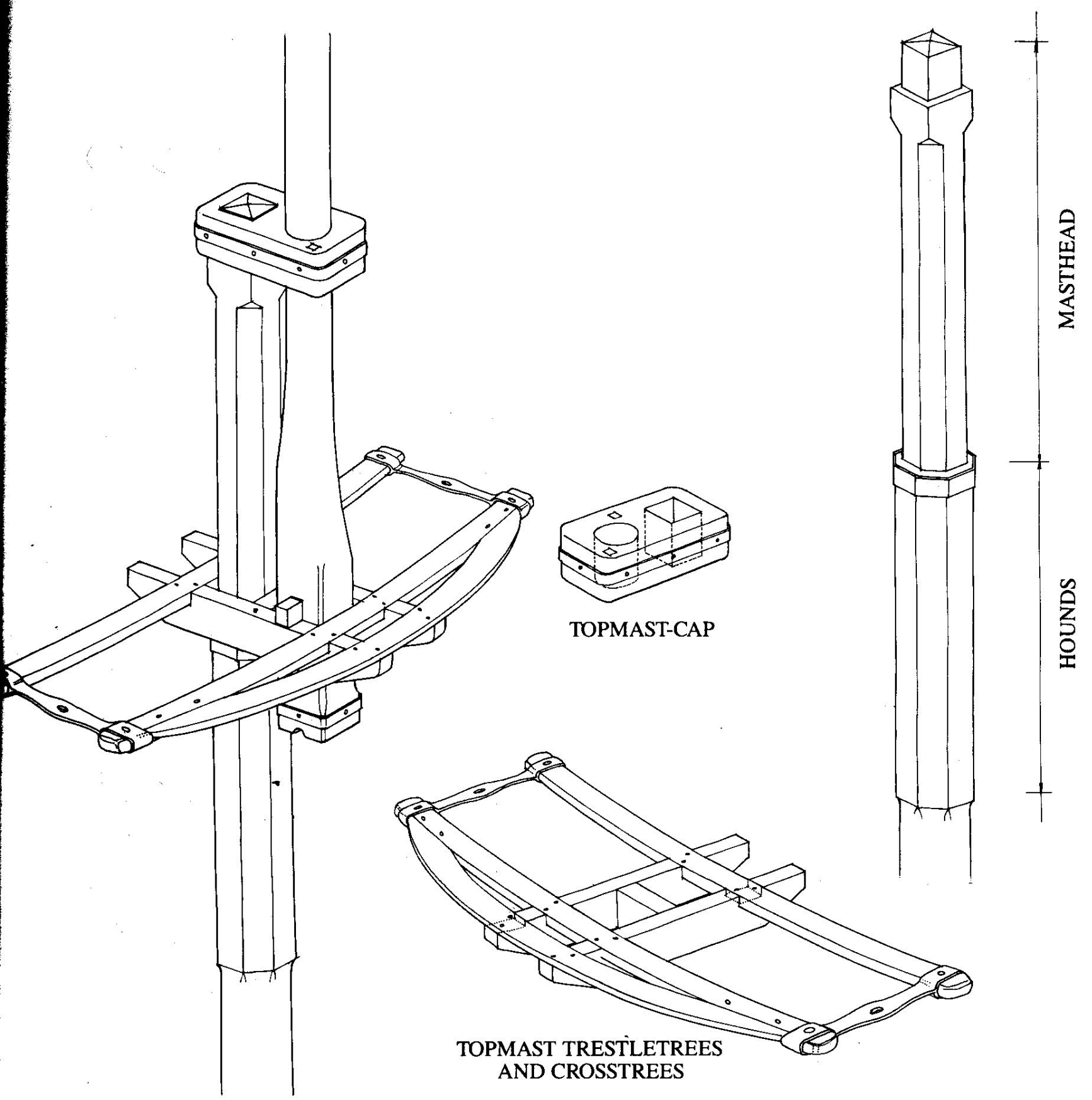


Fig. 242
Topmast Trestletrees and Crosstrees, and Topmast-Cap

Note that the fore crosstree is not as thick as the other two; the forward end of the trestletrees is scored to receive it. The ends of this crosstree are fastened by means of a flat mortice-and-tenon joint to the middle crosstree.

Mizen-topmast trestletrees and crosstrees: Since there is no mizen topgallant-mast on our 74, there is no need therefore for any trestletrees or crosstrees. However, if such a mast were fitted it would be 28 feet long [9.10 m], and the trestletrees, crosstrees and mast-cap would be proportioned accordingly.

Fore-topmast cap: The heeling of the topgallant-mast is supported by its fid on the topmast trestletrees, and as with the topmasts it is further secured by means of a small mast-cap fitted over the head-tenon of the topmast; this mast-cap is fashioned in the same way as the lower mast-caps, and its proportions are dictated by the diameter of the topgallant-mast where it passes through the cap, this diameter being to all intents and purposes the same as the given diameter. The reduced size of this cap means that it only needs to be hooped with a single iron strap, and it has only two eyebolts fitted to its under side.

Main-topmast cap: Exactly the same as the previous.

BOWSPRIT FITTINGS

In Figure 243 I have shown the various fittings belonging to the bowsprit, and while the general arrangement is comparable to that of the masts, the installation is simpler, and thus significantly different in detail. There is a sort of paunch, a cap, and bees (see below), which are effectively miniature tops. Having already described the gammoning-fish at the beginning of this section, I will not go over it again, and we will instead examine in detail the other fittings of the bowsprit.

Bees: or ***B's.***

Bees: There are two pieces of oak fastened on either side of the bowsprit just below the cap, and these are called the *bees*; each bee is bolted to the bowsprit with three blind, ragged bolts, and the shape of the forward end of the bowsprit (see Fig. 244) is such that its upper half is square in section while the lower half is semi-circular: this allows the bees to be readily fastened to the sides of the bowsprit. It is the shape of these little fittings which explains their name, but having said that, sometimes they are not shaped to two semi-circles but to two squares instead, large enough for the two semi-circles to be inscribed within. Note that the bees do not follow the axis of the bowsprit, but are slightly higher at the after end*.

*Note that they are also tilted upwards slightly on their transverse axis, to prevent the men from slipping outwards.

The bees serve as small footholds for the men handling the sails on the bowsprit (these are the most skilled seamen), and their rounded shape is designed to prevent the sails from chafing; the cut-away section in the middle is to accommodate the collars of the fore-topmast stays (see the section on the standing rigging). The length of the bees is 4 1/2 times the diameter of the jibboom (1.58 m), their breadth at the widest part is a quarter of their length, and their thickness 1/16th of this same length.

Bowsprit-cap: This fitting may be compared with the mast-caps and serves to secure the jibboom, which projects as I have said by two-thirds of its length, while the after third which runs down the bowsprit passes through the cap and is fastened by a lashing* (see Fig. 244), the after end seating in a saddle. The head-tenon of the bowsprit has a peculiar shape to prevent the cap from rotating; furthermore, it is offset to starboard, since if it were central to the axis of the bowsprit it might obstruct the rigging which follows the line of the bowsprit*. The jibboom runs out therefore on the starboard side of the bowsprit, and inevitably this means that this exerts a twisting strain on the head of the bowsprit and considerable forces on the tenon in particular.

*The ***crupper***.

*By offsetting the cap to starboard, this ensures that the jibboom is not in the way of the forestay and fore-topmast stay hearts.

The outline or shape of the bowsprit-cap is less simple than that of the other caps, as I have explained in the text accompanying Figure 243.

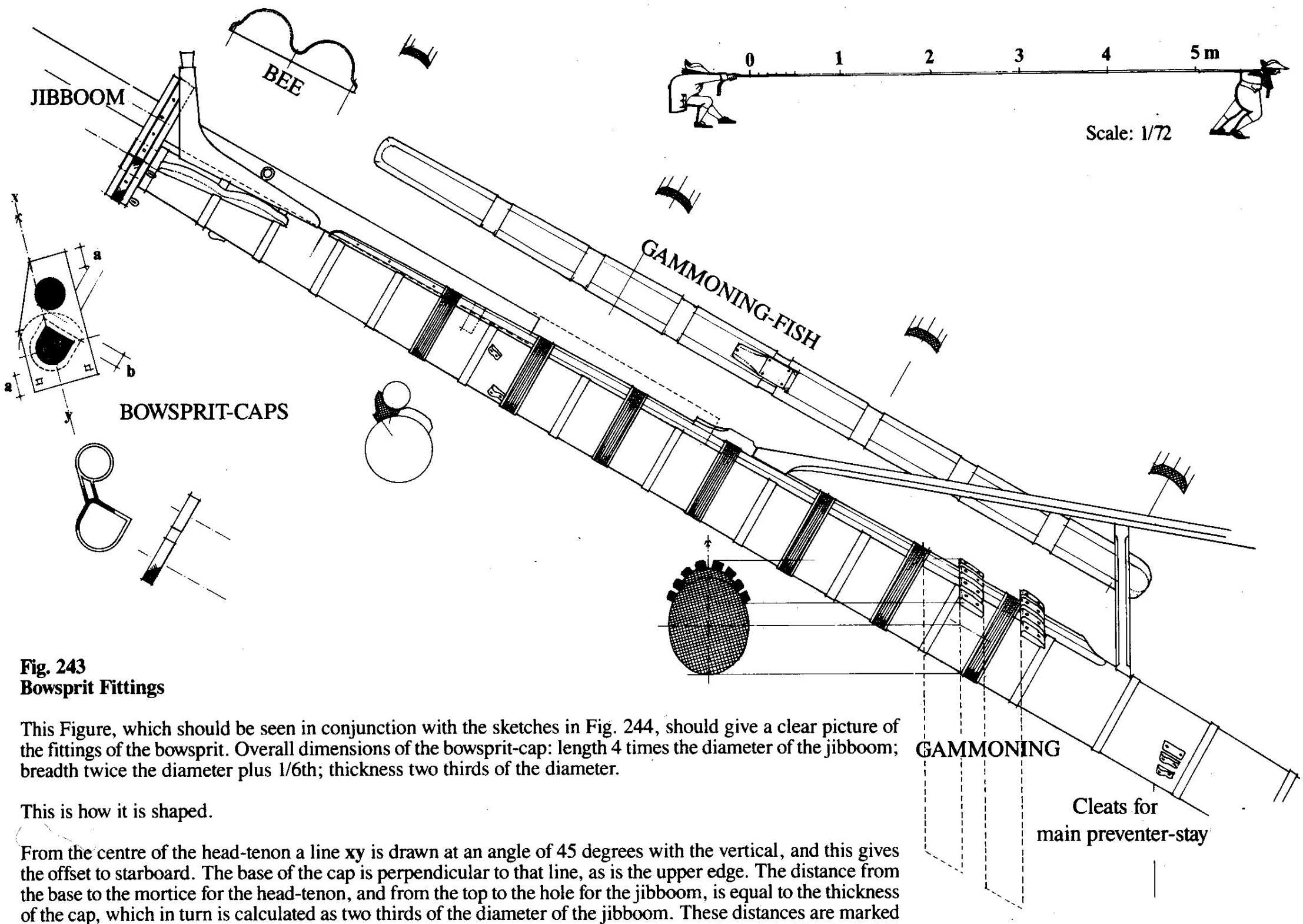


Fig. 243
Bowsprit Fittings

This Figure, which should be seen in conjunction with the sketches in Fig. 244, should give a clear picture of the fittings of the bowsprit. Overall dimensions of the bowsprit-cap: length 4 times the diameter of the jibboom; breadth twice the diameter plus 1/6th; thickness two thirds of the diameter.

This is how it is shaped.

From the centre of the head-tenon a line **xy** is drawn at an angle of 45 degrees with the vertical, and this gives the offset to starboard. The base of the cap is perpendicular to that line, as is the upper edge. The distance from the base to the mortice for the head-tenon, and from the top to the hole for the jibboom, is equal to the thickness of the cap, which in turn is calculated as two thirds of the diameter of the jibboom. These distances are marked by the letter **a**. The distance shown by **b**, representing the distance between the two mortices, is half an inch [13 mm] greater than the diameter of the collar of the forestay (4 inches, or 108 mm). The hole for the jibboom is centred in such a way that it is offset by an inch to an inch and a half [27 – 41 mm] to the right of the line **xy**.

The top starboard corner of the cap is cut off along a line joining the mid-point of the length to the mid-point of the breadth.

I have also shown an alternative form of cap, made of iron.

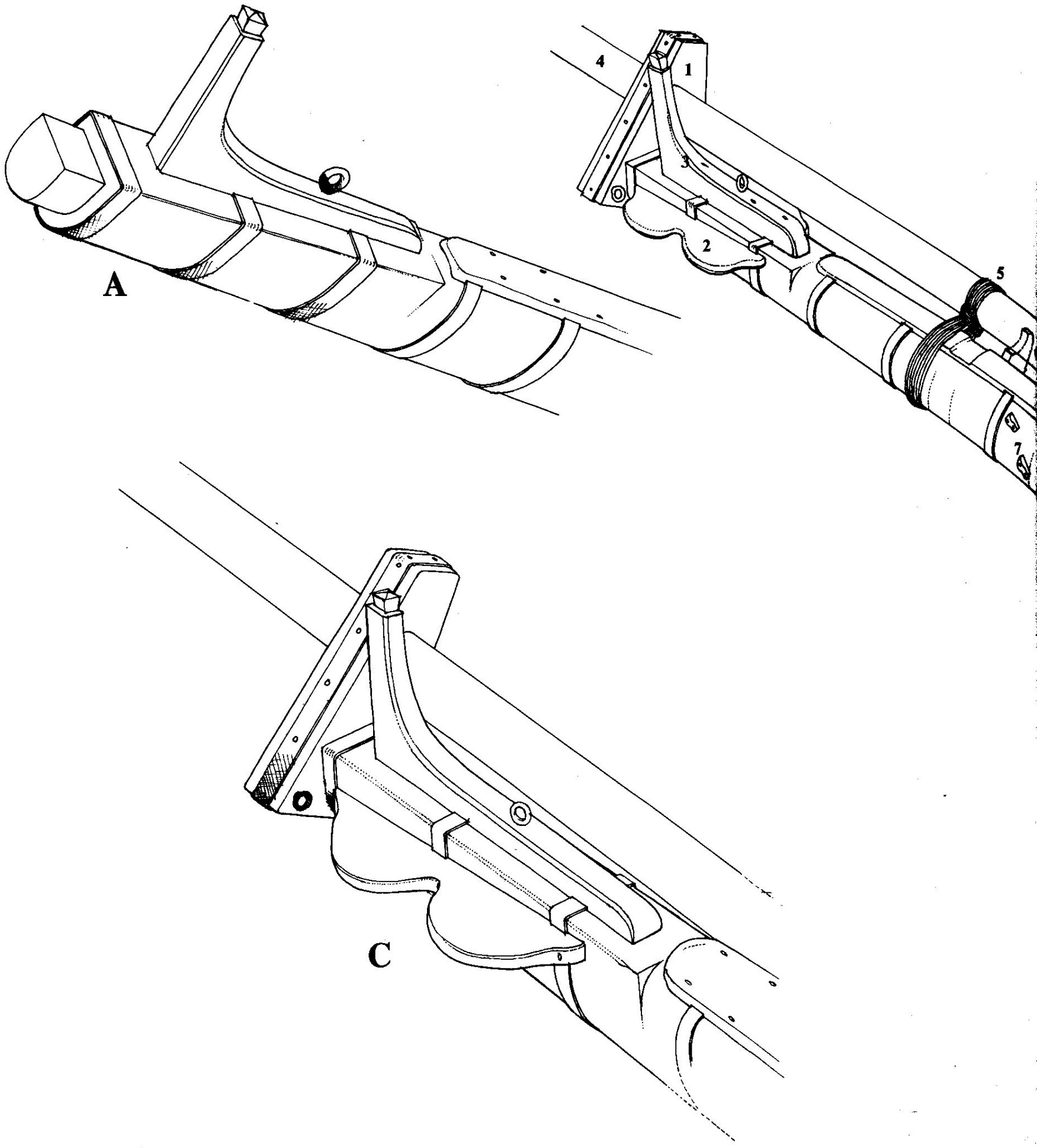
The bowsprit-cap is reinforced by a strap of hoop-iron, and two eyebolts are fastened to the after side at the bottom.

Jackstaff-standard: The lodging arm of the jackstaff-standard is bolted to the upper surface of the bowsprit, which as we have seen is flat on top; this arm takes the eye of the horses of the bowsprit, but more importantly, the vertical arm is designed to support the staff of a small flag called the *jack* (see Vol. IV). In passing I should mention that the jackstaff-standard and the bees are the last vestiges of the old arrangement of the jibboom, which until the beginning of the 18th century had been placed vertically at the end of the bowsprit and was called the spritsail-topmast*.

Jack: strictly speaking, the Union flag on English ships should only be called the Union jack when flown at the jackstaff.

*The standard was thus the ***spritsail-topmast standard***.

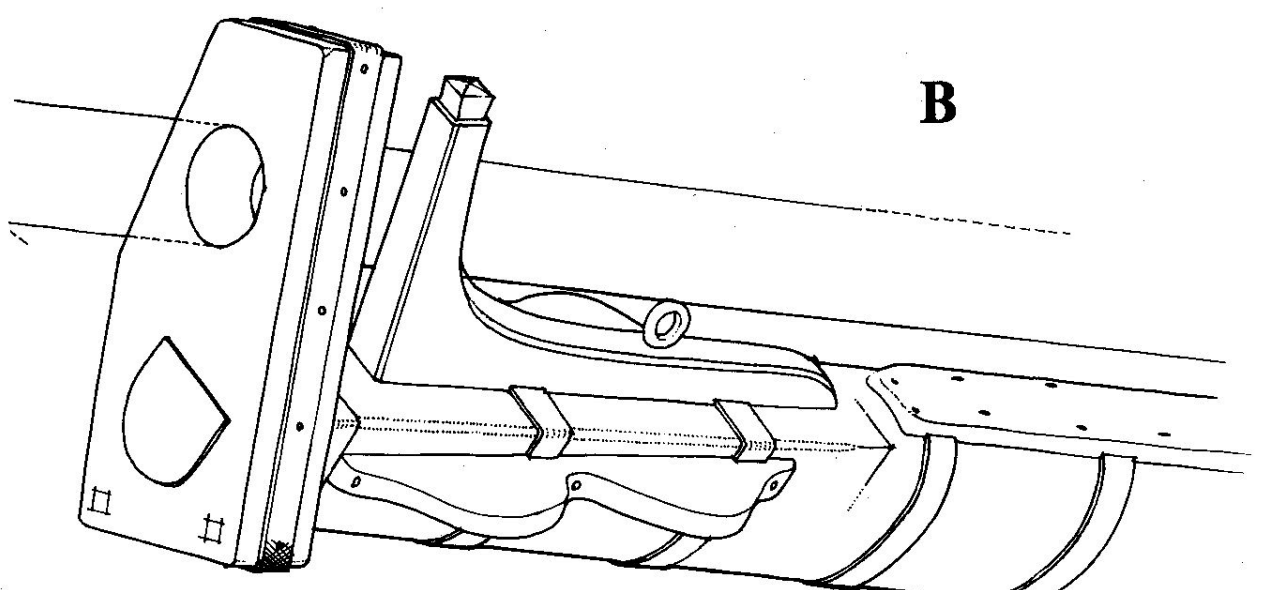
There are no hard-and-fast rules governing the size of the jackstaff-standard, but one calculation is to take a total length of 1/7th of the bowsprit, and divide this again by 7, giving 3/7ths to the vertical part and 4/7ths to the lodging part; the thickness is equal to 1/18th of the length and the depth at the throat is equal to 1/12th. An eyebolt is blind-fastened to the lodging arm and takes the topmast stays.



Other items: A large number of cleats are fixed to the bowsprit and to the gammoning-fish, and these serve to secure collars, cringles and various lashings; examination of Figures 243 and 244 will show how many there are and where they are placed.

The men climb onto the bowsprit by means of a gangboard which we have already mentioned; it will be recalled that the after end of this plank rests on the rail of the beakhead bulkhead, being worked in a Y-shape round either side of the central stanchion of the bulkhead. The forward end of the gangboard is jammed by a stop-cleat nailed to the gammoning-fish; it will be seen that one of the wooldings of the fish passes under this cleat, and a small shore which is nailed to the bowsprit supports the gangboard in the middle.

That concludes my description of the various fittings; I do not think I have left anything out, and I have included one or two alternative arrangements, such as the French-style mast-cap, the mizen-topmast crosstrees, an iron bowsprit-cap, and topmast trestletrees and crosstrees; I have not however described these in the main body of the text, preferring to restrict myself to the explanatory notes accompanying the various Plates or Figures where they are shown.



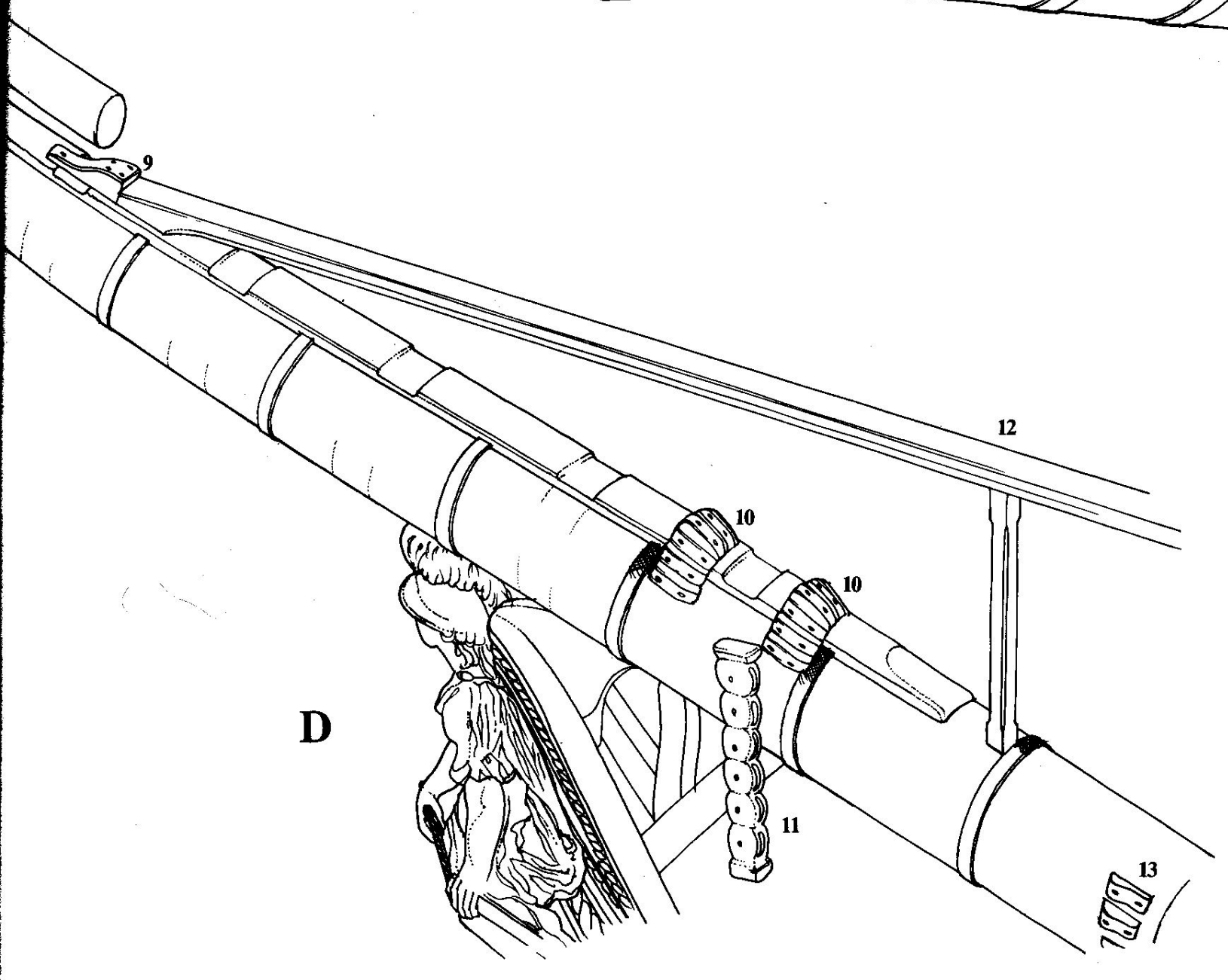


Fig. 244
Enlarged View of the Bowsprit Fittings

A. This sketch shows the shape of the forward end of the bowsprit and its flat upper surface to which the longer arm of the jackstaff-standard is fastened. The peculiar shape of the the head-tenon is clearly visible.
B. The bees are in place and the tenon of the bowsprit is fitted in the cap.
C. This drawing complements the previous one which showed the forward face of the cap: here the after face is illustrated.
D. This shows the whole bowsprit and all its fittings; I believe I have included everything. This drawing should be seen in conjunction with Fig. 243.

Moving from top to bottom, note the following:

1. The cap.
2. The port bees.
3. The jackstaff-standard.
4. The jibboom, passing through the cap.
5. The crupper securing the jibboom.
6. The saddle supporting the jibboom.
7. The forestay cleats.
8. The gammoning-fish with its wide scores for the wooldings.
9. The stop-cleat jamming the forward end of the gangboard.
10. The gammoning-cleats.
11. The port rack-blocks.
12. The gangboard and its pillar.
13. The main preventer-stay cleats.

PROPORTIONS OF THE MASTS

	Length as a proportion of the mid-ship beam.	Given diam. as a proportion of the length.	Min. diam. as a proportion of the given diameter.	Length of masthead as a proportion of the whole length.	Remarks
Mainmast	2 1/2	1/36	2/3	1/9	Stepped abaft the mid-point of the length by 1/72 of this length plus the radius of the mast. Perpendicular to the keel.
Main-topmast	1 1/2	7/288	7/12	1/10	Given diameter at the top of the masthead of the mainmast.
Main-topgallant	40/48	1/48	1/3	1/3	Given diameter at the top of the topmast masthead. Its masthead is a pole mast.
Foremast	2 1/2 less 2/3rds of the head of the main-mast.	1/36	2/3	1/9	The top of the masthead should be level with 1/3 of the masthead of the mainmast. Stepped 1/9 of the length from the stem less the radius of the mast. Perpendicular to the load waterline.
Fore-topmast	1 1/2 less 2/3rds of the head of the main-topmast.	7/288	7/12	1/10	
Fore-topgallant	7/9	1/48	1/3	1/3	
Mizen-mast	1 3/4	7/288	7/12	1/10	Stepped 1/6 of the length from the stern-post plus the radius of the mast. Perpendicular to the keel.
Mizen-topmast	1	7/288	5/12	1/10	
Mizen-topgallant	1/2	1/48	1/3	1/5	When there is no mizen topgallant-mast the mizen-topmast has a pole masthead equal in length to the topgallant less the length of its own masthead.
Bowsprit	1 2/5	1/2 of the total of the given diams of the fore- & main-topmasts.	1/2	–	Projects beyond the stem by a distance equal to the midship beam. Steeved 30° – 35°.
Jibboom	1	1/48	4/5	–	Projects between 1/3 and 2/3 of its length. Given diameter at 2/3 of its length starting from the truck.
Ensign-staff	1	1/72	–	–	

*The given diameter of the lower masts is situated at the level of the planking of the gundeck, and in the case of the mizen-mast, the planking of the upper deck. The given diameter of the bowsprit falls at the bed over the stem.

DIMENSIONS OF THE SHIP'S MASTS AND YARDS
LIST OF STICKS REQUIRED

Masts/Spars	Metric Measurements			Dimensions in palms of 29mm (13 lines).
	Length	Diameter	Masthead	
Mainmast	33.821	0.921	3.902	9 sticks: 1 x 28 p. for spindle; 1 x 18 p. for heel-piece; 2 x 23 p. for fore and aft side-trees; 1 x 22 p. for heel-pieces; 4 x 24 p. for port and starboard side-trees.
Foremast	31.870	0.894	3.577	9 sticks: 1 x 26 p. for spindle; 1 x 18 p. for heel-piece; 2 x 22 p. for fore and aft side-trees; 1 x 20 p. for heel-pieces; 4 x 24 p. for port and starboard side-trees.
Mizen-mast	23.740	0.596	2.708	1 stick of 24 p. or else 3 sticks: 2 x 20 p. & 1 x 17 p.
Bowsprit	20.488	0.908	-	4 sticks: 2 x 24 p., 2 x 23 p.
Main-topmasts (2)	21.463	0.528	2.168	2 sticks of 22 p.
Fore-topmasts (2)	19.837	0.488	2.060	2 sticks of 21 p.
Mizen-topmast	20.162	0.325	7.317*	1 stick of 16 p. or 1 of 14 p. and 1 of 9 p. for mizen-topgallant.
Main-topgallant	13.658	0.230	4.553*	1 stick of 12 p.
Fore-topgallant	12.683	0.203	4.228*	1 stick of 11 p.
Jibboom	14.471	0.352	-	1 stick of 14 p.
Ensign-staff	14.309	0.176	-	1 stick of 10 p.

*Pole.

Yards/Spars	Metric Measurements			Dimensions in palms of 29mm (13 lines).
	Length	Diameter	Yardarms	
Mainyard	29.918	0.623	2.602	2 sticks of 24 palms.
Foreyard	27.317	0.596	2.439	2 sticks of 23 palms.
Mizen-yard	27.317	0.407	-	1 stick of 19 palms.
Main topsail-yards (2)	21.463	0.393	3.577	2 sticks of 18 palms.
Fore topsail-yards (2)	19.837	0.366	3.333	2 sticks of 17 palms.
Spritsail-yard	19.837	0.352	1.626	1 stick of 17 palms.
Crossjack-yard	19.837	0.325	1.626	1 stick of 16 palms.
Mizen topsail-yard	14.309	0.257	2.439	1 stick of 17 palms.
Main topgallant-yard	13.658	0.203	1.138	1 stick of 11 palms.
Fore topgallant-yard	12.683	0.176	1.138	1 stick of 10 palms.
Mizen topgallant-yard	9.106	0.136	0.813	1 stick of 8 palms.
Sprit topsail-yard	13.658	0.203	1.138	1 stick of 10 palms.
Main studdingsail-booms (2)	14.300	0.265	-	2 sticks of 12 palms.
Main-topmast st'sl booms (2)	14.959	0.277	-	2 sticks of 9 palms.
Fore-topmast st'sl booms (2)	13.658	0.253	-	2 sticks of 8 palms.
Fore studdingsail boom	19.837	0.325	1.626	1 stick of 15 palms.
Main-t'gallant st'sl booms (2)	10.731	0.149	-	2 sticks of 7 palms.
Fore-t'gallant st'sl booms (2)	9.918	0.138	-	2 double handmasts of 6 palms.
Mizen-topmast st'sl booms (2)	9.918	0.184	-	2 sticks of 7 palms.

*In addition to the above, 14 single handmasts are required for the studdingsail-yards. And for the cutter: 1 stick of 8 palms, 1 of 7, 1 double handmast, 4 single handmasts. For the other two boats: 2 sticks of 7 palms, 6 double handmasts, 8 single handmasts. Spares: 1 stick of 17 palms, 1 of 15, 1 of 11, 1 of 8, 9 double handmasts of 5 palms.

**Of the total number of masts and spars listed here, 41 are from the Baltic and the remainder from home-grown mast-timber.

PROPORTIONS OF THE YARDS

	Length as a proportion of the mid-ship beam.	Given diam-eter as a proportion of the length.	Min. diam-eter as a proportion of the given diam-eter.	Yardarms as a pro-portion of the length overall.
Mainyard	2 1/2	1/48	2/5	1/10
Main topsail-yard	1 1/2	3/160	2/5	1/7
Main t'gallant-yard	4/5	1/60	2/5	1/8
Fore-yard	2	1/48	2/5	1/12
Fore topsail-yard	1 1/3	3/160	2/5	1/7
Fore t'gallant yard 7/10	1/60	2/5	1/8	
Mizen yard*	2	1/60	3/5	12-15 ins
Crossjack-yard	1 1/3	1/60	2/5	19/144
Mizen topsail-yard	1	3/160	2/5	1/8
Mizen t'gallant-yard	2/3	3/160	2/5	1/8
Spritsail-yard	1 1/2	3/160	2/5	1/6
Sprit topsail-yard	4/5	1/60	2/5	1/8

*The given diameter of the mizen-yard is placed at 1/3 of its length. The lower end or butt of the yard has a diameter equal to 3/5 of the given diameter, while the upper end or peak has only half the given diameter.

PROPORTIONS OF THE FAIR-WEATHER SPARS

	Length	Thickness. ness. (as a proportion of the length)	End or Arm.
Main studdingsail-booms	Equal to the beam	1/54	–
Fore studdingsail booms	Same as the crossjack-yard	–	–
Flying jibboom	2/3 of the jibboom	1/54	–
Mizen-boom	1 1/2 times the distance from the mizen to the taffarel fife-rail	1/60	–
Studdingsail booms (lower yards)	1/2 of lower yard	1/54	–
Studdingsail booms (topsail-yards)	1/2 of topsail-yard	1/72	–
Royal-yards	3/5 of topgallant-yard	1/96	1/16
Lower studdingsail yards	1/3 of the lower yard	1/60	1/16
Topmast studdingsail yards	1/3 of the topsail-yard	1/60	1/8
Topgallant studdingsail yards	1/4 of the topgallant-yard	1/72	1/16
Gaff	2/3 of the beam	1/60	1/16
Crossjack-sail yard	2/3 of the crossjack-yard	1/60	1/16

PROPORTIONS OF MAST AND BOWSPRIT FITTINGS

	Length.	Breadth (as a proportion of the length)	Thickness. (as a proportion of the length)
Lower mast trestletrees	1/4 of their topmast	1/12	1/36
Lower mast crosstrees	1/3 of their topmast	1/18	1/38
Bibbs	2/5 of the trestletree	1/3	1/4
Rubbing-paunch	1/2 of the length of the mast from the trestletrees to the planksheer.	Equal to the space between the trestletrees where it is square; rounded below.	Same as the bibbs.
Gammoning-fish	2/3 of the bowsprit	1/2 diameter of bowsprit.	1/4 of the breadth.
Topmast trestletrees*	1/3 lower mast trestletrees	1/8	1/16
Topmast crosstrees	1/12 lower mast crosstrees	1/24	7/32
Tops	1/4 of their topmast	1/3 of their topmast plus 2 or 3 inches.	The lubber's hole is centred fore-and-aft and athwartships and is half the length.
French-style mast-caps	3x diameter of their respective topmast or topgallant-mast.	Identical to the length.	2/5
English-style mast-caps	3 1/2x diameter of their respective topmast or topgallant-mast.	1/2	1/4
Topmast fids (iron)	2x the diameter of the block of the topmast.	1/8	1/9
Topgallant-mast fids (wood)	2x the diameter of the topgallant-mast.	1/5	1/6
Bowsprit-cap	4 1/2x the diameter of the jibboom.	1/9	1/6
Bees	4 1/2x the diameter of the jibboom.	1/4	1/16
Jackstaff-standard	1/7 of the bowsprit, the lodging arm being 4 parts.	1/12	1/18
English-style topmast sheaves	Diameter equal to diameter of topmast swallow.	–	1/160 of beam.
French-style topmast sheaves	Diameter of topmast less the circumference of the top-rope.	–	1/160 of beam.

*including the mizen-topmast.

Notes:
– the topgallant-masts have sheaves similar to those of the topmasts, and their thickness is equal to 1/320 of the beam in the case of the fore and main, while the thickness of the mizen-topmast sheave is equal to 1/240 of the beam.
– there is a tendency to increase the length of the rubbing-paunch.

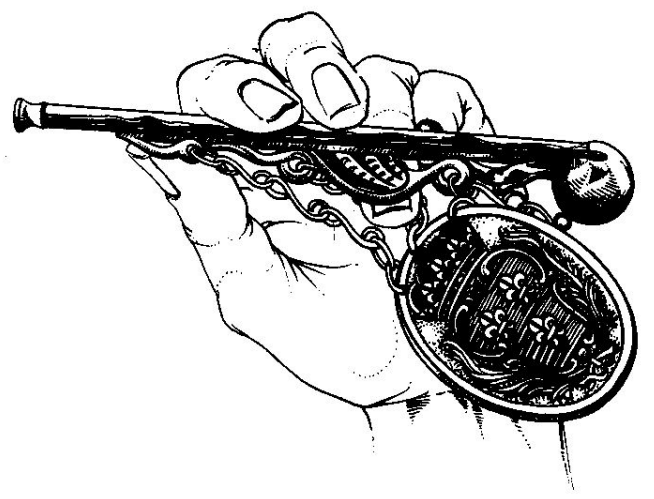
PROPORTIONS OF THE CHANNELS

	Mainmast		Foremast		Mizen-mast	
	Length	Breadth	Length	Breadth	Length	Breadth
Ship of 110 guns	11.00–11.70	1.18–1.40	9.75–10.72	1.13–1.19	6.50–7.15	0.97–1.03
Ship of 80 guns	10.70–11.40	1.08–1.18	9.75–10.40	1.08–1.13	6.50–7.15	0.81–0.92
Ship of 74 guns	10.00–10.70	1.03–1.08	9.10–9.75	1.03–1.08	6.50–6.82	0.81–0.86
Ship of 64 guns	9.75–10.40	0.97–1.03	8.77–9.42	0.97–1.05	5.85–6.17	0.75–0.81
Ship of 50 guns	9.10–9.75	0.89–0.92	8.45–8.77	0.89–0.92	5.20–5.52	0.65–0.67
18-pdr frigate	8.45–9.10	0.84–0.89	7.80–8.12	0.84–0.89	4.87–5.20	0.65–0.67
12-pdr frigate	8.10–8.80	0.84–0.86	7.47–7.80	0.81–0.86	4.87–5.20	0.62–0.65
Storeship of 450 tons	6.50–7.15	0.73–0.75	5.85–6.50	0.70–0.75	4.22–4.55	0.32–0.54
Sloop-of-war	4.55–5.20	0.48–0.59	3.90–4.22	0.48–0.54	–	–
Cutter	4.55–5.20	0.48–0.59	–	–	–	–

PROPORTIONS OF THE TOPS

	Ships					Frigates		Storeship of 450 tons
	110	80	74	64	50	18-pdrs	12-pdrs	
Length of the top	5.20–5.52	4.87–5.20	4.55–4.87	4.22–4.55	3.90–4.06	3.90–4.06	3.73–3.90	3.25–3.73
Breadth	7.80	7.47	7.15	6.50	5.85	5.44	5.11	4.22–4.55
Siding of the lubber's hole	2.76	2.76	2.51	2.27	2.03	1.95	1.78	1.62
Thickness of deals	68 mm	68 mm	61 mm	61 mm	54 mm	47 mm	41 mm	41 mm
Thickness of rim	81 mm	74 mm	68 mm	61 mm	54 mm	54 mm	54 mm	54 mm
Breadth of rim	271 mm	258 mm	244 mm	231 mm	217 mm	204 mm	190 mm	163 mm
Thickness of timbers	81 mm	81 mm	81 mm	68 mm	68 mm	68 mm	68 mm	54 mm
Number of timbers	32	32	32	28	28	24	24	16

*This little table gives the detailed dimensions of the maintop for each type of ship. For the fore and mizen-tops see the proportions given above in the table of mast-fittings.



XIII

SAILS



1. Sailcloth and Sailmaking

Before describing the sails of our 74, I thought that it might be helpful to give some explanations regarding the various types of canvas* used by the Navy, and having covered some of the basic principles, to go on to examine how a sail is made. This then will form the first part of this Chapter, while the second, much larger, is devoted to the description of the numerous sails of the ship. Before we begin however you should at least know the names of the various sails of our 74. Examine therefore Figures 245 and 246 opposite.

*Canvas destined for sailmaking is usually called ***sailcloth***.

SAILCLOTH

First of all I should say that I do not intend to go into the techniques of weaving; there are several excellent books on the subject, and I would refer you to them.*

*See the bibliography at the end of Volume IV.

You should however be aware that any woven material is composed of threads arranged transversely, forming the weft, and these are crossed by other threads running longitudinally, called the warp.

In the case of sailcloth both the warp and the weft are of hemp*; mixing hemp with flax or cotton should be avoided since the hemp fibres being stronger cut the flax or cotton fibres, and furthermore the threads made of this latter material tend to absorb moisture and cause the canvas to rot*. Unless the most meticulous attention is paid to the choice of the fibres for both the warp and the weft, and unless care is taken in matching the quality of both, there is no hope of ever producing good sailcloth.

*English canvas was frequently made of flax. [Trans.]

*Despite this, a light canvas called *cotonine* is used in the Mediterranean, its warp being of hemp and its weft of cotton.

The thread used for the warp must not be coarse. It must be supple without being weak. If it is to take the weft it must be very exactly calibrated and made of the best fibres of the hemp.

The thread used for the weft must be soft, and only slightly twisted so that it will give under the blows of the batten (the part of the loom with which the weaver strikes the weft each time he throws the shuttle which feeds the weft between the threads of the warp). In order for the weft to weave closely with the warp it must have very little lay or twist, but this means that it must be made of very good hemp, since it is thereby considerably weaker.

The threads must be bleached, by means of repeated washing (once only in the case of the warp) and of exposure to the sun when laid out in the fields, but this latter operation is carried out only between March and September, since it must not ferment or be attacked by insects.

The thread used for the warp is spun in Brittany for the Dockyard at Brest, in the Poitou for Rochefort, and in the Dauphiné for Toulon. The output of the spinners, who are scattered throughout the country areas, is collected by commissioners who forward it to the Dockyards.

The thread used for the weft is spun in the Dockyards or in the surrounding area, the hemp being supplied to the spinners, whether men or women, ready combed.

The sailcloth is woven in various workshops and factories set up at Brest, Rennes, Angers, Beaufort, Strasbourg, Toulon etc. Most of the output is in the form of a number of different types of sailcloth, of which these are the principal characteristics (see also Figure 247):

Triple-thread canvas: Fr: toile à trois fils.

Cloth: a breadth of sailcloth.

*A French ell measures 1.188 metres.

*A French ounce weighs 30.56 grammes.

*A rule which is almost universally followed in weaving sailcloth is to make the weft-threads three times thicker than the warp-threads; in Locronan however they make the warp and the weft of the same thickness, which goes against the strength and the goodness of the cloth.

courses: mainsail, foresail, mizen and spritsail; in this instance only the first three.

Triple-thread canvas*: This sailcloth is so-called because three threads of the warp are passed together over and under the weft; this heavy canvas is made in bolts, each breadth or *cloth* measuring 21 inches [56.9 cms] and 50 *ells* in length [59.4 m]. There are two qualities of triple-thread canvas which differ by their weight: the first weighs 24 to 26 *ounces* to the ell, or about 1100 to 1200 grs/m^2, and has 1,535 to 1,600 warp threads to the cloth*; the second quality weighs 20 to 22 ounces, or about 900 to 1,000 grs/m^2. Triple-thread canvas is used only for the *courses*.

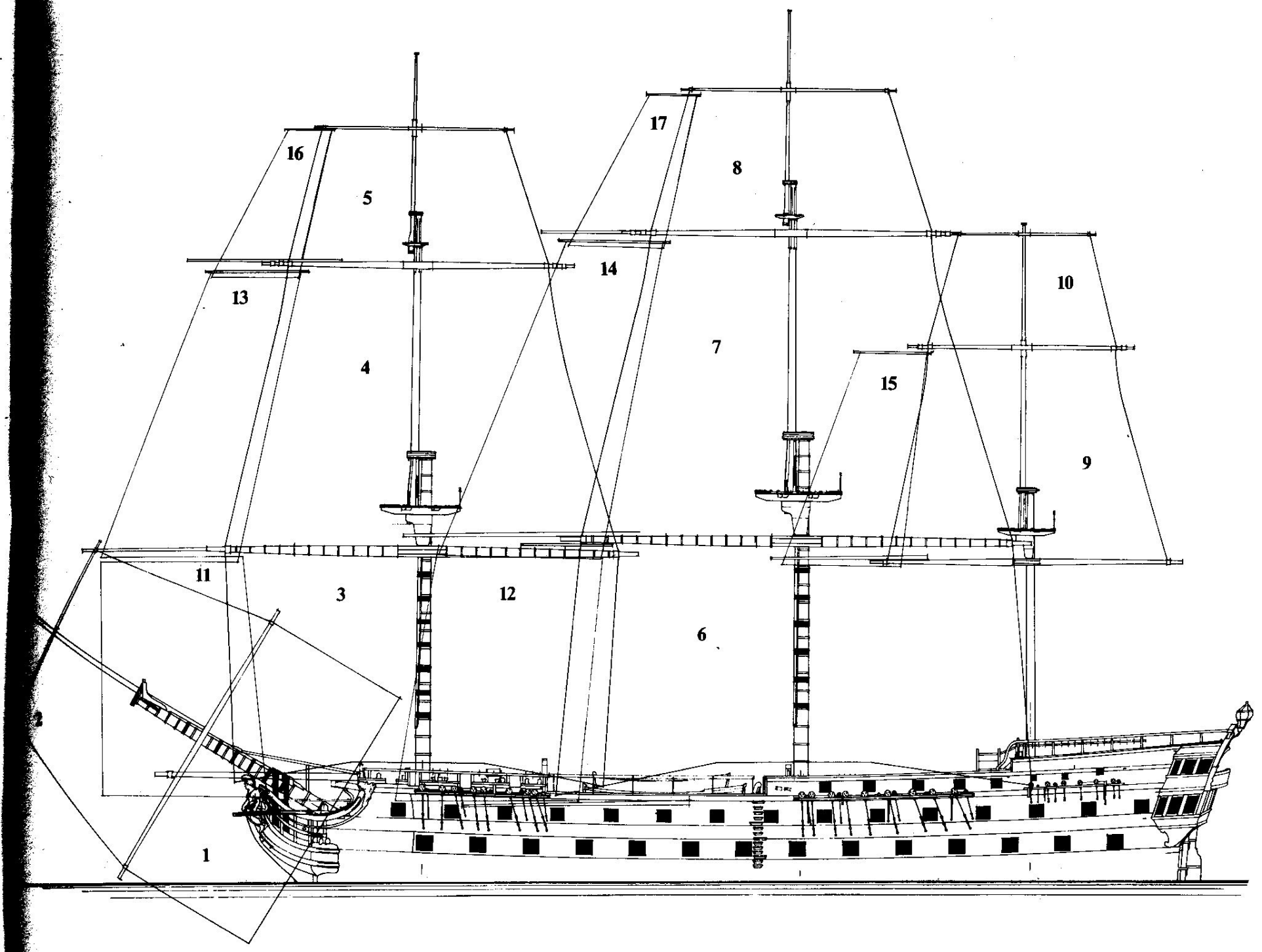


Fig. 245
Square Sails

1. Spritsail – 2. Sprit-topsail – 3. Forecourse – 4. Fore-topsail – 5. Fore-topgallant – 6. Main course – 7. Main-topsail – 8. Main-topgallant – 9. Mizen-topsail – 10. Mizen-topgallant – 11. Lower fore studdingsail – 12. Lower main studdingsail – 13. Fore-topmast studdingsail – 14. Main-topmast studdingsail – 15. Mizen-topmast studdingsail – 16. Fore-topgallant studdingsail – 17. Main-topgallant studdingsail. *Only the port studdingsails have been shown.

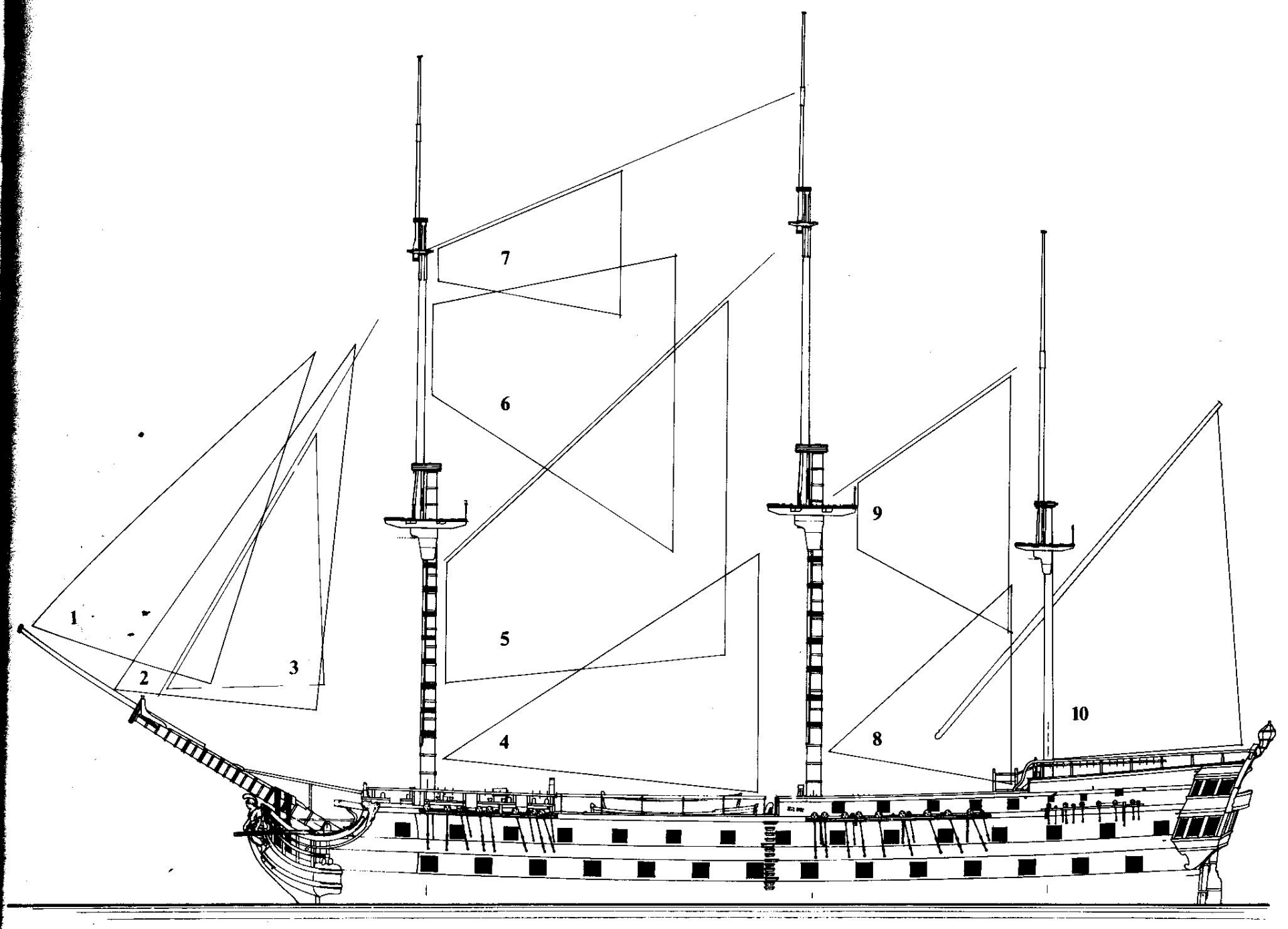


Fig. 246
Fore-and-Aft Sails

1. Main or standing jib – 2. Inner jib – 3. Fore-topmast staysail – 4. Main staysail – 5. Main-topmast staysail – 6. Middle staysail – 7. Main-topgallant staysail – 8. Mizen staysail – 9. Mizen-topmast staysail – 10. Mizen-course.

*Fr: *toile à deux fils.*

Double-thread canvas*: This canvas is so-called because two threads of the warp are passed together over and under the weft. The bolts are of the same dimensions as the triple-thread canvas. Once again there are two weights: the first weighs 19 to 20 ounces to the ell, or about 600 grs/m^2, and has 1,300 to 1,350 warp-threads to the cloth; the second quality is lighter, weighing 17 to 18 ounces to the ell, or about 530 grs/m^2.

Double-thread canvas is used for the mizen-sail, topsails and spritsails for ships of 74 to 110 guns, and for the courses of ships of 50 guns as well as 8-pdr and 12-pdr frigates.

*I am not aware of any equivalent to *toile de mélis double* in English sailcloth. [Trans.]

Double mélis canvas: Characterised by the fact that four threads of the warp are led together through the reed or heddles of the loom (which are made up of a number of thin cords each having a small loop in the middle, through which the threads of the warp are passed). The heddles are moved by pedals so that alternate threads of the warp are raised and lowered, while the shuttle is thrown between them to carry the weft from one side of the cloth to the other.

Double mélis canvas is made in bolts measuring 21 inches [56.9 cms] by 50 ells [59.4 m]. Its weight is 16 to 17 ounces to the ell, or 500 grs/m^2 approximately; there are about 1,000 warp-threads to the cloth. This canvas is used for topsails, mizen-courses and spritsails of ships of 50 guns and frigates.

It is also used to make up mizen-topsails, main-staysails and standing jibs of ships-of-the-line, and the courses of sloops-of-war and other small vessels.

However, as you will see, almost no double mélis canvas is used in our 74.

*Fr: *toile de mélis simple.*

Single mélis canvas*: This is an ordinary single-thread canvas. There are two types, the first being made in bolts of identical dimensions to the double mélis canvas, but with a weight of 14 to 15 ounces [430 to 460 grs]. There are 900 to 950 warp-threads. The second type is made in bolts measuring 24 inches [65 cms]; this canvas weighs 11 to 12 ounces (435 to 475 grs/m^2), and its warp contains 1,000 to 1,050 threads. Single mélis canvas is used for upper sails, topsails of small vessels, and boat sails. This light canvas is also called studdingsail canvas, and it is the lightest type which is used for this purpose.

*Hemp is divided into three qualities: ***first choice***, which consists of the longest fibres; ***combings***, which is the second quality and ***tailings*** or ***ground-toes (ground-tows)*** which is the third.

*It is difficult to give exact equivalents in English canvas, which was supplied to the Navy in eight weights, numbered 1 to 8, the heaviest being No. 1. The weights, in grs/m^2, of English canvas were:
No. 1 = 942 grs/m^2; No. 2 = 878; No. 3 = 814; No. 4 = 750; No. 5 = 685; No. 6 = 621; No. 7 = 514; No. 8 = 450.

Lining canvas: This canvas is ordinary single-thread canvas but of a lower quality than those described above which are made entirely of first-choice hemp, while for lining canvas the combings are used, both for the warp and for the weft; sometimes the warp is made of tailings*. It is made in bolts measuring 56 ells [66.53 m] by 21 or 24 inches wide, it weighs 13 1/2 to 14 1/2 ounces [410 to 450 grs/m^2* in 21 inch cloths]; the warp contains 800 threads.

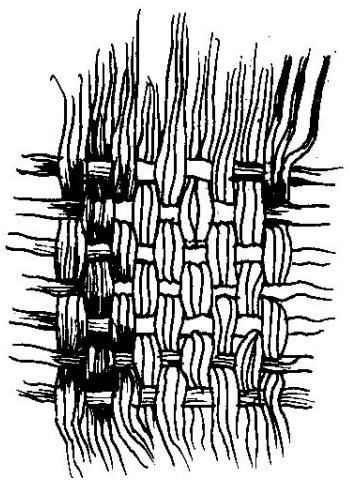
This canvas is used for lining the courses and topsails of ships-of-the-line and frigates in those areas which are subject to the most wear. It is also used for deck- and boat-awnings.

*Tarpaulins are used to cover the hatches and to protect victuals and other stores from the spray when they are being transported in the ship's boats. Often made at Locronan, tarpaulins are usually painted with red ochre (coarse red), or else tarred. In the mill at Brest they use up the poor quality thread for making tarpaulins, and this provides work for the trainee-weavers.

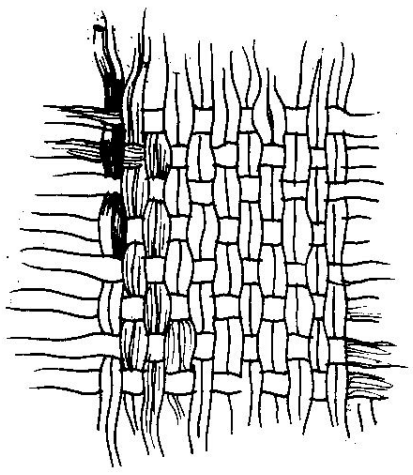
Tarpaulin canvas: It is made in exactly the same way as lining-canvas, but uses hemp of even lower quality. The bolts are 21 inches wide [56.9 cms].*

* Sails must therefore be made up allowing for some stretching, mainly in the direction of the warp. Frequently it is necessary to alter the cut of certain sails at sea in order to set them correctly.

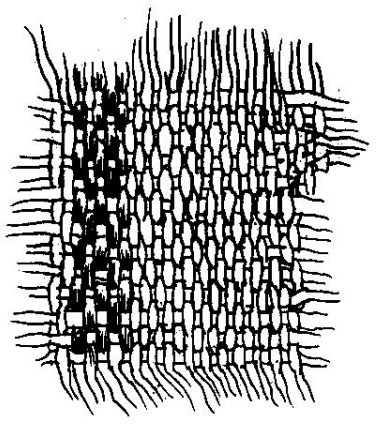
All the above types of canvas have a reddish tint to them; they are strong, particularly if the thread is completely free of boon or other foreign bodies; however, they stretch considerably* and are rather stiff. By increasing the number of bleachings it is possible to obtain canvas which is whiter, more aesthetic and less stiff, but this is at the expense of its strength, the threads being weakened by repeated bleaching.



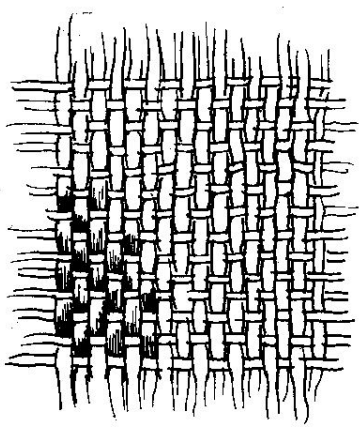
1. Triple-thread canvas



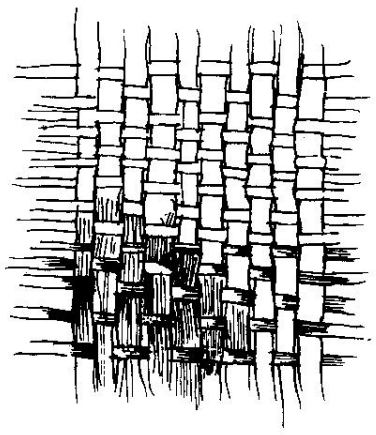
2. Double-thread canvas



3. Double mélis canvas



4. Single mélis canvas



5. Lining canvas

Fig. 247
Different Types of Sailcloth

The colour of the canvas varies according to where it is made; thus Brest canvas is redder than that from Beaufort, which is due to the hemp which is used. Canvas woven in the area surrounding Angers and Beaufort is considered to be better and of superior quality to that from Brest. The mills in Beaufort and Angers are in private hands while the one in Brest belongs to the crown. To the output of these mills should be added that of numerous outworkers, each producing their own bolts of canvas at home. The main places where canvas is made are: Locronan, and Poulan nearby; Port-David, Olonne; and Noyal, near Rennes, where in earlier times very considerable quantities of canvas were produced, to such an extent that sailcloth and *noyals* were synonymous. All these so-called "country cloths", for they come from the agricultural areas particularly of Brittany, are often of a quality reckoned to be inferior and I should add finally that triple-thread canvas is only made at Brest and Angers for the Atlantic seaboard, and at Strasbourg for the Mediterranean.

Noyals: the term seems to have died out in England towards the end of the 17th century, perhaps as a result of protectionist measures designed to encourage domestic production. [Trans.]

Other types of canvas: while on the subject, I should mention: Provins canvas, in bolts of 24 inches, for light tarpaulins and sailbags, produced at Beaufort and Angers; white canvas in bolts 30 inches wide [81 cms] for colours and pendants* produced at Angers, Beaufort, Brest, Laval; *tanned canvas* 31 to 36 inches wide [84-98 cms] produced in the same areas and also at Dinan, Morlaix and Saint-Pol-de-Léon used for mattresses, and a thinner variety in bolts of 22, 28 and 44 inches used for sheets; Olonne canvas used for parcelling ropes and for making hammocks; chequered ticking for mattresses; coarse canvas for sacks; duck canvas, which is a mixture of cotton and hemp or linen, and is used for stern-light curtains.

*Bunting is also used, in bolts of 15 ells [17.82 m] and 13 to 14 inches wide [35-38 cms], which comes mainly from the Auvergne, Picardy, and the Agen region. Some also comes from Holland, in bolts of 21 ells and 18 to 19 inches wide. Bunting is used for vanes, signal-flags and command flags; it comes in white, blue, red, orange, lemon yellow and scarlet. Bunting is made of wool.

Tanned canvas: canvas which is soaked in a mixture of red ochre and oils to protect it. Once popular with fishing-boats it has now largely disappeared.

SAILMAKING

The most convenient way to describe how the sails of our 74 are made is to take as an example one type, the most important, which is the maincourse.

This is made of triple-warp canvas and since as we have seen the bolts are 50 ells long, this enables the cloths to run down the full length of the sail, since the rows of cloths are arranged vertically. The breadth of the maincourse demands 57 cloths, and since you will note that the breadth is smaller at the top or *head* of the sail than at the bottom or *foot*, it is by adjusting the breadth of the seams that the same number of cloths is used throughout. To this effect, the seams are about 3 inches [8.1 cms] wide at the head and one inch [2.7 cms] wide at the foot. If the breadth of the cloths is fixed, their length can vary, since the height of the sail from head to foot varies, as may be seen in Fig. 254.

Head. Foot.

Once the cloths have been cut to the desired length they are laid down side by side (their width is, I repeat, 21 inches or 56.9 cms), and the sailmaker overlaps one cloth with the next, this overlap corresponding to the width of the seam.

Two parallel rows of stitches are made. The sailmaker uses *sail-needles* (shown in Fig. 248) which have a special shape: they are circular in section from the eye to about half way down their length, and thereafter pyramidal, ending in three triangular faces at the point. The needles vary in length from 2 1/2 to 5 inches [6.8 - 13.6 cms], the larger ones being called *bolt-rope needles* (see below), and the eye can take between six and twelve threads. The eye of the needles called "grommet-needles" can take up to a maximum of four threads, while needles called "heading-needles" have an eye which will take two, three or four threads; finally there is the "flat seam needle" which can take only one thread. Sailmakers' thread or twine must be proportioned to the sailcloth to be stitched, being slightly thicker than the threads of the canvas; thus the thickest measures about 35mm in circumference: made of hemp, it must be good and stiff, of uniform thickness and made from the best hemp fibres.

Sail-needles: the best come from Holland, but they are also made in Rouen. English needles were called (in descending size): ***large marline – small marline – double-bolt-rope – large bolt-rope – small bolt-rope – store – old work – tabling – flat seam.***

Bolt-rope needles: the bolt-rope is a length of rope which is more flexible than the other ropes of the rigging, and which runs round the whole border of the sail (see Chapter XIV).

The sailmakers use a sort of thimble for pushing the needle but this is not like an ordinary sewing thimble which is placed over the finger, since the strain is too great and the needle must be pushed extremely hard; thus they use what is called a *palm*, which is a broad bracelet of leather with a hole through which the thumb is placed, thereby preventing the palm from slipping, and stitched to the palm is a disk of brass positioned over the palm of the hand. This disc, which is called a *roping-* or *seaming-eye* is fastened by means of small lugs, and it is criss-crossed by raised lines so that the head of the needle is prevented from jumping out (see Fig. 259 at the end of this Chapter). In order to make it easier to pass the needles through the canvas, the sailmaker greases them by dipping them in a *greasehorn*, a cow's horn filled with tallow. He also uses a number of other implements which I will describe during the course of this Chapter.

Palm.

Roping-eye, seaming-eye.

Greasehorn.

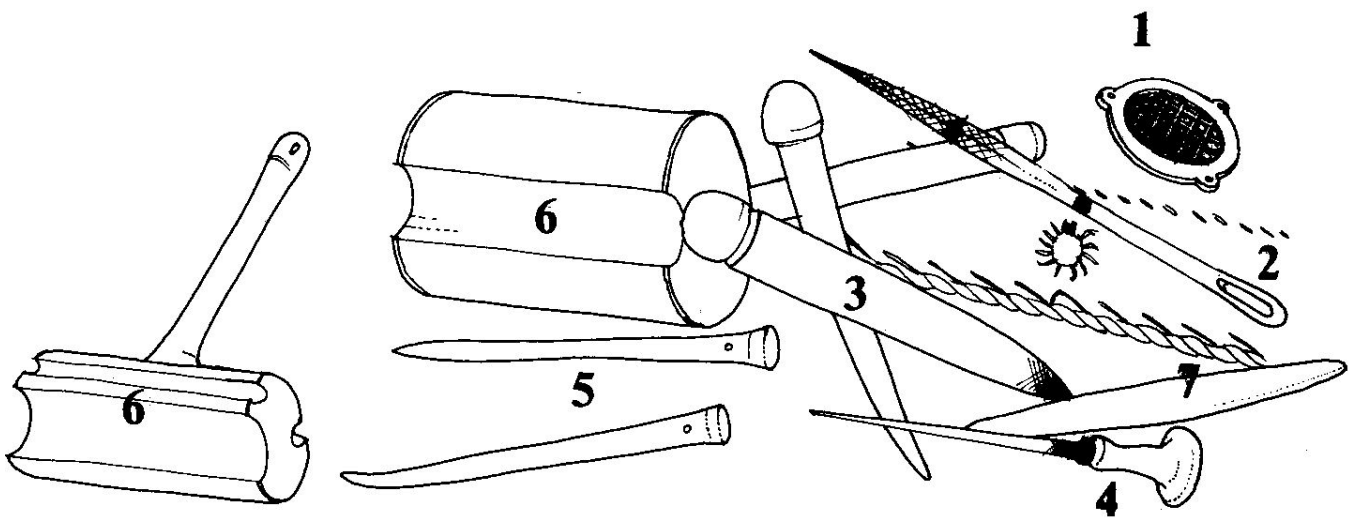
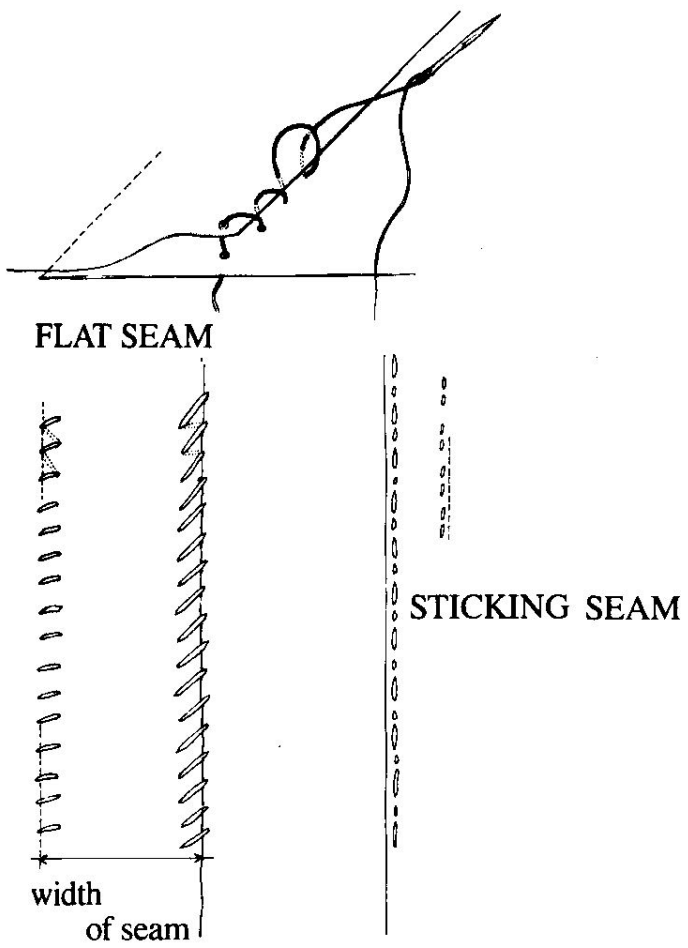


Fig. 248
Sailmaker's Tools

1. Roping or seaming-eye for palm
2. Sail needle
3. Sets or setting-fids
4. Pegging-awl or stabber
5. Hand-fids
6. Serving-mallets
7. Serving-board



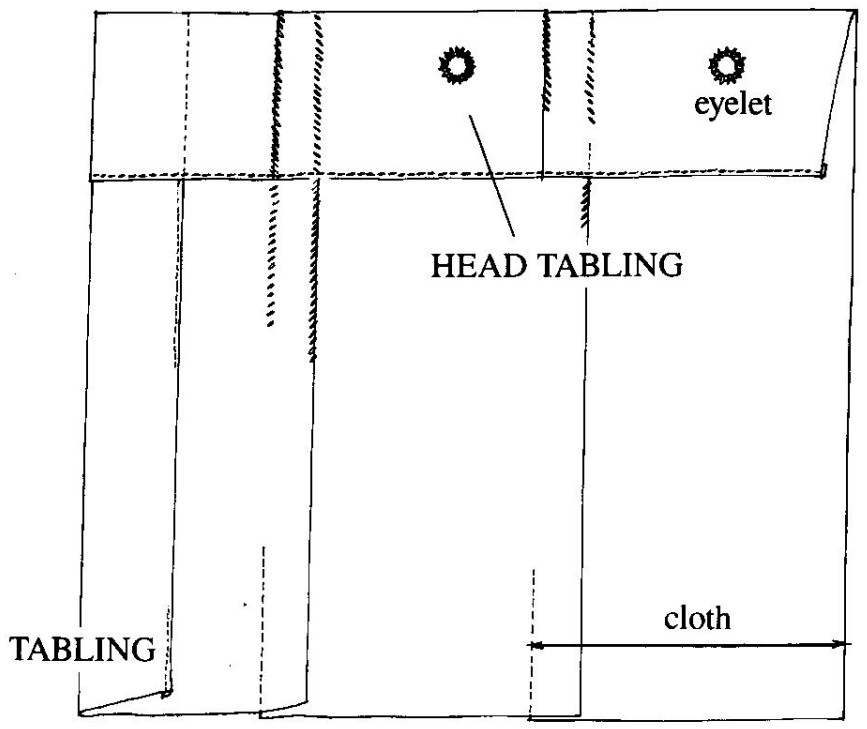


Fig. 249
Making-up of Cloths and Tablings

The sketch on the left shows how the cloths are put together using a flat seam, sometimes called a tabling seam. The arrangement of the seam is different, depending on whether the edge of the cloth is seen or not. I have also shown the seam used for the edge of the tabling. The sketch on the right shows the upper corner of a square sail; note how the left-hand cloth is folded back to form the tabling and a narrow hem enables it to be stitched to the back of the sail. The head-tabling, which is wider, is stitched in the same way.

But let us return to our maincourse, of which the cloths are *put together* with *flat* or *tabling-seams*; the cloth which is underneath is pierced twice by the needle, while that which is laid over it is only pierced once, at the very edge or selvedge of the cloth. Two parallel lines of stitches are thus made, the stitches being about 3mm apart. All the cloths are put together, and then all round the sail a *tabling* is made; this sort of hem is not the same width throughout, being wider at the head (see Fig. 249). The edge of the tabling is tucked under for about 100mm on the inner edge and sewn using a seam called a *sticking-seam*.

To put together: to assemble the cloths of a sail.

Flat seam or ***tabling-seam:*** a sort of over-and-over stitch.

Tabling.

Sticking-seam.

With the sail thus hemmed, the sailmaker next lays a strip of canvas as a reinforcement down the whole *drop* of the sail on either side, over the top of the tabling; it is one cloth wide, and it is sewn at its edges to the tabling and to the *back* of the sail.

Drop: depth of a sail.

Back of the sail: the side which will be filled by the wind, i.e. the side which faces backwards.

Parallel to the head of the sail and at a distance equal to a quarter of the drop, the sailmaker sews a strip of canvas which is only half a cloth in breadth; this is called the *reef-band*. Like the first lining it is sewn to the back of the sail.

Reef-band: its purpose is to take the thin ropes used to reduce the surface area of the sail. See the section on sail-ropes.

Next the sailmaker sews six pieces of canvas at various points along the *leech* of the sail; these are called *patches*, and are designed to strengthen the sail against the strains of the ropes secured at these points. Each patch is one ell high [1.19 m] and two cloths broad, and they are spaced evenly apart as will be seen in Fig. 254.

Leech: also called the ***skirts***: the side of the sail.

Patch.

Despite all these precautions the sail is still not strong enough, and it must be strengthened further by means of the *bolt-ropes*, which are ropes tightly sewn all the way round the edge of the sail, stitched to the tabling; the sailmaker stitches the bolt-ropes in such a way that the tabling is secured round two-thirds of the circumference of the bolt-rope.*

Bolt-ropes: sometimes called ***ropings***.

*In stitching the canvas to the bolt-ropes the sailmakers must leave what is called ***slack-canvas***, since otherwise as the bolt-rope stretches the canvas will tear.

The thickness of the bolt-rope is not the same all round the sail, so that it must be made in a series of lengths fastened one to the other. The rope running along the head of the sail and which is called the *head-rope* has only two-thirds the thickness of the *leech-ropes* or the *foot-rope*.

Head-rope: bolt-rope in the head of a sail.

Leech-ropes: bolt-ropes in the skirts of a sail.

The two thicknesses of bolt-rope are joined at their ends at the upper corner of the sail in such a way that two cringles are formed at each corner: Fig. 250 and the accompanying text illustrate this neat arrangement.

Foot-rope: bolt-rope in the foot of a sail. Not to be confused with the footropes or horses stretched under the yards for the feet of the men working on the yards.

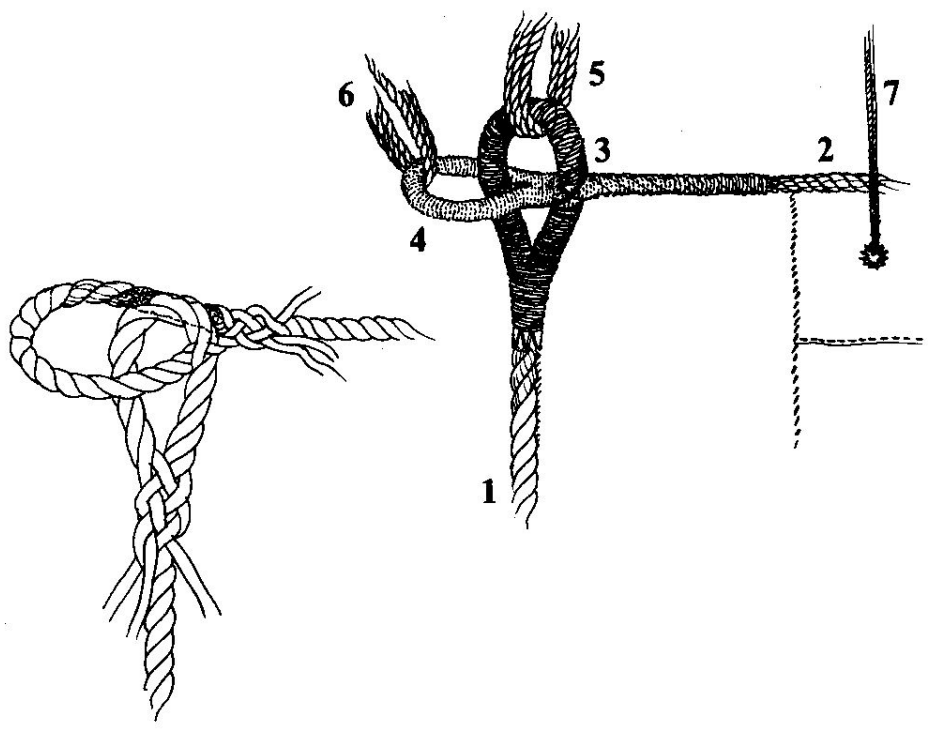


Fig. 250
Leech- and Head-Ropes at the Upper Corner of a Sail

The small sketch on the left shows how the head-rope is passed through the strands of the leech-rope; the two bolt-ropes are then turned back on themselves and spliced, thus forming two cringles.

The main drawing illustrates: 1. The leech-rope – 2. The head-rope – 3. The leech-rope cringle – 4. The head-rope cringle – 5. The reef-earring – 6. The head-earring – 7. The rope-band passing though a grommet in the tabling.

To splice a rope.

To serve a rope.

The cringles and the places where the bolt-ropes are *spliced* together are *served*, which is to say that they are covered by thin twine wound round and round, an operation which I shall describe at the beginning of the next Chapter. This has the effect of strengthening the bolt-ropes at these points.

Clue or *clew.*

The head-rope is sewn to the back of the sail, but the other bolt-ropes are sewn partly to the back and partly to the front of the sail. The leech-ropes are sewn to the back of the sail from the upper corner of the head, down as far as the point marked O on Fig. 254, a short way above the lower corner which is called the *clue*. From O, the sailmaker begins to sew the bolt-rope to the front of the sail, and follows it round along the foot of the sail. The distance from O to C (the clue) is about three feet [97.5 cms] and the other side of the canvas extends to Z for a distance equivalent to 1/8th of the foot of the sail. The bolt-ropes are made somewhat longer than the edge of the sail, so that the sailmaker can form a cringle at the clue.

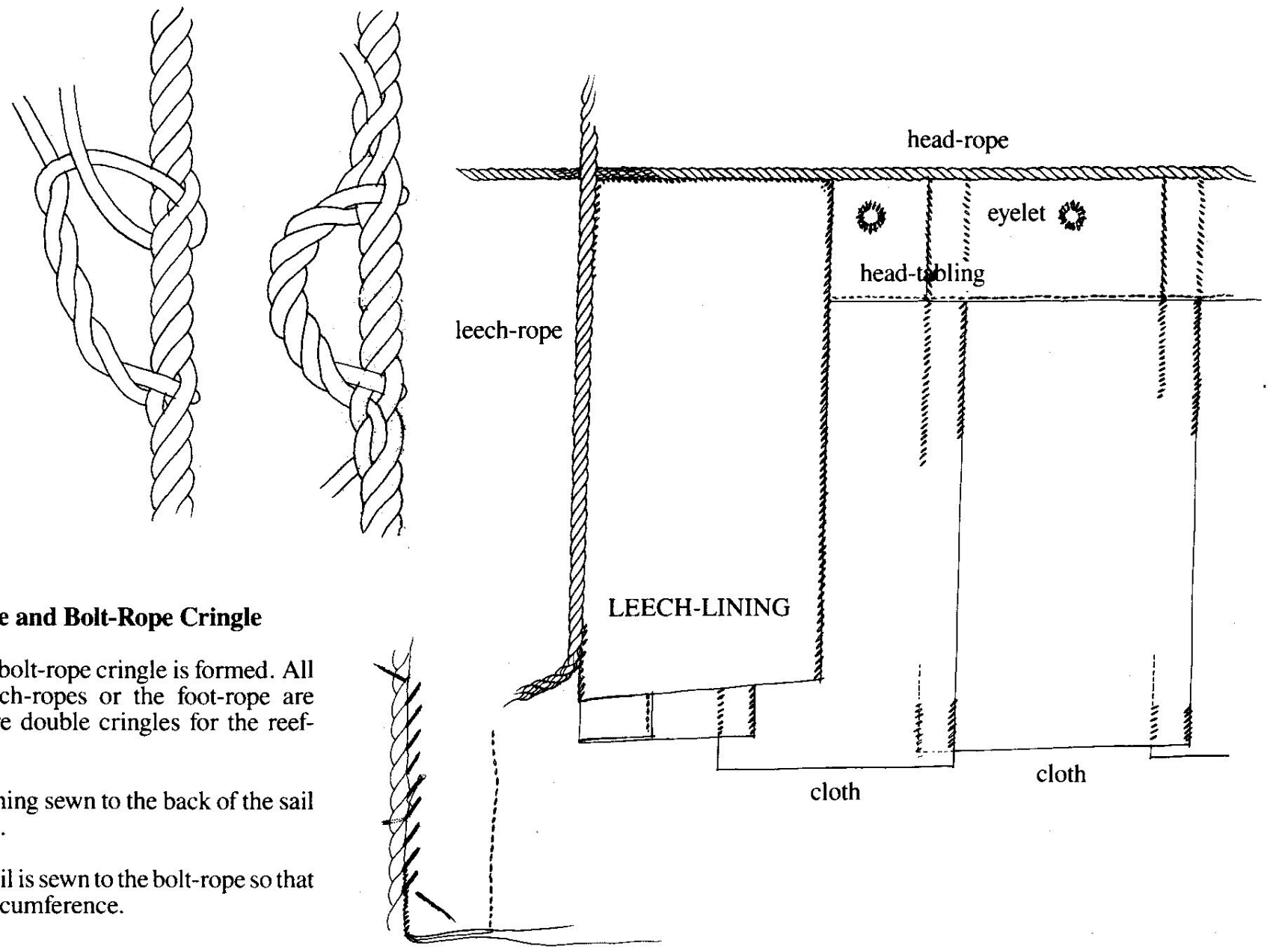


Fig. 251
Upper Corner of the Maincourse and Bolt-Rope Cringle

The sketch on the left shows how a bolt-rope cringle is formed. All the cringles, whether on the leech-ropes or the foot-rope are formed in the same way; there are double cringles for the reef-bands.

The right-hand sketch shows the lining sewn to the back of the sail or top of the cloths and the tabling.

The inset drawing shows how the sail is sewn to the bolt-rope so that it wraps round two-thirds of its circumference.

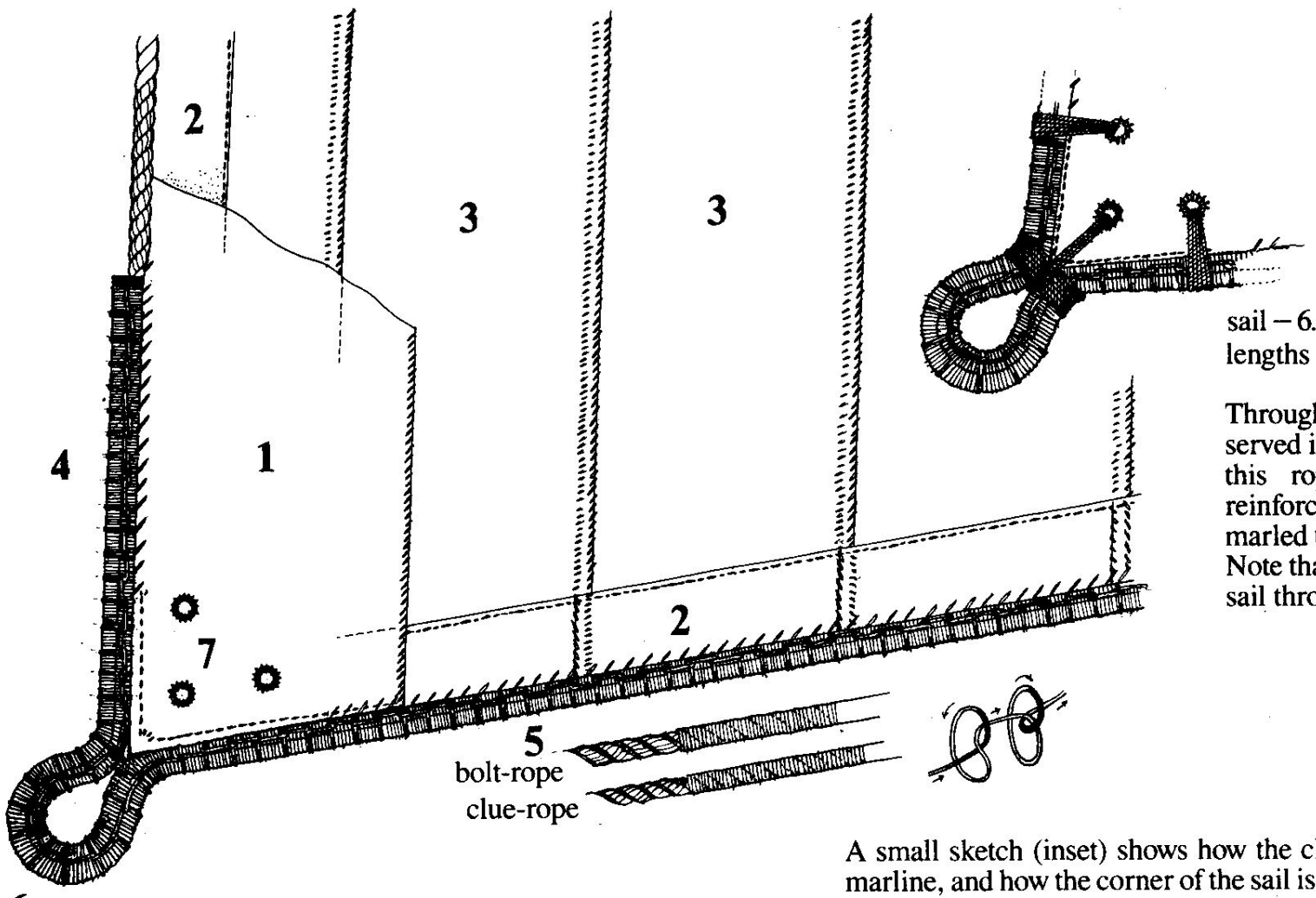


Fig. 252
The Clue of the Maincourse

1. Leech-lining – 2. Tabling of the leech and the foot – 3. Cloths – 4. Bolt-rope wormed and served for a distance of about three feet along the leech – 5. Bolt-rope protected in the same way, for a distance equal to about an eighth of the foot of the sail – 6. Clue – 7. Marling-holes through which lengths of marline are passed.

Throughout the length where the bolt-rope is served it is reinforced by a second, thinner rope; this rope is sewn to the bolt-rope. This reinforcing rope is called a clue-rope and may be marled to the bolt-rope (see Ch. XIV, section 1). Note that the bolt-rope is sewn to the front of the sail throughout the length of this reinforcement.

A small sketch (inset) shows how the clue-cringle is fastened off by a length of marline, and how the corner of the sail is attached to the bolt-rope by other lengths of marline rather than being sewn.

From the point Z to the corresponding point Q the foot-rope passes back to the after side of the sail and is sewn accordingly.

The length of the bolt-rope forming the angle OCZ (and the corresponding angle RDQ) are reinforced by a second rope, only thinner, called the *clue-rope*. These same sections of the bolt-rope are *wormed*, which means that the *cont-lines* are filled with a thin line in order to round out the circumference of the rope and thus improve the serving; all this will be explained in detail at the beginning of Chapter XIV.

Clue-rope: this was not strictly the same thing in English sailmaking practice, but the principle is the same. An English clue-rope is thicker than the bolt-rope. [Trans.]

To worm a rope.

The clue-rope is also served, laid alongside and fastened to the bolt-rope (see Fig. 252). In this way the bolt-rope is suitably secured at the lower corners of the sail which are subjected to considerable strains.

Cont-lines: the spiral gaps between the strands of a rope; in the 18th century, seamen were not afraid to use the somewhat less coy expression ***cunt-lines***, but this seems to have been bowdlerised in 19th century dictionaries. In fact, the derivation is probably from the word "cant", meaning skewed. [Trans.]

Marling-holes.

The canvas of the sail is sewn at the corner to the bolt-rope, but right in the corner it is difficult to make these stitches since the two sides are too close together, and furthermore the cringle formed in the clue- and bolt-ropes must be fastened off. Three *marling-holes* are made in the corner of the sail, one at the apex and two others somewhat further away, 3 inches [8.1 cms] from their respective bolt-ropes. These holes are reinforced around their circumferences; through these holes a length of *marline* is passed which secures each side of the sail to its respective bolt-rope. The small eyelet at the apex also has a length of marline passed through it, which serves to seize the throat-lashing of the clue-rope in order to tighten it. In order to reinforce these holes and to prevent the sail from being torn, little *grommets* of thin line are prepared which are the same diameter as the hole (in this case 14 lines or 31.6 mm), and these are *sewn* to the sail. Holes are also made in the reef-band (as many as there are cloths), and these are strengthened in the same way (see Fig. 254). In the same way the head-tabling is pierced by the same number of holes, and it is the need to leave enough room for these which causes the tabling at the head to be broader than the others. In order to make these holes the sailmaker uses a *stabber* and a *setting-fid*, which is different from hand-fids in that it is straight, pointed at one end and made of hardwood. See Fig. 248 for these tools.

Marline or ***marling:*** thin line 5 to 7 mm in diameter (see Chapter XIV).

Grommets.

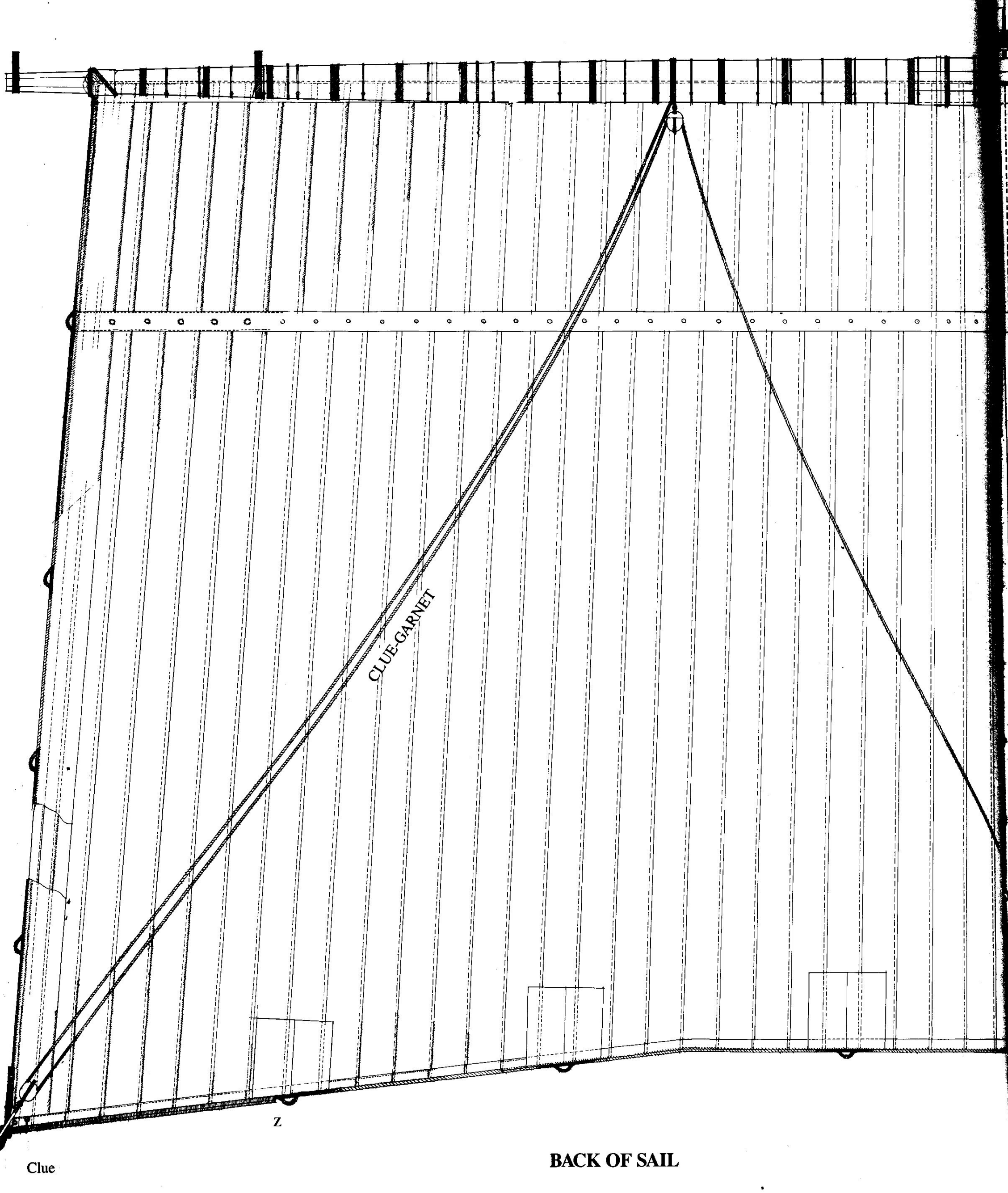
A sailmaker would say "stuck" since ***to stick*** is to sew or stitch.

Stabber or ***pegging-awl.***

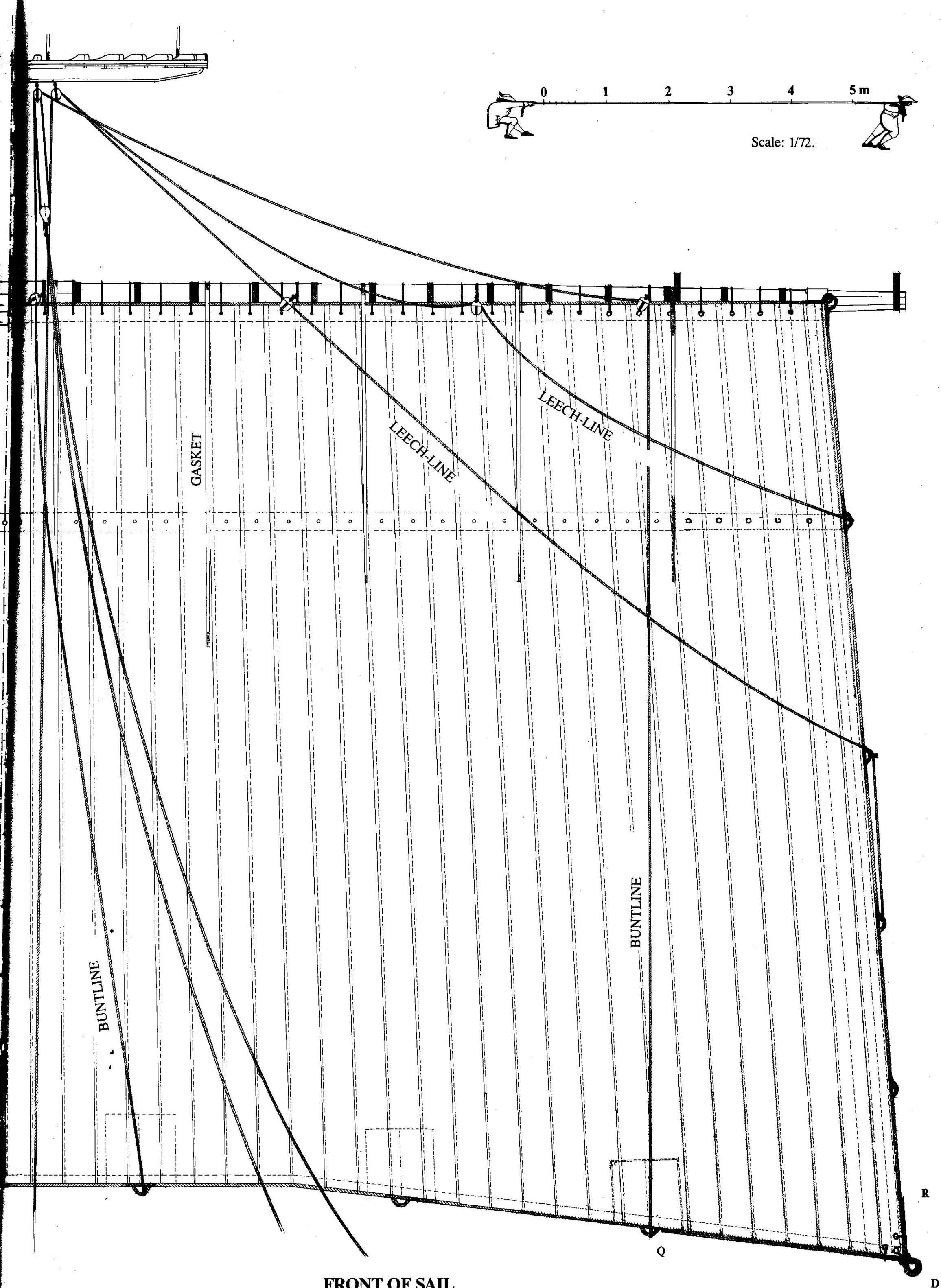
Setting-fid or ***set.***

Fig. 254
Maincourse

This drawing also illustrates the paragraph devoted to this sail in section 2. The scale is large enough to see the arrangement of the cloths, of which the breadth of the seams varies as I have explained in the main body of the text. Tablings, patches, reef-bands, eyelets, earrings, ropebands and buntlines etc. are all shown on this sail.



BACK OF SAIL



FRONT OF SAIL

Along the leech-rope and the foot-rope the sailmaker arranges a number of cringles, the ends of which are interlaced with the strands of the bolt-ropes; the internal measurement of these cringles is about 5 inches [13.6 cms] along the bolt-rope and 2 inches [5.4 cms] at the broadest point of their curve. On Fig. 251 I have shown a cringle in detail, together with its splice which is also done with a fid, but of a different shape from that which I have just described, but I shall talk about splicing in the first section of Chapter XIV. The drawing of the whole maincourse shows where the various cringles are fixed, and in the second section of this Chapter I will give more details, particularly regarding their use.

Leech-earring.

To fix the sail to its yard, use is made first of all of *leech-earrings*, which are three-strand ropes several fathoms long; this earring is passed through the upper leech-cringle and over the square of the yardarm, and by means of several turns passed over and over the upper corners of the sail are attached and secured to the mainyard.

Head-earring.

A second rope, called the *head-earring* is passed through the head-cringle and over the yard inboard of the square and completes the fastening of the first earring.

Rope-band.

Reef-band.

A rope called the *rope-band* is secured to each eyelet of the *head-tabling*; these ropes are lighter than the earrings, and each one is inserted so that its mid-point corresponds to the eyelet with the two ends hanging down on either side of the sail. Then, by passing the two ends alternately in opposite directions over the yard and through the eyelet in the tabling, the head of the sail is finally tightly fastened to its yard.

Reef-point.

Pointed; Whipped: see section I of Chapter XIV.

Through each eyelet of the reef-bands is passed a *reef-point*, which is a short braided cordage plaited from 3, 5 or 7 pieces: the reef-point is held in the reef-eyelet by a knot on either side of the sail, and the ends are *pointed* and *whipped*; each reef-point is several fathoms long, and we will see how they are used in the next section.

All these details relating to the maincourse apply equally to the other sails. In Fig. 255 I have shown the main-topsail of our 74, and with the help of the accompanying text you can see the quantity and arrangement of the lining-cloths, of the cringles, reef-bands etc. Similarly, I have in Figs. 256 and 257 drawn other types of sail such as a topgallant, a jib and a staysail. The scale of these drawings is large enough to show all the details, with the help of the explanatory notes and what has already been said about the maincourse.

With that, you should now be familiar with the way all the sails of our 74 are made, without my having to add anything further on the subject.



Fig. 253
Sailmaker's Bench

Made of fir and 6 feet long [1.95 m], 9 inches wide [24 cms], 14 inches high [38 cms]; the bench is provided with boxes at either end to hold the balls of sailmaking twine; there is a round hole in the front to allow the ball to be placed in the box, and through which the twine is pulled. The ends of the bench have a number of holes in them to take the sailmaker's tools such as stabbing-awls, fids, etc.

2. LIST OF SAILS AND THEIR PROPORTIONS

All the sails of our 74 can be divided into two categories: square-sails, and fore-and-aft sails. Some of the first category are extra sails, used only in light airs.

Let us begin by defining the place of each sail and its dimensions; then we will go into the details of how each sail is put together, building on what we have already learned.

Both the sprit-topsail and the spritsail-course have rope-band eyelets as we have seen in the example of the maincourse, and earring-cringles for leech- and head-earrings. And these sails, like all the others carried by our 74, are turned back along their edges; this sort of hem (or tabling as it is called) being more or less wide along the head of the sail depending on whether it is bent to a yard or a stay. That said, I do not need to repeat it for each of the various sails.

While the spritsail is not always bent to its yard, the yard itself is almost always left in place since as we have seen it serves to give the necessary spread to the jibboom guys.

Square sails

BOWSPRIT

Sprit-Topsail: Situated at the outboard end of the jib-boom, the name sprit-topsail or spritsail-topsail is a relic of the earlier arrangement of the head sails when the bowsprit carried a sprit-topmast with a yard to which the sprit-topsail was bent, exactly like the other topsails. The sprit-topsail is trapezoidal in shape, its drop or depth is the same as that of the mizen topsail (see below); its foot or bottom edge is the same breadth as the head of the spritsail (see the next section). The terms drop, foot and head are very expressive, evocative of the way the sail falls, the way it is braced out to the sides of the ship and headed at the yard to which it is bent.

If the sprit-topsail has the same drop as the mizen-topsail it is because it is designed to be able to serve as a replacement for the latter in case of need; the breadth of the sprit-topsail at the head is dictated by the breadth of the yard less the yardarms.

The sprit-topsail has no patches or cringles, and is edged by the three bolt-ropes which I have already described, like the topsails. The sprit-topsail is made from single mélis canvas of either the first or the second type; I have chosen the first, as you will note from the width of the cloths.

The position of the sprit-topsail is not fixed, since it can be moved outboard and inboard along the jibboom by means of a parrel and a tackle. Most captains never bend the sprit-topsail, since it is unfavourably placed to catch the wind and furthermore this sail and its yard strain the jibboom. Nevertheless, despite its limited use, I believe that it is important to describe it, since it is always included in the regulations for fitting-out.

Spritsail: The spritsail or *spritsail course* is bent below the sprit-topsail, and its yard is fixed as we have seen to the bowsprit at the point where the forestays are made fast. Its shape is rectangular, and it is the only square sail* whose foot is equal to its head, the length of the latter being equal to the length of the yard less the yardarms. Its drop is half the width of the head, so that the foot is very close to the surface of the sea. The spritsail course is bordered by two bolt-ropes*, one of which forms the head-rope. There are cringles at all four corners of the sail as we have seen in Fig. 255, and the same arrangement is also followed for the sprit-topsail.

The reef-bands are put on diagonally*, this special arrangement being justified by the need to prevent the sail from being submerged when the bracing of the yard tilts it. The balance-reef enables the corner to be raised so that the sail is once again nearly horizontal. For all that, the sail remains close to the surface of the sea, so that waves can fill the belly formed by the foot of the sail, and in order for it to drain away, which is absolutely essential, *water holes* are formed, which are round holes almost a full cloth in diameter placed near the foot of the sail. The spritsails are thus pierced by two or three water holes.

Spritsail course.

*This term is used for all the trapezoidal sails despite the fact that neither the sails nor their corners are square. However, they are set square to the ship's keel.

*When I give the number of bolt-ropes I mean the number which are spliced together, for the border of the sail must always be strengthened by a bolt-rope along all its sides, made up of one to three lengths.

*i.e. in the form of a St Andrew's cross. They are sometimes called ***balance-reefs.***

Water holes.

The reef-bands are otherwise the same as those of the topsails, and run from 3/8ths of the way down the leech at one side to the opposite upper corner of the sail.

Buntlines: ropes serving to raise the ***bunt*** or middle part of the foot of the sail.

Each of the leech-ropes has one reef-cringle, and the foot-rope has three *buntline* cringles spaced equally apart, the third being placed in the middle. The spritsail is made of double-thread canvas of the first quality.

Both the sprit-topsail and the spritsail-course have rope-band eyelets as we have seen in the example of the maincourse, and earring-cringles for leech- and head-earrings. And these sails, like all the others carried by our 74, are turned back along their edges; this sort of hem (or tabling as it is called) being more or less wide along the head of the sail depending on whether it is bent to a yard or a stay. That said, I do not need to repeat it for each of the various sails.

While the spritsail is not always bent to its yard, the yard itself is almost always left in place since as we have seen it serves to give the necessary spread to the jibboom guys.

FOREMAST

Forecourse: Its head is the breadth of the foreyard less the yardarms. The drop at the bunt should be such that the foot is a few feet above the forecastle breastrail. On either side the drop is longer, since it is important to bring the clue as close as possible to the outboard end of the bumpkins*, and these are made fast on the beakhead (see Volume II); however, the bumpkins cannot extend too far outboard without being weakened, so that the foot of the sail is narrower than the head: this unusual arrangement allows the forecourse to be hove in tighter to the bumpkin, but even so, despite the arrangements which I have described, it is almost impossible to keep the sail taut when sailing close-hauled.

*The angle made by the bumpkin with the side of the ship and its projection outboard are extremely variable. In our 74 the angle formed by the forward end of the keel with the bumpkin is 20 degrees, but it can vary from 15 degrees to a maximum of 35 degrees.

gored: cut diagonally.

The length of the drop at the bunt is retained for about a third of the foot, and thereafter the cloths are *gored* progressively until they reach the drop of the leech at the clue. The full drawing of the ship's square sails (Plate XLVII) shows the shape of the forecourse quite clearly.

The fact that the foot of the sail is narrower than the head makes it necessary to adjust the width of the seams, since the same number of cloths are used and the seams are thus wider at the foot.

buntline-cloths: patches.

The size and use to which the forecourse is put require it to be reinforced with linings sewn to the inside or back of the sail. Three cloths go to make up the leech-lining, the first running down the full drop of the leech, thereby covering the tabling. The second lining-cloth stops half-way, and the third a quarter of the way up the sail. *Buntline-cloths* are sewn to the foot running up from each buntline-cringle. There are six in all of these patches, and they are two cloths wide and one ell [1.188m] long. The reef-band is in the upper quarter of the sail, and at the centre of each cloth there is a reef-point eyelet; it will be remembered that the reef-bands like the linings are always stuck to the inside or back of the sail. The bolt-ropes are fastened as I explained in the previous section.

To each of the leech-ropes is spliced a reef-cringle at the end of the reef-band, and two bowline-cringles (see the section on sail-ropes), of which one is at the centre of the drop and the other is half way down from the first to the clue. There are six buntline cringles evenly spaced along the foot-rope. The forecourse is made of triple-thread canvas of the first quality.

Fore-topsail: This makes up the second tier of sails on the foremast, and the cloths are arranged following the same principles as the maincourse, as are the bolt-ropes, reef-bands, clues etc.

The breadth of the head is determined by the length of the yard as usual. The foot is the same breadth as the head of the forecourse, less 1/48th of the length of the yard. Head and foot are cut without gores. The drop is equal to the length of the fore-topmast, less the masthead and half the length of the hounds (see Chapter XII).

The sides of the topsail are curved, the curve varying according to the position of the reef-bands; there are three of these, the upper one four feet [1.30 m] below the head, the lower one one-third of the way down the sail, and the middle reef-band half-way between the other two. As we have seen, the ends of the yards are provided with squares in such a way that as the sail is raised by the reef-bands so they are spaced inboard to allow for the reduction in breadth of the sail. In the case of the first reef-band this reduction in breadth is relatively small, and so the same square is used as for the leech-earring and the head-earring. The next square must be vertically over the outboard edge of the second reef-band. The intersections of the perpendiculars running down from the squares of the yard to the mid-point of each reef-band gives two points through which the leech of the topsail passes, which means that it must be cut to a curve, but below the lower reef-band the leech of the sail is generally straight.

The number of cloths needed for the topsails and topgallants is calculated so that the selvedge of a cloth coincides with the squares of the yard (see Fig. 255), and the breadth of the seams varies between 1 and 1 1/4 inches [2.7 – 3.4 cms].

A large lining known as the *top-lining* is stuck above the foot of the sail, running a third of the way up and equal to about a third of the breadth at the head. The purpose of the top-lining is to protect the canvas of the topsail from being chafed by the fore edge of the top. Despite the use of a *crow's-foot*, this chafing can be particularly serious when the topsail is masked by another sail. A further lining which runs as far as the clue is stuck along the foot of the sail on either side of the top-lining.

Top-lining.

Crow's-foot: small ropes which fan out to the rim of the top from the mouse of the stay.

At the leech, small patches one cloth wide and a few feet long are stuck below each reef-band. Other patches also one cloth wide are stuck below the upper corners of the sail.

Down the leech of the sail from the lower reef-band to the foot several lining cloths are sewn; there are seven in all, and they are arranged step-wise, but rather than follow my explanations examine Fig. 255.

The bolt-ropes, which are fastened as I have already explained, are of varying thickness: the foot-rope, which runs round the clues, is the heaviest, and the head-rope the lightest.

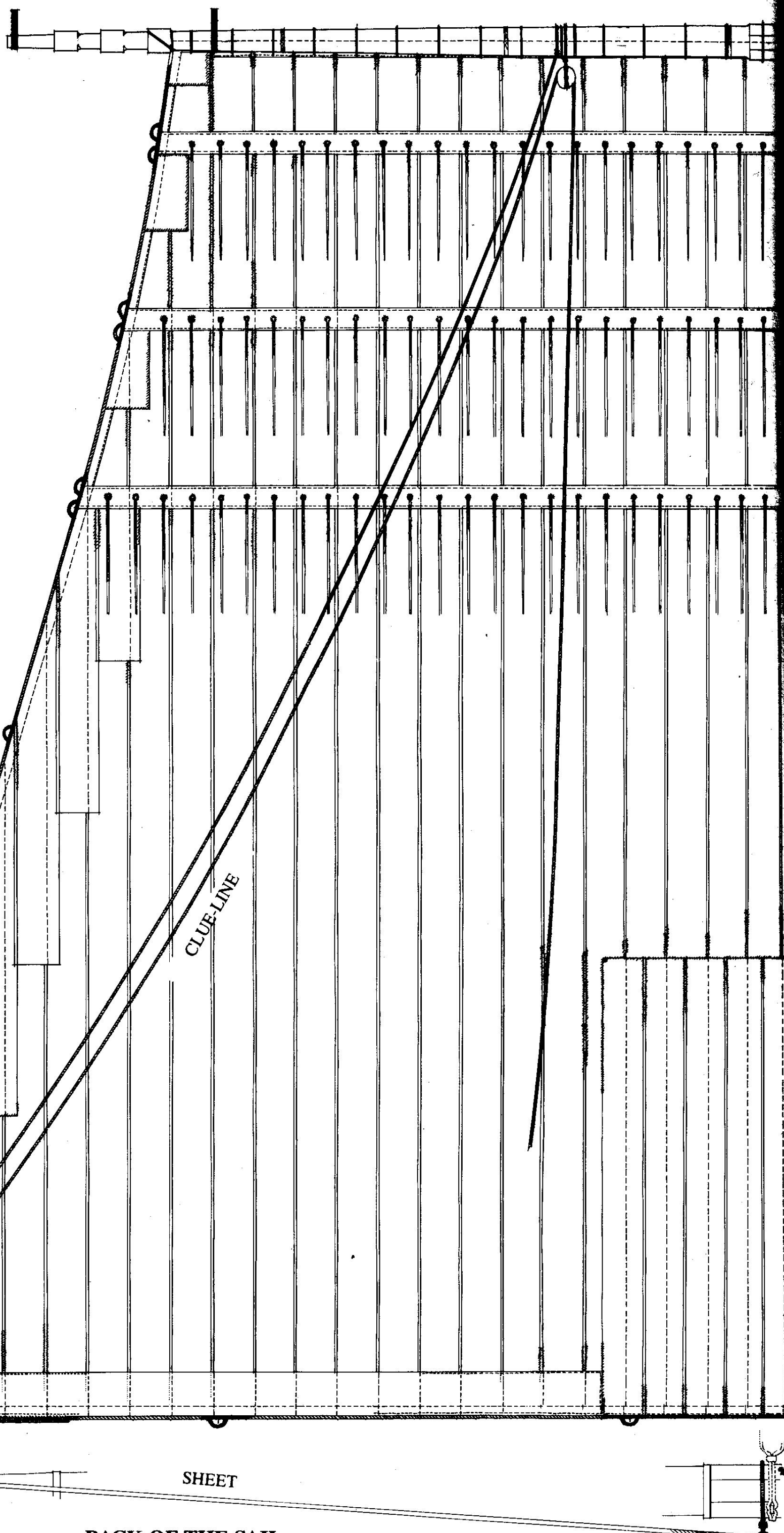
Spliced into each leech-rope opposite each reef-band there is a double cringle; below the reef-cringles are three bowline-cringles, the upper one slightly above the mid-point of the drop; then the remaining distance to the clew is divided into seven equal parts, with the middle bowline-cringle two parts below the upper and the lower bowline-cringle half way down the remaining distance.

There are four buntline-cringles spliced into the foot-rope at regular intervals, and a bull's-eye is let into each of the central cringles.

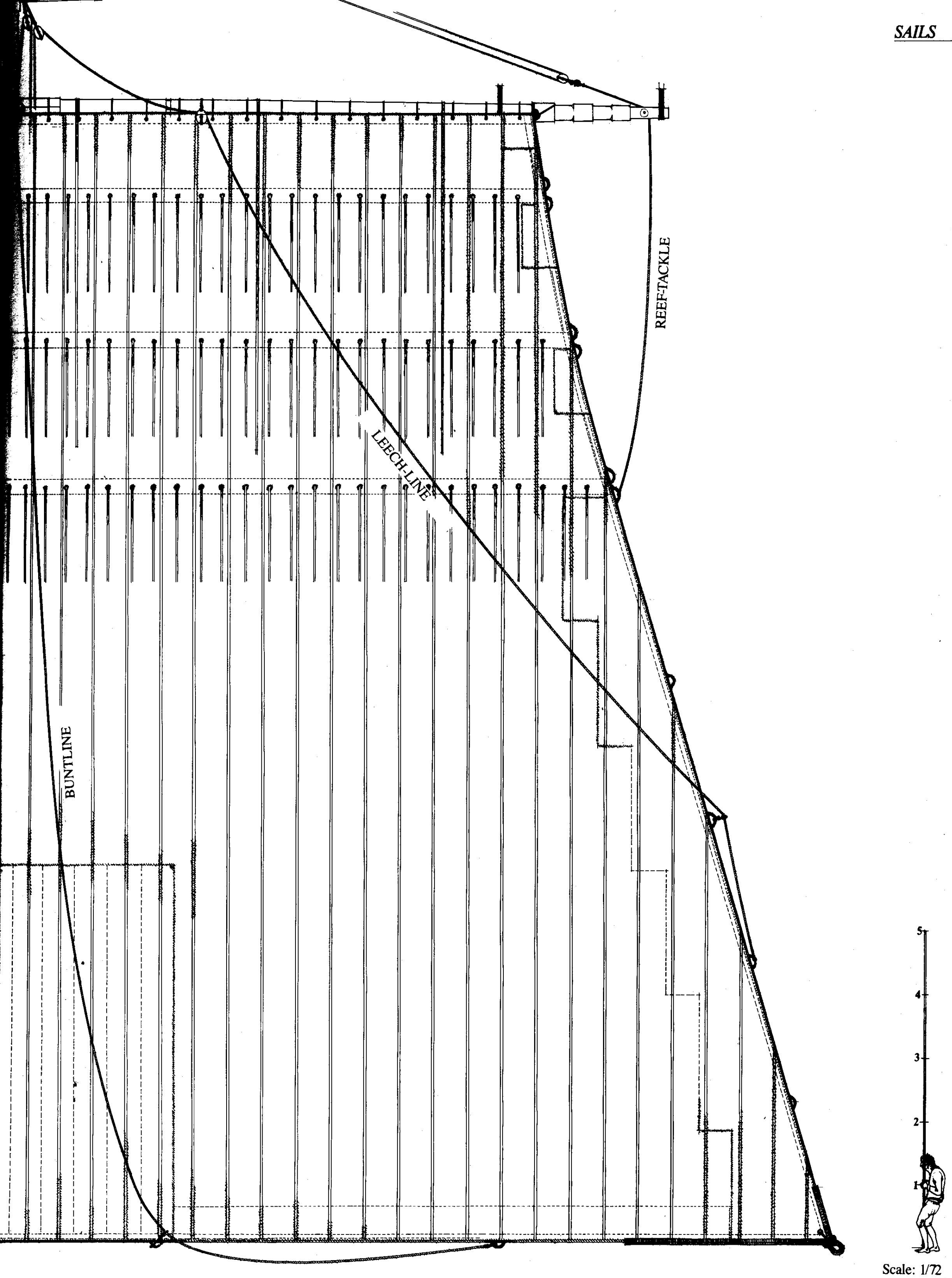
The fore-topsail is made with double-thread canvas of the first type.

Fig. 255
Main-Topsail

As with the drawing of the maincourse, the scale of this drawing is large enough to show all the details. Note that the patches, tablings, top-lining and reef-bands are stuck to the after side of the sail. Note also the large number of reef-points and how they are arranged. In theory each row of reef-points should be slightly longer than the previous row, and also vary in length according to their positions along the reef-band. However, in practice they are all the same length. The number of cloths is dictated by the length of the yard, and should always be a round number, but this can always be achieved by varying the width of the seams. The remaining breadth is made up of cloths which must be gored according to the shape of the leech.



BACK OF THE SAIL



Scale: 1/72

FRONT OF THE SAIL

Fore-topgallant: This makes up the third tier of sails on the foremast. Its foot is equal in breadth to the head of the fore-topsail, its head is dictated by the yard as usual, and its drop is equal to the length of the fore topgallant-mast less its polehead (see the previous Chapter).

The cloths are arranged as for the fore-topsail, but it should be remembered that the topgallants are made of single mélis canvas of the second type, so that the cloths are 24 inches [65 cms] broad instead of 21 inches [57 cms].

This sail has no linings, the tabling alone providing sufficient strength for the topgallants which are never bent in bad weather.

There are three bolt-ropes, the foot-rope being the heaviest and the head-rope the lightest. The clues are not served. The fore-topgallant has three bowline-cringles arranged in the same manner as for the fore-topsail. There are no cringles in the foot-rope, no reef-bands and therefore no reef-cringles.

MAINMAST

Maincourse: The breadth at the head is dictated by the length of the mainyard less the yardarms, and the foot is the same length as the whole yard, including yardarms. The drop at the bunt is dictated by the height of the quarterdeck and gangways, but account must also be taken of the space occupied by the ship's boats (see volume II); the drop is calculated from the yard when it is hoisted to the level of the *catharpins*, and this applies also to the forecourse. The drop at the leech is some 5 or 6 feet [1.63 – 1.95 m] greater. The foot is divided into three parts, with the bunt cut parallel to the head; outboard of the bunt the cloths are gored progressively as far as the clue, so that the foot of the maincourse is cut in the same way as the forecourse.

Catharpins: an interlacing of ropes used to haul together the lower shrouds below the tops, and situated the length of the masthead below them.

The same number of cloths go to make up both the foot and the head of the maincourse, and the difference in breadth is made up by adjusting the width of the seams, which unlike those of the forecourse are broader at the head than at the foot, varying from one to three inches [27 – 81 mm].

There is a lining-cloth at the leech composed of a single cloth running down the full drop of the sail. This lining is completed by buntline-cloths on the foot exactly as for the forecourse. Reef-bands, reef-cringles, bowline and buntline-cringles etc. are all identical to the arrangement I have already described for the forecourse.

The maincourse is cut from triple-thread canvas of the heaviest kind.

Main-topsail: Its head is given by the yard and its foot is equal to the head of the maincourse less 1/48th of the mainyard. Its drop is equal to the length of the main-topmast, less the masthead and half the length of the hounds. The formulae for determining the dimensions of this trapezoidal sail are thus the same as used for the fore-topsail. The main-topsail is put together exactly like the fore-topsail, except for the bowline-cringles of which there are four instead of three. The uppermost bowline-cringle is situated roughly half-way down the sail, and the others are evenly spaced between the uppermost cringle and the clue. The main-topsail is cut from double-thread canvas of the first type.

Main-topgallant: Its head is given by its yard, its foot is equal to the head of the main-topsail, and its drop is equal to the length of the topgallant-mast less the height of the polehead. This sail is made up exactly like the fore-topgallant, and is also cut from single mélis canvas of the second type.

MIZEN-MAST

Mizen-topsail: The mizen-topsail is no different from the other topsails: its head is given by its yard, and its foot is equal to the distance between the yard-arms of the crossjack-yard less 1/48th of its total length. The drop is given by the distance between the crossjack-yard and the mizen topsail-yard when hung at the hounds of the mizen-topmast, taking into account the position of the sheave* (see the previous Chapter).

*This is the case for our 74, where the mizen-topmast carries the mizen topgallant-yard on its polehead. When the mizen-mast is in three sections, the drop of the mizen-topsail is calculated in the same manner as for the other topsails.

The mizen-topsail has only two reef-bands, the lower one being a third of the way down the drop, and the upper one half-way between the first and the head. The leeches are gored following the same principles as with the main- and fore-topsails.

The linings are similar, and the top-lining has the same proportions of one-third of the foot and one-thrid of the drop. The bolt-ropes are arranged as on the other topsails: the leech-ropes have only two reef-cringles, and three bowline-cringles distributed as on the fore-topsail. The foot-rope has the same number of buntline-cringles, arranged in the same way, as the other topsails.

The mizen-topsail is cut from single mélis canvas of the first type.

Mizen-topgallant: This sail is in every respect similar to the other topgallants. Its head is given by its yard, its foot is equal to the head of the mizen-topsail, and its drop is equal to the distance separating the top of the topsail-yard from the sheave-hole cut in the upper part of the polehead of the mizen-topmast. There are the same number of bowline and buntline-cringles as on the other topgallants, and they are arranged in the same way.

The sail is put together exactly like the other topgallants, and is also cut from single mélis canvas of the second type.

The series of sails which I have described above make up the ship's square sails*, even though their shape is for the most part trapezoidal.

*Thus the ship is said to be ***square-rigged***.

Other types of vessel, such as frigates or sloops-of-war, bend a further tier of sails called the *royals*, and sometimes even a fifth tier added to this fourth tier; this fifth tier is composed of very small sails called *skyscraper-sails*. All these fair-weather sails, which are used only in the lightest airs, have their yards crossed on the poleheads of the topgallant-masts, and in the case of the skyscrapers a temporary pole extends the polehead to which the skyscraper-yards are affixed. While all these sails exist in theory, I should emphasise that at the period chosen for this study of a 74, neither royals nor a fortiori skyscrapers are carried.

Royals: or ***royal topsails, royal sails, topgallant-royal sails***.

Skyscraper sails or ***skysails:*** these can be either square or in two parts, the two halves then being triangular.

STUDDINGSAILS

I also include the studdingsails in the family of square sails; these are supplementary sails which can only be used when the wind* and the ship's course are favourable, and they extend outboard the surface of the square sails. Seven pairs of studdingsails can be bent to the yards of our 74, as follows: two pairs for the two larger courses, the main and the fore; three pairs for the topsails, including therefore the mizen-topsail; two pairs for the topgallants. It will be seen therefore that neither the crossjack-yard* nor the mizen topgallant-yard carry studdingsails.

*At most the lower studdingsails can be carried in a fresh breeze (22 km/hr), and then with some care, but the topmast studdingsails cannot then be spread. This being said, some captains risk spreading their topmast studdingsails when they have a single reef in their topsails; this means that they must fit a small reef-band to the studdingsails; but this is extremely unusual.

*At least in the case of our 74; sometimes the crossjack-yard is fitted with studdingsails, but this has largely disappeared.

As we shall see later, the studdingsails are fastened extremely precariously; they are inconvenient and very liable to carry away. They must be taken down early, at the first sign of the wind freshening, or if there is any risk of the wind veering or backing. When sailing close-hauled the studdingsails cannot be used. The lower main studdingsails are rarely used, nor are the topgallant studdingsails. In short, these sails are more appreciated by marine artists than by seamen!

The studdingsails are named after the sails which they extend; their proportions are as follows:

Lower studdingsails: Their head is equal to one-third of the sail they extend, the foot is 5/12ths of the same dimension, and the drop roughly the same as the drop at the leech of their respective courses. Their general shape is that of an irregular trapezoid, and rather than attempt to define it I would suggest that you examine Plate XLVII.

Like the other sails, the studdingsails have a tabling all round formed by folding back the edge of the sail; the head-tabling has a number of eyelets (see below); patches are stuck to the lower corners at the back of the sail and these are a single cloth wide and the same height. The edges of the sails are reinforced by two bolt-ropes, the first forming almost three sides and the second forming the head-rope and running down for a small section of the inner leech; double eyelets are fastened at the upper corners, and single eyelets at the bottom, serving the purpose already described in the earlier part of this chapter.

I should add that the head of the lower fore studdingsail is not bent to a yard, and that the head of the lower main studdingsail is only bent to a yard for its inner half; the eyelet for the rope-bands are arranged accordingly.

Topmast studdingsails: Their head is equal to the length of thier small yards less an eighth, the yard itself being 1/3rd the length of the topsail-yard; their foot is the same breadth as the head of the lower studdingsails, and their drop equal to that of their respective topsails plus 1/36th. Since the topmast studdingsails are bent to yards, the head-tabling has eyelets along its full length. The bolt-ropes are made up in the same way as for the lower studdingsails, as are the eyelets at the upper and lower corners. The sails are shaped like a parallelogram as is shown on the drawings, and the fact that thier foot is offset compared to their head dictates the sloping leech.

Topgallant studdingsails: Their head is equal to the length of their small yards less 1/16th, the yards themselves being one-quarter the length of the topgallant-yards. The foot is equal to the head of the topmast studdingsails and the drop the same as the topgallant. The shape and general arrangement of these sails is similar to those of the topmast studdingsails, except that they have two rather than three bolt-ropes*, and the eyelets are single not only at the lower corners but also at the upper corners.

*This does not mean that one (or two) sides of the sail have no boltropes, but that it is made up of fewer sections.

The lower studdingsails and the topmast studdingsails are cut from Mlis canvas of the second type, and the topgallant studdingsails from a still lighter canvas called "studdingsail-canvas": both types of canvas come in bolts of 24 inches [65 cms].

Ringtail: often a topmast studdingsail is used for this purpose. If a special sail is used, its drop is equal to that of the mizen-course (after leech), its head equal to a third of the drop, and the foot half.

The royals may also be extended by studdingsails, as can the mizen-topgallant, but only in vessels which are smaller than ships-of-the-line.

Sometimes the mizen-course also has a sort of studdingsail called a *ringtail* which I will mention here even though the mizen-course is not a square-sail but a triangular sail; the ringtail extends the mizen-course aft and is bent to a small yard hung from the end of the mizen-yard, and a boom on the poop serves to spread the foot of this small sail. Another kind of supplementary sail is sometimes set beneath the mizen-yard when the wind is abaft or on the quarter; this is the *driver*, which is bent athwartships, and should not therefore be confused with the ringtail which is a fore-and-aft sail.

Driver or ***spanker:*** not to be confused with the ***driver boomsail***. This sail is often a topmast studdingsail; its foot is spread by a yard placed over the taffarel and its small yard is hoisted below the upper (outboard) end of the mizen-yard. The driver is only used in very good weather and with the wind directly abaft.

Some frigates use a *driver boom-sail*, bent to a gaff and with a boom at the foot, with the addition sometimes of a bonnet, which is triangular and bent below the gaff.

Crossjack-sail: this is an occasional sail bent to a yard which does not normally carry a sail. Schooners, which are small two-masted vessels, have a similar square sail, and cutters which have only one mast also use this sort of sail.

I only mention these somewhat fanciful sails in passing, since the regulations governing the fitting-out of our 74 makes no mention of them. There is also a sail called a *crossjack-sail* which may sometimes be bent to the crossjack-yard.

Fore-and-aft sails

As their name implies, these sails are aligned with the longitudinal axis of the keel, and they are triangular, trapezoidal or an irregular quadrilateral in shape; they have no yards, being bent to ropes (stays).

BOWSPRIT

Standing jib: This sail has its tack situated at the outboard end of the jibboom, but this position can be varied by virtue of the fact that the jibstay moves on a traveller, which will be described in the next chapter, and it will be remembered furthermore that the jibboom itself can be moved in and out in relation to the bowsprit-cap so that between one-third and two-thirds of its length extends outboard.

The standing-jib is in the form of a right-angled triangle, of which the after side, called the leech, is the same length as the main-topmast, The foot or shortest side is equal to one-third of the leech plus one-third of the drop of the main-topsail. As with all sails a tabling is fashioned on all the sides, and the cloths are put together as one would expect starting from the leech. The tabling which corresponds to the hypotenuse, called the *hoist*, has the stay-holes formed in it through which the *hanks* are passed which allow the jib to be hoisted on its stay. A patch or *piece* lines each corner of the sail. The tack-piece is three cloths wide, and the clue-piece and peak-piece are each one cloth wide and a few feet long.

Hoist: the part of the sail which runs on the stay; also called the ***stay***, but this can be confusing.

Piece: on a triangular sail there may be three, called the ***tack-piece***, the ***clue-piece*** and the ***peek-*** or ***peak-piece.***

The sides of the jib are reinforced by a bolt-rope in two pieces forming single cringles at each corner, the clue-cringle being served. The standing-jib is hoisted on its own jib-stay, the lower end of which is made fast to the traveller.

Inner jib: Its leech is the same as the leech of the standing-job, and its foot is a little less. The sail is put together in exactly the same way as the standing-jib; however, since this sail is often not run on a stay (which is the case with our 74), its hoist has no eyelets. I should add that the inner jib can be run in and out along the jibboom by means of a rope traveller.

Fore-topmast staysail: Carried still lower than the inner jib, the fore-topmast staysail has its tack made fast to the bowsprit and it runs on the fore-topmast preventer-stay. Its shape is that of a right-angled triangle, the drop of the leech being the same as that of the forecourse at its leech; the foot is two-thirds the drop of the leech. The fore-topmast staysail is put together like the standing jib, but it has a *headstick* at the peak through which the bolt-ropes of the leech and the hoist are passed; the purpose of this accessory is to keep the fore-topmast staysail stretched at its peak while it is hoisted on the fore-topmast preventer-stay; the headstick is placed parallel to the foot of the sail.

Headstick: this is a small piece of wood resembling a toggle; it is 27 to 32 cms in length and 8 to 11 cms in diameter. It is made fast to the head-rope by means of a groove or hole at either end. The headstick is designed to prevent the head of the sail from twisting when it is cut to too sharp a point.

The standing-jib and the inner jib are both made of single mélis canvas of the first type, while the fore-topmast staysail is made of double-thread canvas.

Sometimes another little jib is used when the ship is hove to: this is made fast to a powerful stay running down alongside the forestays: it is called a *storm-jib*, and it is only used when the forecourse has to be taken in, which is rare; it is made of triple-thread canvas. The storm-jib is also called a fore-staysail, but the more colourful term storm-jib is to be preferred.

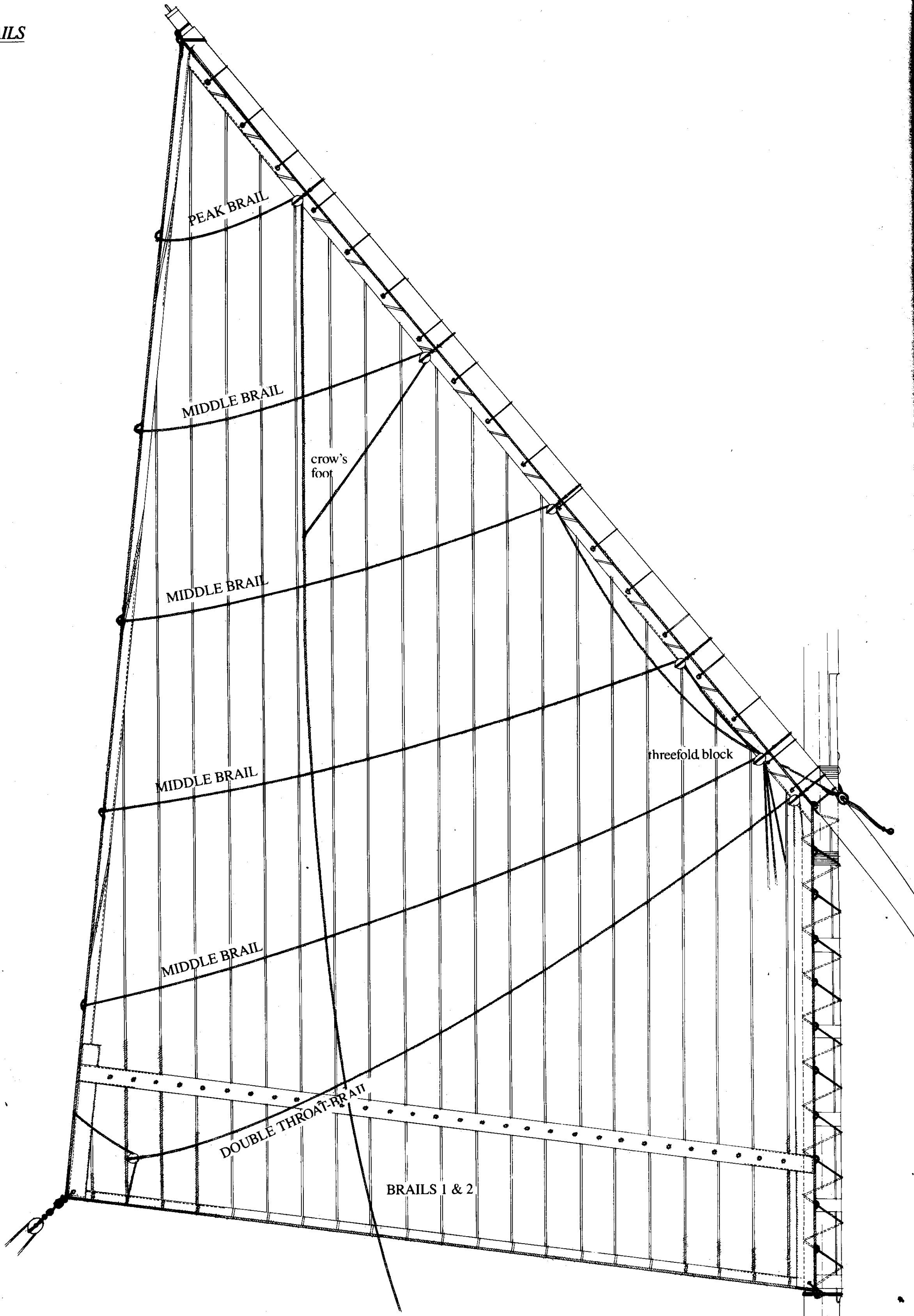
Storm-jib or ***storm-staysail.***

Frigates and sloops-of-war which carry a vast suit of sails, may also employ other jibs beyond those I have already mentioned; there is the *flying-jib*, which is made fast at the tack to the pole of the jibboom if it has one (which is not the case with our 74) or to a *flying jibboom*, and a further jib set still higher and further outboard may also be used, called a *jib-topsail*, and its tack is made fast to a small pole made fast to the outboard end of the flying jib-boom.

Flying-jib.

Flying jibboom: extended by a small temporary pole called a ***jib-topsail pole***. If the jibboom is long enough to form a polehead, there is no need for a jib-topsail pole, but only a flying jibboom.

Thus frigates or sloops-of-war may use up to six jibs, but three suffice for our 74.

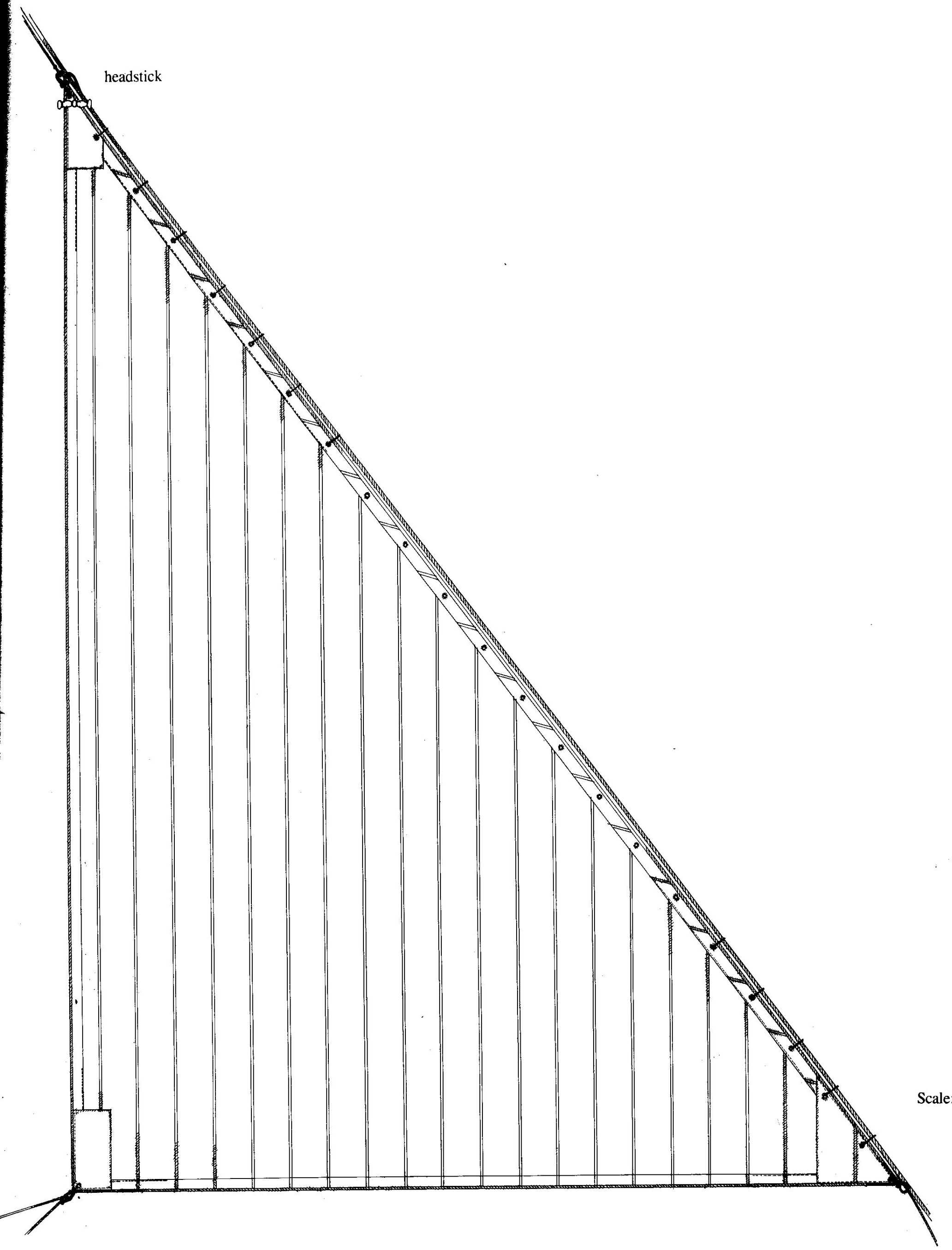


MIZEN-COURSE

Fig. 256
Mizen-Course and Fore-Topmast Staysail

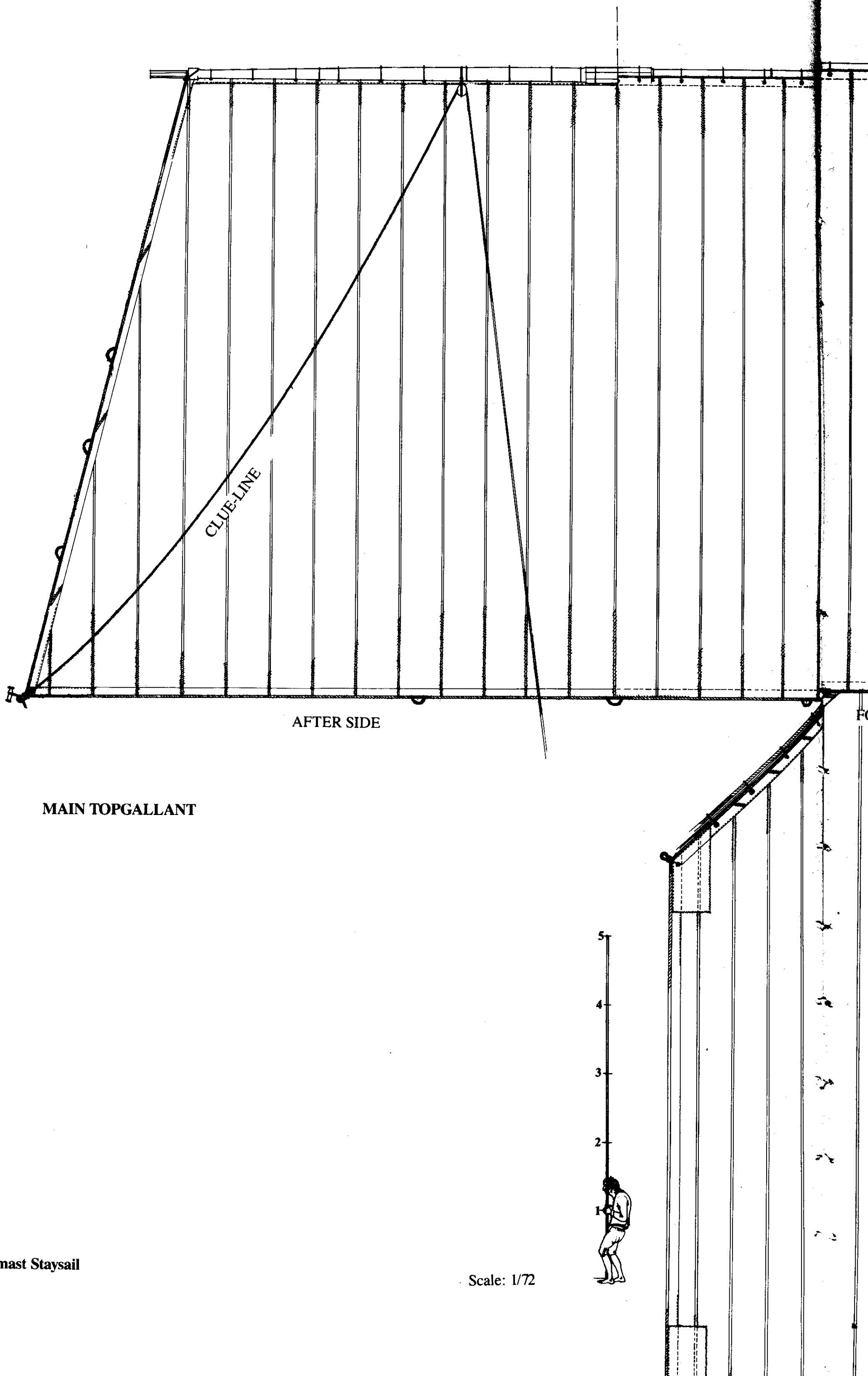
The mizen-course is shown from starboard, the hoist being laced to the starboard side of the mizen-mast.

The fore-topmast staysail has a headstick at the peak with holes in either end through which the bolt-ropes are passed so that the peak of the sail is held taut.



Scale: 1/72

FORE-TOPMAST STAYSAIL



MAIN TOPGALLANT

Fig. 257
Main-Topgallant and Main-Topmast Staysail

Scale: 1/72

MAIN-TOPMAST STAYSAIL

Under-jib.

To conclude this description of the sails which may be set on the bowsprit, I should just mention the *under-jib*, which is a triangular sail running along the bottom of the bowsprit and bent to the jibboom; but this last sail which is employed in the English Royal Navy is not used in French ships.

FORE-AND-AFT SAILS BETWEEN THE FOREMAST AND THE MAIN

Staysails.

These sails are called *staysails*, since they are bent in the general direction of the stays, and in some cases even on the stays themselves. The utility of these sails is questioned by some people, who claim that they take the wind from the square sails of the mainmast when sailing close-hauled and that they are themselves masked by the square sails when running, to such an extent that they add little to the vessel's speed in the latter case and add considerably to the leeway in the former.

Our 74 has four staysails between the foremast and the main, and these sails are spread one over the other so that they partially mask each other.

*Fr: *charbonnière, pouillouse.*

Main staysail: This is sometimes called the "smokesail"*, although this term may also be applied to the staysail above; they owe this description to the fact that they are situated above the flue-pipes from the galley (see Vol. II).

The main-staysail takes the form of a right-angled triangle. Its leech (shortest side) is equal to the drop of the maincourse plus half of the masthead of the mainmast; its foot is equal to the distance between the foremast and the main, which means that the tack must be made fast forward of the foremast; some people prefer to shorten the foot so that it can be made fast abaft the foremast.

The main-staysail is put together exactly like the standing-jib, save that the cloths run parallel to the leech which in the case of this sail is the shortest side.

Main-topmast staysail: When the term "smokesail" is applied to the main-staysail, the main-topmast staysail is then sometimes called the main-staysail. I prefer however to call it the topmast staysail, since it is bent to the main-topmast preventer-stay, even though it is true that its surface area is greater than that of the main-staysail.

It is trapezoidal in shape, so that it has two leeches* or vertical sides. The bunt is equal to twice the masthead of the mainmast, and the leech to 1 1/4 times the length of the main-topmast. The foot represents 17/24ths of the distance separating the foremast from the main.

*Such sails are said to be ***nocked,*** and the fore-leech is called the ***bunt*** or ***luff.*** The upper corner of the bunt is the ***nock,*** which explains the appellation.

The cloths are put together parallel to the leech and the bunt, and patches are stuck to each corner*, one cloth wide and a few feet long. The main-topmast staysail has two bolt-ropes: one running a short distance along the hoist, the whole of the bunt and the foot and part-way up the leech; while the other bolt-rope borders the remainder. Single cringles are formed in the bolt-ropes at each corner, and the clue-cringle is wormed.

*The ***tack-piece***, ***nock-piece***, ***peak-piece*** and ***clue-piece***.

It is scarcely necessary for me to add that the hoist-tabling has stay-holes pierced in it, and you will note that these holes are not in the centre of each cloth but offset to one side towards one of the seams. This is true of all the staysails, the jibs and the mizen-course. The seams contribute significantly to the strength of the sail, and the eyelets are better placed close to the seams when the head of the sail forming the hoist is gored.

Middle staysail: So-called because it is bent to the middle stay between the main-topmast stay and the main-topgallant stay. Its bunt is equal to one and a half times the masthead of the mainmast and its leech to that of the main-topsail plus half of the masthead of the main-topmast. The foot is somewhat less than that of the main-topmast staysail. These two staysails are put together in exactly the same manner.

Main-topgallant staysail: This is the last and uppermost of the staysails, and it is bent to the main-topgallant stay, which gives it its name. This sail is sometimes triangular - a relic of the time when all the staysails were this shape - but in the case of our 74 it is the more "modern" trapezoidal shape which has been chosen.

The bunt is equal to the masthead of the main-topmast, the leech represents 3/4 of that of the main-topgallant sail, and the foot is half the distance separating the masts.

This sail is put together in the same way as the other staysails which I have already described, except that it has no patches.

FORE-AND-AFT SAILS BETWEEN THE MAINMAST AND THE MIZEN

Our 74 has two further staysails:

Mizen-Staysail: This sail is comparable to a jib, in that it is placed forward of the mizen and is triangular in shape*.

*It is often used as a storm staysail when hove to.

Its leech is the same depth as the fore-leech of the mizen-course where it is laced to the mast, plus the masthead of the mizen. The maximum length of the foot is the distance separating the mainmast from the mizen. This sail is bent to a *staysail stay* which runs beneath the mizen-stay. It is put together exactly like the main-staysail.

Staysail stay: a stay which serves only to bend a staysail.

Mizen-topmast staysail: Trapezoidal in shape, its bunt is equal to the masthead of the mainmast and its leech to that of the mizen-topsail. The foot represents 3/4 of the distance separating the masts. This sail is put together exactly like the other staysails, has patches at the corners and is reinforced by a single bolt-rope of which the ends are spliced together a third of the way along the hoist from the nock.

The main-staysail is cut from double-thread or even treble-thread canvas, as is the mizen-staysail. The main-topmast staysail is cut sometimes from double-thread canvas and sometimes from single mélis canvas of the second type, which is the canvas chosen for the other staysails.

As I have stated for the other types of sails, with the staysails too there are further additional ones which are sometimes employed: a main-royal staysail, a main-skyscraper staysail (!), a mizen-topgallant staysail, a mizen-royal staysail and mizen-skyscraper staysail; in view of Bourdé de Villehuet's* statement that the mizen-topmast staysail or nothing was much the same thing, I wonder what he would have said of all these other flights of fancy?

*Bourdé de Villehuet: born in about 1730 at Saint-Coulomb near Saint-Malo, died at Lorient in 1789. He was a senior Captain with the French East India Company, an accomplished seaman, and the author of various books which are listed in the Bibliography at the end of Volume IV.

Some ships use a mizen-staysail which has been specially strengthened as a storm-staysail.

SAIL BENT TO AND ABAFT THE MIZEN

Mizen-course: This fore-and-aft sail is sometimes called an "English" mizen, as opposed to the older form of French sail which was headed to the full length of the mizen-yard less its yardarms, so that this sail was triangular in shape or in other words a lateen sail. But over the last 30 years or so (remember we are in 1780) there has been a preference for the English mizen, which is obtained by nocking all the canvas forward of the mizen-mast and by fastening the fore-leech* thus obtained to the mast itself, generally with a lacing. It has recently been proposed that a *gaff* should be used in place of the mizen-yard, with jaws embracing the mast, and some people believe that it would be preferable to increase the area of the mizen by lacing its foot to a *boom*, which would allow its clue to be extended far aft beyond the taffarel, in which case this sail is called a *driver*. If this alternative were adopted, the mizen could be retained for bad weather. But all this is the subject of discussions and our 74 has an "English" mizen-course.

*For some reason not called the bunt; also called the ***mast-leech***.

Gaff: a gaff had been used in English ships from the 1740s. (Trans.).

Boom: sometimes called the ***driver-boom*** or ***spanker-boom***; its length is equal to 1 1/2 times the distance from the mizen-mast to the stern-timbers, measured on the quarterdeck.

Driver: sometimes called the ***spanker***, although strictly speaking the terms are not synonymous.

The head of the mizen-course represents roughly 7/12ths of the total length of the mizen-yard. The depth of the fore-leech is determined by the height of the yard on the mast, which in turn is dictated by the level of the catharpins, as we shall see, and the fore-leech must end at the tack taking into account the level of the planking of the poop and the poop-rails; theoretically the depth of the fore-leech is equal to the height of the mizen-mast above the planking of the poop less 2 1/2 times the length of the masthead. The depth of the after-leech is determined by the rake of the yard which forms an angle of 45° to 50° with the horizon, and it is usually taken as the depth of the fore-leech plus 2/3rds of the head, at least in theory. The foot is equal to the distance between the mizen-mast and the taffarel, less a few feet. In short, the dimensions of the mizen-course are less easy to determine than those of the other sails, since they are subject to the height of the yard which, like its rake, can vary.

The general shape of the mizen-course is that of an irregular quadrilateral, although it is described as a triangular sail. The cloths are put together parallel to the fore-leech. There is a lining which is half a cloth broad which runs the full length of the fore-leech; a second lining of the same breadth is stuck to the after-leech running up from the clue to somewhere slightly above the reef-band, which is placed one quarter of the way up the fore-leech, and parallel to the foot; this reef-band has reef-eyelets arranged in the same way as on the topsails, but the reef-points which are called *reef-hanks* are only fitted when a reef has to be taken in.

Reef-hanks.

Lacing.

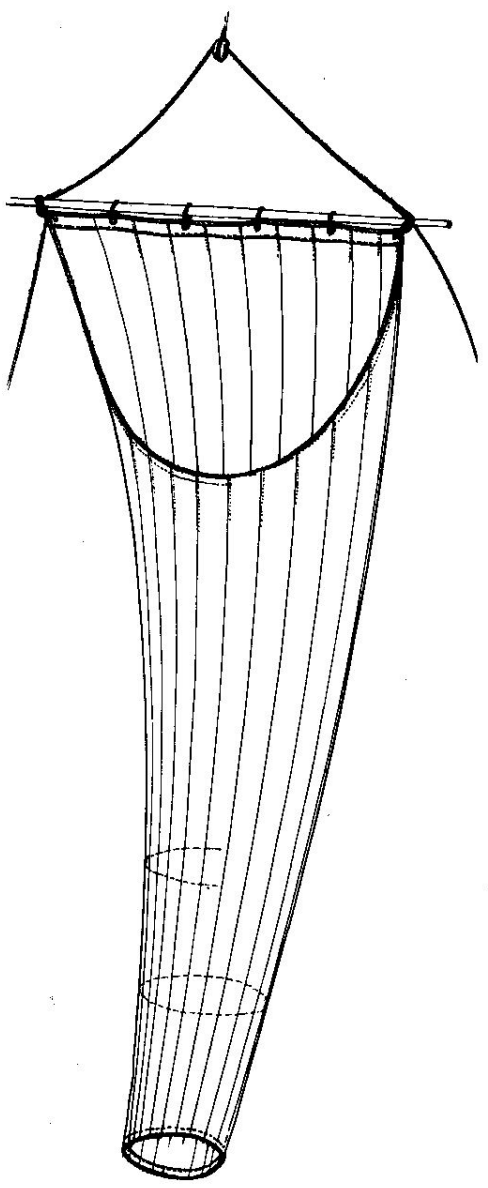


Fig. 258
Wind-Sail

Also called a ventilator, its general shape is conical, the diameter at the top being a little more than twice that at the bottom, which is about 2 feet [65 cms]. Flexible wooden hoops spaced along the inside of the wind-sail help to retain its shape.

Suspended from a small spar, the wind-sail is braced to the direction of the wind by means of two lines or braces pulling on the spar. The wind-sail is in effect a sort of chimney, with its lower end placed in the hold or the between decks, and it allows fresh air to be drawn in by creating an area of lower pressure. As a rule the wind-sail is passed down through the main-hatch.

The mizen-course is bordered by three bolt-ropes of differing thickness: the heaviest is the foot-rope, and this extends up the fore- and after-leech as far as the reef-band; the remaining part of the leech-ropes is formed of slightly thinner rope, and the thinnest is used for the head-rope. Two cringles are formed at the nock and the peak, and one each at the tack and the clue; the clue-cringle is wormed and has an iron thimble, the tack-cringle also has a thimble, but it is not wormed. The head-tabling has eyelets for the rope-bands, and the double cringles at nock and peak take the leech- and head-earrings as on the square sails. The mast-leech has ten evenly-spaced cringles for the *lacing*. While on the subject I should add that since the yard runs on the starboard side of the mast the mast-leech is on the same side so that the sail is more or less tangential to the mast.

The after-leech has five brail-cringles for the numerous brails needed by this sail.

The mizen-course is cut from double-thread canvas of the first type.

When we looked at the studdingsails I mentioned that on very rare occasions a ringtail may be added to the mizen-course, and when this sail is replaced by a driver it may be supplemented by a gaff-topsail placed between the mast and the gaff, and by a gaff-topgallant sail above.

I think that I have covered in this chapter all the additional sails which may be carried, but once again I would emphasise that these are employed by vessels other than ships-of-the-line, for which strength is more important than speed.

That then is the full list of the thirty-four sails of our 74. It remains for us to study the rigging needed to work them, which we shall do in the course of the next chapter, and in the fourth and last Volume we will examine how they are used.

LIST OF SAILS

Sail	Quality of canvas	Quantity (ells)
2 Maincourses	Triple-warp, type 1 Lining-canvas	1,554 170
2 Forecourses	Triple-warp, type 1 Lining-Canvas	1,102 170
2 Main-topsails	Double-thread, type 1 Lining-canvas	1,276 170
2 Fore-topsails	Double-thread, type 1 Lining-canvas	1,092 160
2 Mizen-courses	Double-thread, type 1 Lining-canvas	500 28
2 Spritsails-courses	Double-thread, type 1 Lining-canvas	400 24
2 Mizen-topsails	Double-thread, type 2	530
1 Main-topgallant	Single mélis	196
1 Fore-topgallant	Single mélis	196
1 Sprit-topsail	Single mélis	225
1 Mizen-topgallant	Single mélis	106
2 Standing-jibs	Single mélis	410
1 Inner jib	Single mélis	166
2 Fore-topmast staysails	Double-thread, type 1	260
1 Main-staysail	Double-thread, type 1	300
1 Mizen-staysail	Double-thread, type 1	160
1 Main-topmast staysail	Single mélis	404
1 Middle-staysail	Single mélis	210
1 Mizen-topmast staysail	Single mélis	90
1 Main-topgallant staysail	Single mélis	90
8 Lower studdingsails	Single mélis	1,602
6 Topmast studdingsails	Single mélis	506
3 Deck-awnings*	Lining-canvas	1,098
1 Upper-awning**	Single mélis	304
2 Awning-curtains	Single mélis	80
6 Tarpaulins	Double-thread	320
4 Breastwork tarpaulins	Double-thread	110
2 Weather-cloths***	Double mélis, Locronan	150
4 Sails for the longboat	Single mélis	180
Sails for the other boats	Single mélis, Brest	190
5 Sailbags	Lining-canvas	480
Waist- and top-cloths	Double mélis	732
Gunroom screen bulkheads	Single mélis	22
Covers for cartridge-rooms	Double-thread, Locronan	64
Wardroom screen-bulkheads	Single mélis	130
Lining magazines and cartridge rooms	Double mélis, Locronan	536
Hoses	Lining-canvas, Brest	57
Spare canvas	Triple-warp, type 2, Brest	40
Spare canvas	Double-thread, type 2, Brest	60
Spare canvas	Double mélis	25
Spare canvas	Single mélis	30
Canvas for parcelling	Double mélis, Locronan	700

* If a forecastle awning is used, the ridge-rope runs from the foremast to the foot of the forestay, and the side-ropes are secured to a spar or stanchion over each cathead; the after edge is laced across its full width to the forward edge of the main deck-awning. The cloths of the awnings run athwartships. They are spread 9 or 10 feet [2.92 – 3.25 m] above the decks.

SAILMAKER'S STORES

Sail needles	45	Fig. 248
Bolt-rope needles	6	Fig. 248
Benches	2	Fig. 253
Padlocks	2	
Thread (pounds)	60	
Seat-cushions*		
Hose for washing the decks	1	
Sailmaker's palms	4	Fig. 259
Bolt-ropes of various thicknesses (fathoms)	70	
Awning or curtains for stern-gallery	1	
Wind-sail for ventilating the hold	1	Fig. 258

* The quantity depends on the number of locker-seats in the stateroom; they are red if there is a flag-officer on board, otherwise green.

To this list must be added the full list of the ship's suit of sails, as well as some of the stores for the ship's boats.

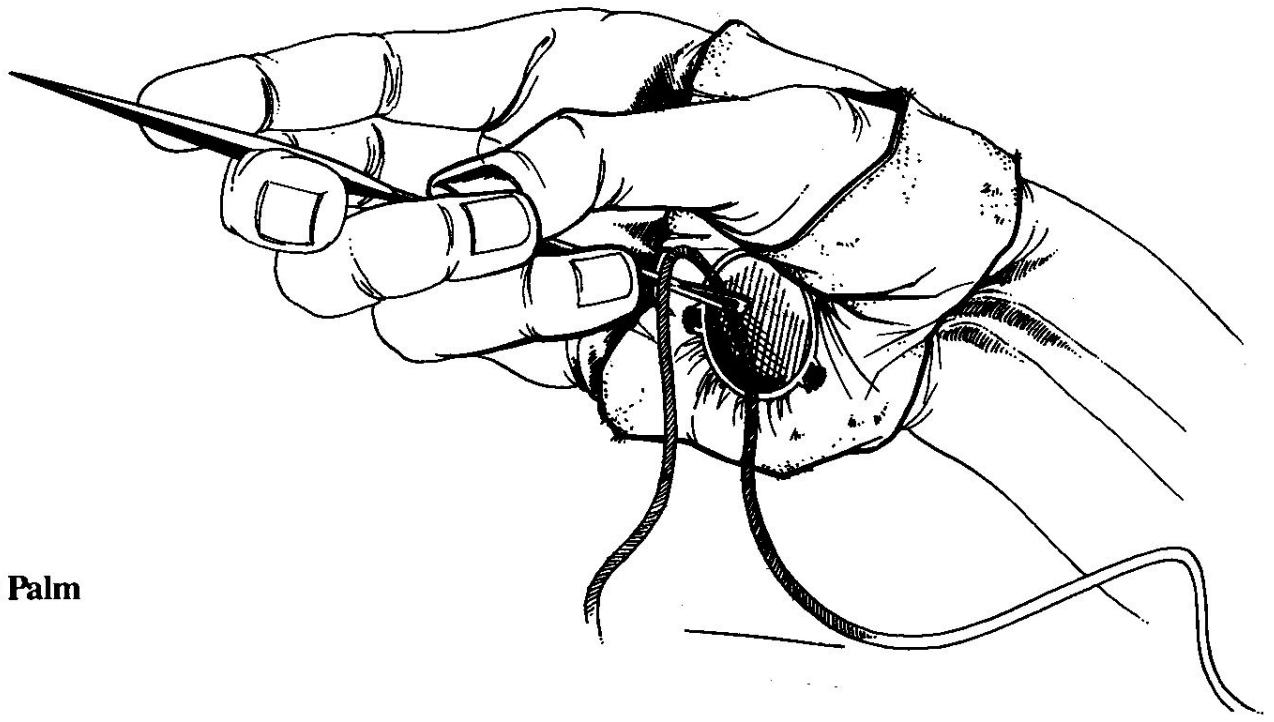


Fig. 259
Sailmaker's Palm

XIV

RIGGING

We have now come to the complex chapter on the rigging. I have tried as far as possible to reduce the complexities by dividing it up into sections and by including a large number of schematic diagrams.

I will start this chapter by giving some idea of how ropes are made, and then go on to describe what has to be done to join them, protect them, etc., and in this section on "the art of seamanship" my explanations go somewhat beyond basic principles. In the following section we will go on to look at blockmaking, where I will describe everything connected with it which we are liable to encounter as we go about our 74.

Then we can go on to study the rigging of the ship, and I have chosen to describe in succeeding sections the rigging of masts, yards and sails, and in these three sections I describe the ropes relating to each mast, each yard and each sail.

In addition, there are a series of drawings which bring together all the ropes and lines of a particular kind which are found on board. Thus, the description is arranged in two ways; I hope thereby to have done everything possible to make it easier to understand the rigging, but that does not mean that considerable application will not be required of the reader.

The anchor-cables and other related ropes are the subject of a special section, and it seemed to me simpler for the reader to bring together in the same section various knots and splices which logically ought perhaps to have been covered in the earlier sections.

In the last section I have brought together everything which has to do with the boats – their masts, sails and rigging; this is a convenient way of treating the subject, and in view of their simplicity should present no problems; in order not to disperse the information, I have also included in this same section details of their equipment, which could I suppose be considered as following on from and concluding Chapter XI in Volume II.

1. Ropemaking and related skills

SPINNING

In the first volume I talked briefly about hemp, so I shall not repeat myself here, and will confine myself to a few words about the spinning of hemp. This is done in *ropewalks*, which are crude alleys arranged along the walls of towns, in moats, and as far as possible sheltered from the sun and the wind; but such ropewalks are obviously not protected from rain or cold, and so in the Royal Dockyards the ropewalks take the form of covered galleries, the shortest of which are 600 feet long, or nearly 200 metres, and some are considerably longer.

Ropewalk.

Spinning-wheel or ***crank-wheel.***

For spinning, at one end of the walk there is a *spinning-wheel*, which is an extremely rudimentary device consisting of a large heavy wheel turned by a workman* with the help of a strong crank; above the wheel is a semicircular frame called the *head*, and round its outside edge are arranged between seven and eleven *whirls*, depending on the size of the wheel. These whirls, which are not unlike bobbins, have a hook on the front. A drive-belt driven by the wheel passes round the head and over the bobbins so that they rotate and the hooks therefore rotate also. A clever arrangement allows the *whirl-carrier* to be raised to alter the tension of the drive-belt.

*The ***wheel-turner.***

Head.

Whirls.

Whirl-carrier.

In the larger ropewalks as many as four spinning-wheels may be set up side by side.

Stake-horses: trestles in which pegs are inserted as in a rake; Steel [op.cit.] also illustrates an arrangement of two posts and a cross-rail.

Winches: the yarn is wound on réels which are then removed.

Other items of equipment to be found in a spinning-alley are *stake-horses* to hold up the yarns and *winches* for winding them on.

*Fr: *maître de la roue.*

Streak: bunch of hemp fibres.

Yarn.

List.

This is how the spinners work: one of the most experienced of them, given the title of "head spinner"*, attaches to his belt a *streak* of hemp and drops a loop of the fibres over the uppermost whirl: as the hook turns, driven by the wheel-turner at the crank, the hemp twists and the spinner backs away feeding more hemp to the lengthening *yarn*; as he walks he takes in his right hand a piece of cloth called a *list*, in this case a piece of coarse material, and wrapping it round the yarn he grips it tightly and pulls it towards him, thereby preventing the yarn from twisting on itself and forming kinks or seizing.

Holding back the twisting which is imparted by the wheel, the spinner feeds more hemp with his left hand and as he backs slowly away he draws the list along the yarn as it progressively gets longer. When the head spinner is four or five fathoms away from the wheel, two other spinners attach in turn their hemp to the two next whirls, and two by two eight more spinners start spinning until all the whirls are occupied.

When the head spinner reaches the foot of the ropewalk, someone removes his yarn from the whirl and passes it through a small pulley fastened to the floor of the ropewalk and twists it round a length of tow called a *rubber*. He then attaches the rubber to a heavy stone, and fixes the end of the yarn to the reel of the winch; one or two men turn the winch, and an apprentice holds the yarn wrapped in a second rubber and guides it so that it winds exactly onto the reel. The yarn is drawn together as it passes over the rubber and under the flat stone which performs a braking function; the action of the rubber evens out the twisting of the yarn and allows it to be wound more tightly onto the reel. The head spinner, with his yarn being wound onto the reel, approaches the nearest spinner and twists the free end of the yarn together with that of his colleague, whose yarn is in turn detached from the whirl; the second spinner splices his yarn in turn to that of his nearest colleague, and so on. The winch continues turning without interruption, the yarn is wound on, the spinners return to the winch at the head of the walk, and the work becomes continuous.

Rubber.

The output of the spinners is such that eleven men can spin on average seven hundred pounds [342.3 kgs] of hemp in a day*.

*The English comparison is that an experienced spinner can produce 1,000 feet of evenly twisted yarn in twelve minutes. [Trans.]

The thickness of the yarn varies, but in theory it must not exceed 3 1/2 to 4 1/2 lines [8-10 mm], or in other words a diameter of 2.3 to 3.1 mm, which is used for cables and ropes; a somewhat thinner yarn called *bolt-rope yarn* is used for laying bolt-ropes, and the thinnest of all is *housing-yarn*, used for making *house-line* (see below) and lead-lines.

Bolt-rope yarn. Housing-yarn. House-line.

TARRING

It used to be the practice to tar ropes once they were laid by passing them through a bath of hot tar and baking them afterwards. This method has now been abandoned, and the rope-yarn itself is now tarred before it is made up into rope.

I have already talked in the first two volumes about pitch and tar; the two should not be confused. The latter is obtained by burning, in a manner similar to that used for making charcoal. The burning of the resinous softwoods allows the sap to be collected, and this sap then takes the name of tar; obviously, the quality of the tar depends on the trees used, and it is also important to know whether the trees have previously been tapped for their resin. To summarise, the best tar comes from trees which have not been tapped, from the forests of Scandinavia. This tar is clear, fine and slightly reddish in colour.

The hot tar is placed in a copper kettle two feet deep [65 cms] and about the same diameter; at the bottom of the kettle is placed an iron cross-bar or *bridge*. The rope-yarn is unwound from the winch and passed under the step, where it becomes impregnated with tar; as it comes out of the kettle it is passed through a list of oakum to remove the surplus tar, or else over a sort of horsehair brush. As it emerges, the tarred yarn is wound up by a winch. This is the method employed in all three Royal Dockyards, except that in Toulon the yarn is tarred as soon as it is spun, so that the tar-house is at the end of the spinning-walk and the yarn is only wound onto the reels after it has passed through the tar-kettle; this makes the work easier, but carries with it the risk of fire by reason of the close proximity of the tar-kettles, and the fires which are kept alight under them, to the spinning-walk.

Bridge: also called the ***step*** or the ***tongue***, depending in its shape.

LAYING

To lay; to close is more commonly used of heavy ropes such as anchor-cables.

We come now to the actual process of making the rope from the tarred rope-yarn, called *laying* or *closing*.

Spun-yarn.

By twisting together two yarns, you obtain *spun-yarn*, the word being self-explanatory. The yarns are prevented form unravelling by the fact that the new twist is opposed by the twist in the yarn, the one being clockwise and the other anti-clockwise.

*Sometimes called a ***loper.***

In order to make spun-yarn the ropemaker uses a winch, but this time with four winch-hooks arranged in a square. and thanks to an ingenious arrangement of gears, when the ropemaker turns the handle the whirls rotate at the same time but much faster. A yarn is attached to one of the whirls and then stretched out to a post; a second yarn is fastened to the opposite whirl and taken to the same post, where the ends of the two yarns are knotted together; there is a swivel-hook* inserted in the post with a hook at one end and a ring at the other; the knotted yarns are placed over the hook, and a rope with a weight on the end is passed through the ring. The rope passes over a notch in the head of a second post situated some way away from the first to which the yarns are attached. The counter-weight serves to maintain an even tension in the two warped yarns, and since they shorten as they are twisted together the weight must be able to rise progressively, hence the notch in the second post.

Laying-top or ***top.***

Strands: sometimes also called ***lissoms***; a rope is built up as follows: a number of fibres twisted together form a yarn, a number of yarns a strand; three strands make a hawser, and three hawsers a cable.

Once all this has been set up, the ropemaker takes a *laying-top*, which is a piece of wood turned to the shape of a truncated cone, its size proportional to the rope to be laid; down the length of the top are as many grooves as there are components or *strands* in the rope, and thus for spun-yarn there are just two, on opposite sides of the top.

The ropemaker places the top between the two yarns so that its narrow end touches the loper; he turns the wheel of the winch and when he judges that the yarns are sufficiently twisted he moves the top, sliding it between the yarns until it reaches the winch which he continues to turn without stopping; in this way the two yarns are twisted together to form spun-yarn.

If the ropemaker uses three hooks, three yarns and a top with three grooves, he produces house-line.

In principle it is better to use three fine yarns rather than two thicker ones using the same amount of hemp, for the miniature rope thus obtained is stronger.

Marline or ***mar-line***: somewhat confusingly, this is called *lusin* in French, a word derived from the English word "housing" (house-line). The French word for housing is however *merlin*. [Trans.]

Hawser: or ***hawser-laid rope.***

Thus, two yarns laid together give spun-yarn, of which there are two kinds, thin and thick. Spun-yarn is mainly used for serving ropes, its thickness being chosen accordingly. A rope which is served with spun-yarn is protected from chafing and from the water; almost all spun-yarn is tarred. *Marline* is a true twisted line, made simply of two yarns twisted together without laying; as with spun-yarn, marline is used for whipping the ends of ropes of medium size when they have been cut. Sailmaking twine is the best quality of twisted line. House-line, as I said, is made up of three yarns closed up, and is used for the same purpose as marline, but for thicker ropes such as cables. Let us move on now to look at how larger ropes are made, recognising that the same principles are followed: as an example, I will take the laying of a three-stranded *hawser*, which is a rope made up of three bundles of yarns.

A greater or lesser number of yarns are twisted together, and for this particular hawser three bundles are closed up separately, thereby obtaining the three strands; these in their turn are laid together to form a three-stranded hawser, but obviously it is equally possible to make such ropes of two or four strands.

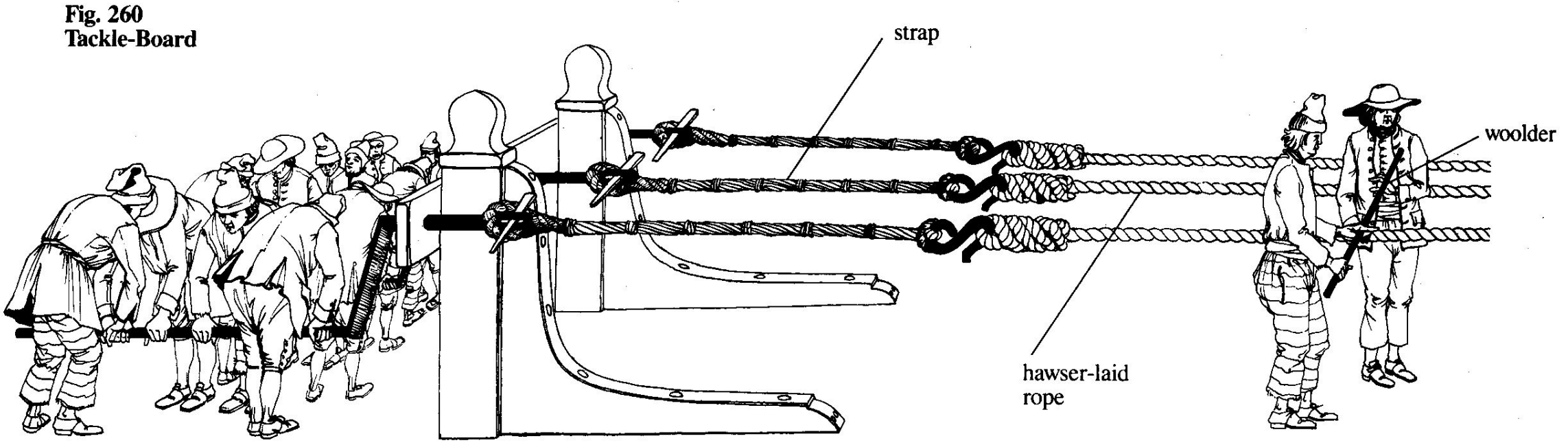


Fig. 260
Tackle-Board

The most commonly used hawser-laid ropes vary betwen one and twelve inches [27 – 344 mm] in circumference, the smallest being called *ratling*; to lay these thinner ropes large wheels are used, still with three whirls, but with two, three, four or even six yarns made fast to each. The work is carried out in the manner just described, except that they are laid against the direction of the first twist.

Ratling: small rope of the type used for forming the ***ratlings***. [q.v.]

The laying-house has a *tackle-board* which can be compared with the cable-bitts on board ship, the cross-piece or *breast-board* of which has four or five holes through it for the cranks* which take the place of the whirls. The tackle-board is situated a few paces forward of the *warping-frames* at one end of the ropewalk. Another item of equipment, but this time mobile, is a sort of sledge on wheels; this sledge is about eight feet long [2.60m] and half that in width, but this is only an average size and in fact the dimensions vary according to the size of the rope to be laid. This device is in fact called a *sledge*, and it is weighted down with a greater or lesser quantity of kentledge of cast-iron*. On the sledge is erected a framework with a breast-board to take cranks, which is the equivalent of the tackle-board but mobile.

Tackle-board. Breastboard.

*Called ***heavers.***

Warping-frames: frames containing a large number of reels of yarn.

Sledge.

*English practice was to extend the sledge by a piece called the ***drag***, which was loaded with old tar-barrels filled with clay and called ***press-barrels***. [Trans.]

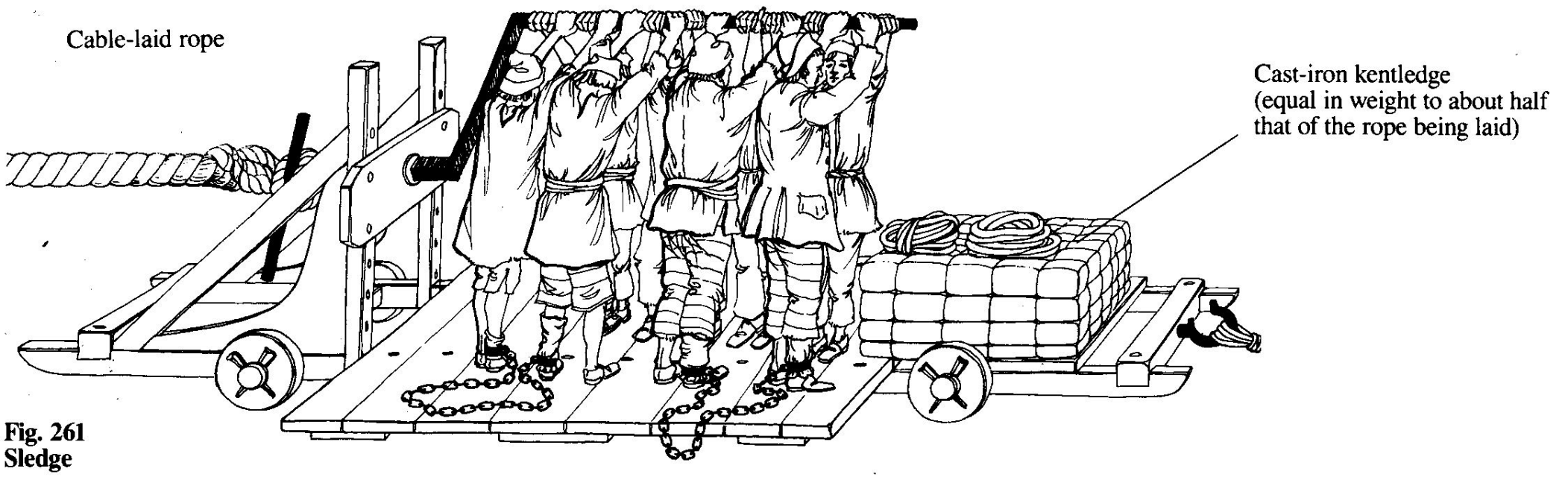


Fig. 261
Sledge

Forming a cable from three hawser-laid ropes.

Top-cart.

In the ropewalk is another sledge or wheeled platform with a framework on top: this is the *top-cart*, and the top is secured by a rod running through it, the ends of the rod being made fast to the uprights of the framework. The top-cart is not weighted, being designed to "run sweetly" as the ropemakers say, but its speed can be slowed down to a greater or lesser degree by a sort of rubber called the *tails*, which is a length of soft rope wound round the rope being laid as it is formed by the top, the number of turns being varied according to the friction required; the tails are in turn made fast to the *staff* running through the top.

Tails (plural).

Staff or ***bolt.***

Woolder; winding-stick.

Strap.

Stake-horses similar to those used in the spinning-walk are also used in the laying-house; I should also mention the *woolders* or *winding-sticks*, composed of a staff and a strap of rope (see Fig. 260), and the other *straps* or strops in the same picture, which are simply lengths of rope doubled over.

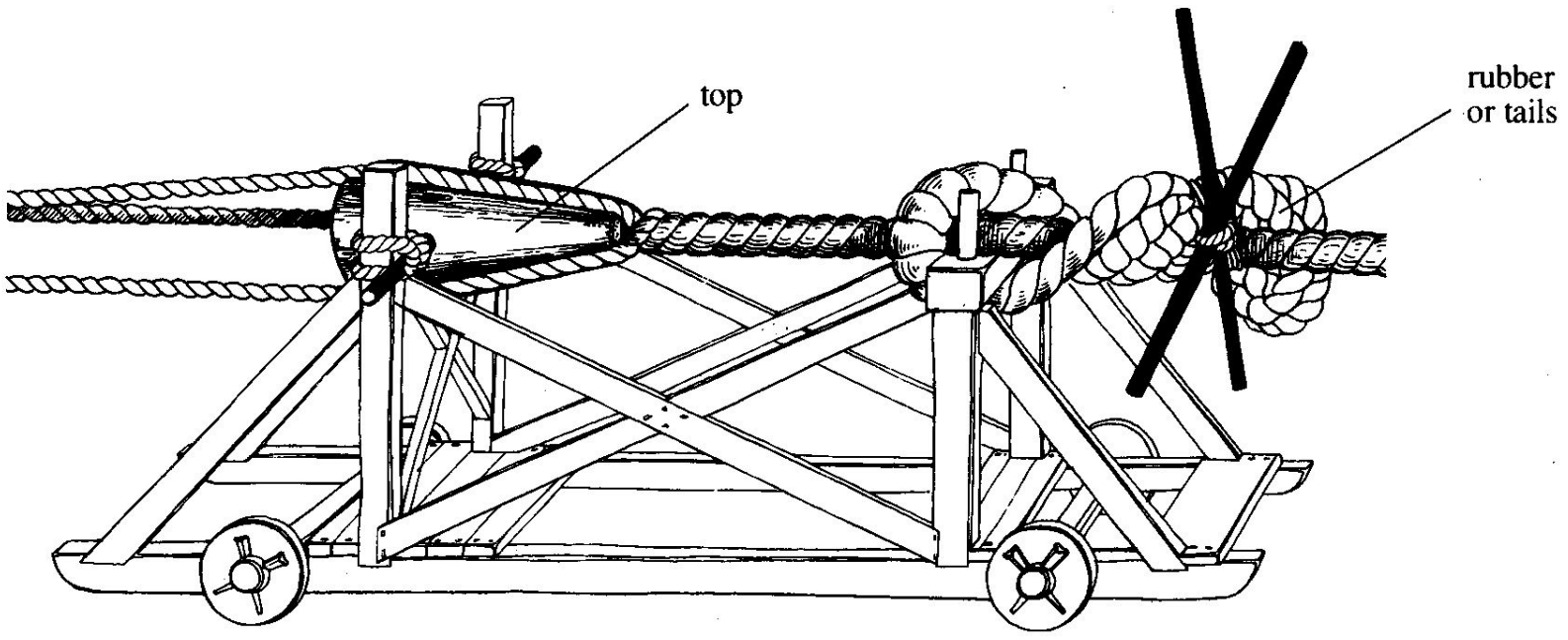


Fig. 262
Top-cart

An alternative arrangement to that described in the main text is for the rubber or tails which are wrapped round the rope to be made fast not to the staff running through the top but to another cross-piece of the top-cart (the arrangement in Toulon).

Having explained this very basic equipment we will go on to look at the process of laying rope.

First of all the yarns must be warped from the reels at the end of the ropery, which it should be remembered is 1,000 feet long [324m]; in order therefore to limit the amount of walking up and down, it is necessary to have a large number of reels (a 21-inch rope 57 centimetres in circumference requires 2,250 yarns!). The Master-Ropemaker orders the correct number of yarns to be warped from the reels and passed through an iron ring which serves to bring the yarns together, and the workmen then carry them on their shoulders to the bottom end of the ropewalk; if the rope requires a very large number of yarns a warping-frame is set up at the bottom end as well, and the workmen return with a second bunch of yarns, which reduces the amount of walking. When the correct number of yarns have been warped off the reels, the Master-Ropemaker orders the sledge to be make fast with a length of rope to a post driven into the ground called the *reaching-post*. (Remember, the ropewalk has at one end the fixed tackle-board and at the other the sledge). The sledge is weighted with what is estimated to be the right amount of kentledge, and heavers of a size appropriate to the rope being laid are inserted in the breast-board.

Reaching-post.

One the yarns have been stretched out over the stake-horses, they are divided into three equal bundles and each bundle is knotted together at both ends; the bundle is opened out at the knot and hooked over the end of the heaver where a forelock holds it in place. The yarns in each bundle must be equally taut* and carefully laid out over the trestles or stake-horses. Once the three bundles of yarns have been neatly laid out along their full length they are cut free from the heavers and extended by the straps to which they are knotted, and it is the straps which are fastened to the heavers of the tackle-board. Thus the three bundles of yarns are fastened at one end to the three heavers of the sledge and at the other to the three heavers of the tackle-board. In this state the bundles are called *skeins* but as soon as they are twisted they are called a strand.

*This is called ***warping the yarn.***

Skein of yarns.

The men at the tackle-board turn the heavers clockwise, and those on the sledge crank anti-clockwise, and as soon as the strands begin to twist the sledge is released from the reaching-post and begins to move as the strand shortens; the purpose of the weight on the sledge is both to increase and to restrain the effects of the twisting of the yarns. Once the strands are sufficiently twisted, which is judged from the amount by which they have shortened, the turning is stopped. The Master-Ropemaker directs that the forelock be removed from the central heaver on the sledge, and the strand is unhooked from it while being firmly held by the men to stop it unwinding.

In place of this heaver another much larger one is fitted, over which are hooked not only the middle strand but also the two others, so that the three strands turn on the same hook which acts like the loper described above for spinning spun-yarn.

The strands are rubbed with tallow or soap, and the top is placed in the angle where they come together; if the rope is a heavy one, the top-cart is used, and to ensure that the rope lays evenly, tails are fastened to the top-cart, formed of two long rubbers of oakum which are made fast to the bolt passed through the top and wound round the formed rope; thus thanks to this sort of brake, the movement of the top-cart up the ropewalk can be controlled.

The top-cart advances up the walk, the rope is formed, the strands shorten and the sledge moves closer to the tackle-board, but since the rope is extremely long the single large heaver on the sledge cannot transmit its twisting effect along the full length of the rope and so several men armed with woolders work the twist along. Progressively, as the top moves and the rope is laid, the twist of the strands is lost and this must be corrected by cranking the heavers at the tackle-board.

The usual practice is to lay ropes which are 120 fathoms long [195m] and laid up by a third, which is to say that the skeins of yarns are 180 fathoms long before they are laid, and they shorten by 60 fathoms through their own twist and through the action of laying the strands. This gives an idea of how long the ropewalk has to be in the dockyards; the one in Rochefort is more than 1,000 feet [324m] long.

Once the rope is the length and thickness required, the Master-Ropemaker orders the men to stop cranking the heavers on the sledge and for the three strands to be tied off as tightly as possible with tarred ropeyarns next to the top and next to the heaver on the sledge. The length of rope is laid out along the wall of the ropewalk and is left for a day to relax.

The lengths of rope are coiled up in the following manner: two pieces of junk are laid out in the form of a cross, knotted in the middle; a circle is formed in the rope with the meeting-point of the two pieces of junk in the middle, and once this first turn has been formed it is secured with rope-yarn, and then a second turn is wound tightly round it and then a third until a *Flemish coil* is formed which is 18 inches to two feet [49-65 cms] in diameter and this first tier is covered by a second starting from the outside and finishing in the middle; the third tier starts at the middle, and so on; when the coil is finished they take the ends of the junk which stretch out beyond it and by putting on all four ends at once all the *fakes* are secured tightly together and the ends of the junk are made fast*.

Flemish coil: "is a rope coiled up in a spiral manner, forming but one tier, and lying flat on the deck, the end being in the middle of it" [Falconer: op. cit.]; to coil a rope in this manner is ***to flemish*** it.

Fake; or ***flake***.

*Anchor cables are not coiled but are carried from the stores to the ship which is being fitted out either on the men's shoulders or with the help of rollers.

In order to be able to recognise ropes made for the King's service, these include a white (untarred) yarn in the middle called a *marking yarn*.

Marking yarn: also called the ***royal yarn***, or more colourfully, since its purpose was to detect malpractice, the ***rogue's yarn***. Untarred ropes contained a black (tarred) marking yarn.

Most hawser-laid ropes are made up of three strands, but they are also made with four, five or even six strands, sometimes using a *heart* or central strand which is fed through a hole passing down the central axis of the top.

Heart.

Bolt-ropes are generally laid slacker than other ropes, their yarns shortening by only a quarter; they are made in sizes of between 1 and 6 inches, in quarter-inch steps.

Cable-laid: laid up from 3 hawser-laid ropes.

Lay: the twist.

Closing.

To end this section on ropemaking I will talk briefly about how cables are made, since they are *cable-laid* ropes. From what you already know, you will understand that all that is needed is to place the ordinary ropes on the heavers of the tackle-board and of the sledge in the same way as was done with the strands of the rope, to turn the cranks in the direction of the *lay* of the ropes, and when they have acquired the desired elasticity to hook them over one large crank at the sledge end; and inserting the top at the point where the lay starts, to lay them in exactly the same way as with large hawser-laid ropes; in the case of cables this is more often called *closing*. All cables are made up of three hawser-laid ropes, and each rope of three strands, so that a cable-laid rope has nine strands in all.

*English practice was usually (but not always) to make shrouds of four strands by closing in a heart. Ropes made in this way were said to be ***shroud-laid***.

Anchor-cables and warps are cable-laid, shrouds are sometimes cable-laid*, messengers are frequently cable-laid, but sometimes hawser-laid, the ties of the larger yards, buoy-ropes and stays are cable-laid.

Obviously there is a great deal more which could be said about ropemaking, but we will have to restrict ourselves to the essentials, which are all that is needed within the scope of this book.

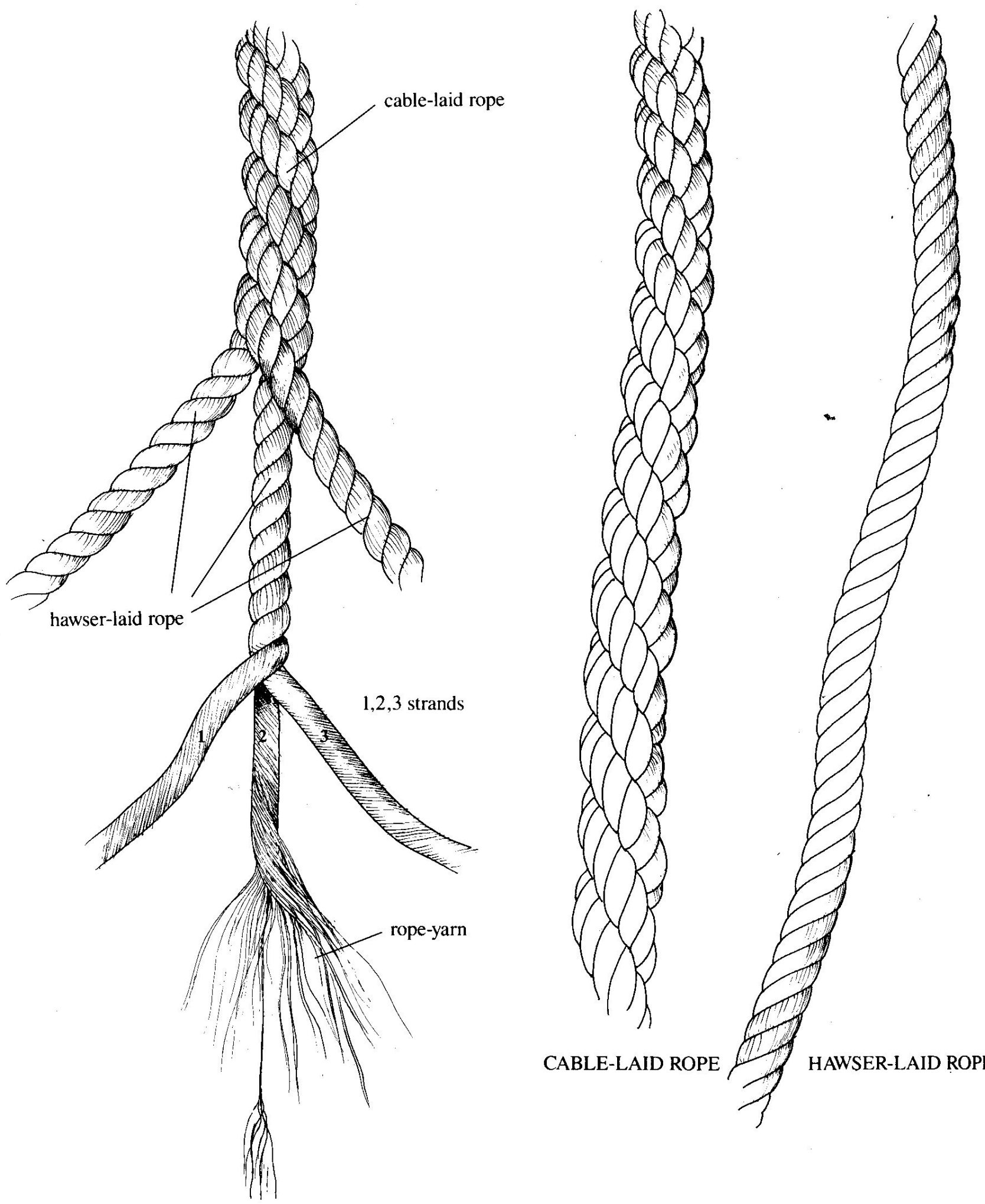
Fig. 263
Cable-Laid and Hawser-Laid Ropes

These drawings show the difference between a cable-laid rope and a hawser-laid rope. The latter is composed of three strands laid "against the sun" (counter-clockwise), while if one takes three hawser-laid ropes and closes them as a cable, these run "with the sun".

A cable-laid rope is stronger than a hawser-laid rope. A cable made of three three-stranded ropes has nine strands whereas a hawser-laid rope of the same diameter would only have three, and as I have already stated, the more subdivisions there are in making up a rope, the stronger it is (for the same cross-section). Of course, it is always possible to increase the number of strands in a hawser-laid rope, but it then becomes difficult to lay.

Cable-laying a rope makes it stronger, less easy for the water to penetrate since it is tighter, and less likely to be damaged by chafing.

But the additional cost of cable-laid ropes limits their use.



KNOTS

There are many books dealing with knots, and I will take the liberty of referring you to them, and of only showing here those knots which are commonly used on board our 74. For each of these knots I have given a drawing on Plate XLIX, and in the text which follows, some explanations regarding their use.

The following terms* are used in describing them: the *standing end* or *part* is that which is attached to something, or which is inaccessible for some other reason; the *running end* is the free end with which the *knot** , *bend* or *hitch* is made; a *bight* is a loop, or part of a rope of which neither end is accessible.

* I am extremely grateful to David White for thoroughly overhauling my translation of this section, and for helping to unravel the differences between French and English practice, and made more complicated by the fact that no two authorities agree. This text is in consequence more a paraphrase than a word-for-word translation. [Trans.]

Standing end or ***standing part.***

Running end.

Half-hitch: The running end is crossed over the standing part, passed behind it and up through the bight thus formed. The end is usually seized to the standing part.

Magnus hitch: This knot is used for securing a topmast or heavy outrigger*; it is one of the weakest fastenings. The running end is taken twice around the spar or other object to which the rope is to be fastened. It then crosses the two turns, passes round the spar again and up through the bight just formed.

*In general, a ***knot*** is worked in a rope without involving any other rope or object; a ***bend*** joins two ropes together; a ***hitch*** attaches a rope to another object. There are of course exceptions.

*See the section on careening, p. 233.

Granny knot.

Reef knot: This is the simplest knot for letting out reefs, and is used to join two ropes of equal thickness. It is formed by making two overhand knots (see below), one after the other, but with the ends crossed alternate ways each time. If the ends are crossed the same way it becomes a *Granny knot*, which will slip if made with the lay or jam if made against it.

Bowline or sailor's knot: Used to fasten a rope (buntline, leech-line, reef-tackle etc.) to a cringle, or to make a temporary eye in the end of a rope. Made by taking the end in the right hand, pointing away from the body, with the standing part in the left, and laying the end over the standing part. With the right hand turn a bight of the standing part over the end, away from the body, lead the end round under the standing part and down through the bight.

Sheet bend: Normally used to secure a rope to an eye (such as the headsail sheets or staysail sheets to the clue-cringles), and for securing buoys (for the latter see section 6, p.208). It is formed by passing the end down through the eye, round both parts, and back up and under its own bight. The two ends then hang down to serve as sheets.

Carrick bend: Used to join two cables together. Form a bight in one cable by crossing the end over the standing part. Then take the end of the second cable and lay it over the bight; pass it under the standing part of the first cable, up and over the running end, down under the bight, up and over its own standing part and down through the bight. Both ends should then be stopped to their standing parts.

Timber hitch: Used to hoist a spar, quarters of flour, salt meat, empty casks and other light objects, usually in conjunction with a half-hitch. It is formed by passing the running end round the spar, round behind the standing part, and then under and over itself two or three times, so that by hauling the rope tight the object which is to be hoisted is held fast.

Jamming hitch or countryman's knot: Used for more or less the same purposes as the timber hitch, but in particular for hoisting pieces of timber, and anchor cablets. The hitch is formed by making a single knot in one end of the rope through which the other end is passed; as the object is hoisted, the bight tightens round it.

Standing bowline: Used for hoisting a man to the head of a mast which has no shrouds. The standing bowline is made by first of all forming a small bight or eye of about a foot in circumference. The short end of the rope (which should be about 2 fathoms or 3.25 m long) is passed through the bight, over the standing end and back through the bight again; the end is then seized with a small lashing. It is also used sometimes as a sling, in which case the end is passed double through the bight, and the action of hauling up the object to be hoisted tightens the sling.

Over-hand knot: When made in a single rope it is an inferior form of stopper; it is occasionally used to secure standing rigging at a masthead. Formed by crossing the running end over the standing part and then through the bight so formed. It is an extremely unseamanlike method of joining two ropes together, but is sometimes used if there is no time to form a splice.

Sheepshank: Used to shorten a rope temporarily; formed by laying the rope back on itself twice and half-hitching the ends over the two bights so formed.

*Differs from a plain shroud knot in that the strands are turned back on themselves before the wall-knot is formed. Darcy Lever [*The Young Sea Officer's Sheet Anchor*, 1819 Edn.] states: "This knot is much snugger, and equally secure as the other".

French shroud-knot*: Used to join damaged shrouds or backstays in place of splices. The French shroud-knot is formed by unlaying the ends, marrying them together, and then forming a wall-knot (see below) on each rope with the strands of the other. The strands of each are unlaid for a distance of two and a half to three feet (approximately 80 to 100 cms) in order to form the wall-knots.

Half knot: Simply the first half of a reef knot. It is used for securing standing rigging at the masthead, the knot being hauled tight round the head of the mast.

Cat's-paw: Used to attach the laniard to the hook of a tackle when setting up shrouds. Formed by turning a bight over itself, thus forming two smaller bights. These in turn are given two or three twists in opposite directions, and the hook is then passed through them.

SPLICES AND EYES

Short splice: Used for joining two ropes which may be cut through and which are not required to reeve through a block etc. A short splice is formed by unlaying the strands of both ropes for a distance equal to twice their circumference, and marrying the ends together. The strands are then tucked, in turn, over and under the strands of the opposing rope with the aid of a *marling-spike*. The strands are passed through *with the lay* so that those of the lower rope pass through the upper rope and vice versa.

Marling-spike or ***marline-spike:*** iron pin resembling a sailmaker's fid and used for separating the strands of a rope when splicing.

With the lay: i.e. right-handed (or ***with the sun*** in contemporary parlance) in the case of a hawser-laid rope.

Long Splice: Used to join two ropes which are required to pass through a block or thimble. The ropes are unlaid for length equal to five and a half times their circumference and the ends are then married as for a short splice. One strand in one rope is then unlaid, and a strand from the opposing rope is laid up in its place. This is repeated for the other rope. There are now three pairs of ends. Each pair is knotted with an overhand knot and the ends are tucked once under one strand and the surplus cut off.

Cable-splice: Used to splice small cables which part; the principle is the same as for other splices except that the strands are passed through the opposite way, since the cable is laid up left-handed; the number of passes is equal to the number of strands.

Collar-splice: Used to form the eye or collar of a stay; the strands are unlaid for a distance of three feet or so (depending on the circumference of the stay) and then each strand is laid up again so as to form three smaller strands, making nine in all; next, three eyes are formed from six of the strands, each pair of strands being spliced together with a long splice. The three remaining strands are then used to strengthen the eyes by splicing them together. If the stay is four-stranded, the same principle is followed, but with a fourth eye being formed at the first stage; the ends are then tapered or marled with rope-yarn and served with spun-yarn; a whipping (see below) is passed round the rope above the eye to prevent it from being enlarged.

Cable-eye: Used when joining two cablets; an eye is formed on each cablet, the end being laid back on itself and the eye formed with a short splice; both eyes are formed in the same way. Once the two eye-splices have been formed, the cablets are then joined by a lashing (see below) of 3 to 3 1/2 inch rope [81-95 mm], which is passed through and through about ten times and made fast with two half-hitches.

Hawser-eye: The above description applies also to hawser-eyes; the end of the hawser is taken back on itself to form a bight and spliced into itself with a short splice.

SEIZINGS

Round seizing: Used to seize two ropes together side by side. A small eye is spliced in the end of the seizing line; the line is then passed round both ropes and through the eye. A first layer of seven turns is taken round both ropes, the end is passed between the last two, back through the eye, and all turns are then heaved taut. A second layer of six *riders* is taken over them. The end is again passed through the last two turns, and four cross turns are made around all between the two ropes and the end is secured.

Riders: a second layer of turns, sometimes called ***riding turns***. There is always one fewer riding turn than there were turns in the first layer.

Throat-seizing: This sort of seizing is most commonly used for shrouds and stays, the throat-seizing being made where the shroud or stay forms a cross above the deadeye. It is formed in the same way as the round seizing, but without the cross turns.

Cross-seizing: A slightly special form of seizing in which a grommet is formed at the mid-point of a line and made fast where two ropes cross. The two ends are then taken separately and passed in opposite directions several times round opposing corners of the cross. They are then crossed over and the same number of turns are taken round at right-angles to the first; the lashing is finished off with two riding turns between the ropes and a reef knot.

Tail-block lashing: Used for fastening a tail-block to a shroud or other large rope. It is formed by taking two round turns around the rope, against the lay, below the standing end of the tail, crossing the upper turn. The end is then dogged with the lay and seized to the rope with eight to ten turns of spun-yarn and a reef knot.

Sheer-lashing: Used when masting or unmasting a ship, to secure the heads of two sheer-legs. To form a sheer-lashing, take a rope and middle it (fold it in half); with one half take 18 to 20 S-turns round the two sheers taking care to ensure that each turn is separated from the next by a space equal to the diameter of the rope; with the other half make a series of riding turns between the first, but without passing in and out, and then take seven or eight frappings at right-angles to the lashing, between the sheer-legs.

Spar-lashing: This lashing is most commonly used to join two spars which run parallel to each other, and to maintain them a certain distance apart, as for example with the crupper joining the bowsprit and the jib-boom. A line is made fast with an eye to one of the spars and then passed round both spars, always in the same direction. The lashing is finished off with several frapping turns between the spars, and secured with half-hitches.

Cross-lashing: Used to join two eyes or thimbles in a rope, or to secure a length of rope with an eye formed in its end to a spar. The lashing is formed by passing a length of line through and through the two eyes to be joined, followed by a number of frapping turns, and finishing with a reef knot.

Seizing: "Seizing" is the general term used for fastening two ropes by tying them tightly together. A few turns of line taken round them prevents them from slipping.

Temporary seizing: A sort of preliminary lashing used to bring two ropes together before seizing them permanently with a lashing. A temporary seizing is clapped on by means of a length of line passed round the two ropes in question; a knot called a *Marline hitch* is made in the end of the line so that a heaver or woolder can be engaged.

Marline hitch.

Woolding: As we have seen, woolding is used to help bind together made-masts, but any two pieces of timber can be confined and bound together using similar lashings, executed however slightly differently.

Fag end: end of a rope which becomes untwisted through frequent use.

Whipping: This small seizing is made to the *fag end* of a rope in order to prevent it from unlaying. Whipping is carried out with spun-yarn or sailmaker's twine: a series of round turns are made, passing in the same direction, laying one end of the twine under the first few turns and the other under the last turns*.

*Sometimes the whipping was knotted at every turn, in which case it was known as a ***West Country whipping***. [Trans.]

PROTECTING ROPES FROM WEAR

Worming: This consists of using a much thinner rope to fill the contlines of a thicker rope. Wound round in a spiral, the worming strengthens the rope and binds it together more tightly. In order to keep the worming tight when winding, a small piece of wood is used like a lever. The worming is stopped by a few turns of line, spun-yarn or ratling. If a rope is simply wormed (i.e. not parcelled and served as well), the worming must be secured at intervals by special seizings called *snaked seizings*.

Snaked seizing.

Parcelling: This operation consists of covering a rope with strips of tarred canvas, the purpose of which is to protect it from wear or damp. The canvas is three to five inches wide [81-136 mm] depending on the size of the rope, and it is wound round in a spiral so that each turn covers the previous one by about half its width. If the rope is then to be served (see below), the parcelling is held on by a series of half-hitches, or else stopped by tight seizings of spun-yarn every so often.

Keckling: strictly speaking the term is applied only to cables, and therefore to much thicker rope used as protection; the principle is however the same.

Serving: Also called *keckling*; this consists of winding spun-yarn, house-line or marline in tight turns along the whole length of the rope, so that each turn touches the next. Serving is wound in the opposite direction to the lay of the rope* in order to hold it tighter. Generally speaking rope is served after it has first been wormed and parcelled. Serving is carried out using a cylindrical mallet called a *serving mallet*, with a longitudinal groove cut in the head; this is used for larger ropes, but for small ones a *serving board* is used. The serving is stopped to the rope and two or three turns of spun-yarn are taken round the head of the mallet and the same number of turns round the handle. The mallet is rotated round the rope and the spun-yarn fed out, while a second seaman assists the operation by turning the ball of spun-yarn in the same direction at each turn of the mallet.

*An old saw says: "worm and parcel with the lay, serve and turn the other way".

Serving-mallet.

Serving-board: small piece of wood performing the same function as the mallet, but providing less leverage.

Leathering: The first step is to cut the leather in strips of a width equal to the circumference of the rope to be leathered; after soaking the strips in water in order to soften them and to make them easier to work, they are sewn lengthwise along their edges and to the part of the rope to be protected. Sometimes a small stopping pulled tight is clapped on either end of the leathering.

Among other types of protection I should mention also the practice of covering the deadeyes and their laniards with bullock's hide, with the hair on the inside and the seam hidden; and to protect them from the muzzle-flash of the quarterdeck and forecastle guns the laniards may also be covered with copper sheets or carefully worked *mats* (see below).

Mat.

The foremost lower-mast shrouds are not always served with spun-yarn over their whole length, but covered with *sennit* or a *wrought mat* (see below); some people believe that spun-yarn causes the ropes to rot and prefer therefore to cover these lower shrouds with a simple plait which is laced on and can be removed at will.

Sennit. Wrought mat.

STOPPERS, WALL-KNOTS, MOUSING A STAY

Double wall-knot, crowned: Used for anchor-stoppers, the straps of jeer-blocks etc. It is formed at the end of a rope which has been unlayed, taking one strand at a time and passing it through the others, the last being passed down through the first. Each strand is then pulled tight, to form a single wall-knot; then each strand is passed back through the knot using a marline-spike, forcing them under each of the other strands to form a double wall. To crown the knot, one strand is held down against the side of the rope to form a bight above the wall-knot; in the case of a four-strand rope, the first strand is held down and a bight is formed in the same way with the strand opposite; the third strand is then passed over the first bight and through the second; the same process is repeated with the fourth strand. All four strands are then pulled tight one after the other and the crown is formed. The strands are then whipped.

Stopper-knot, stopped and wormed: This is a double wall-knot without crowning; the rope is wormed in order to strengthen and round it, and a snaked seizing holds the worming in place. A length of thin line is laid down the contlines, one for each strand, and the ends are securely whipped with rope-yarn under the wall-knot. Then a snaked-seizing is clapped on with house-line: after a suitable number of turns has been taken tightly round the rope, the house-line is brought over the top and passed under the first and last turns with a marline-spike so that it forms a zigzag pattern; to finish the snaked seizing the end of the line is tucked in and cut off.

Plaited stopper: This is a medium-sized rope which is unlaid for part of its length in order to make a flat plait from the three unlaid strands; plaited stoppers being flat hug more tightly the rope to be stopped and retain it better.

Cable stopper: See the section on the ground tackle.

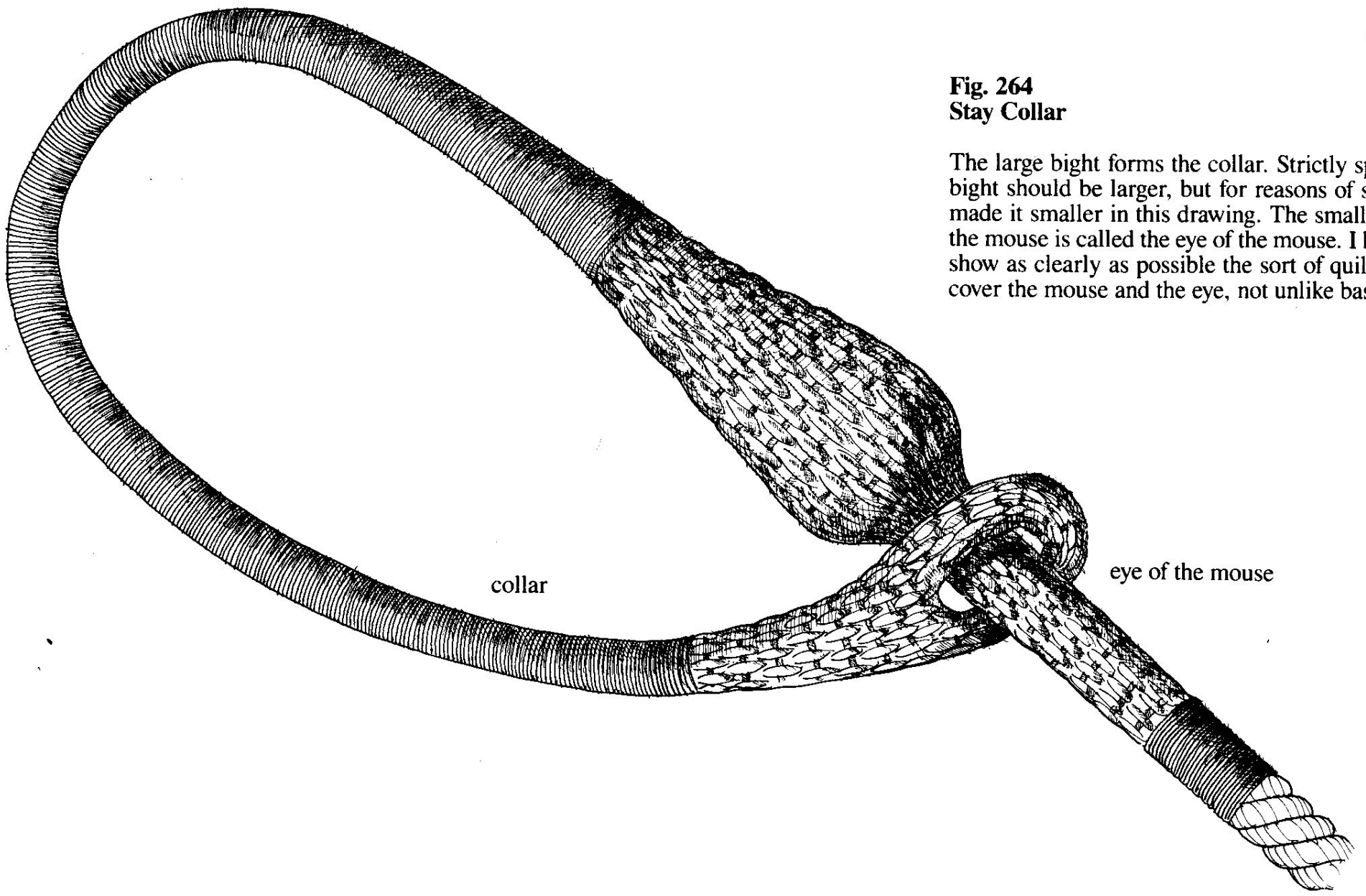


Fig. 264
Stay Collar

The large bight forms the collar. Strictly speaking this bight should be larger, but for reasons of space I have made it smaller in this drawing. The small loop below the mouse is called the eye of the mouse. I have tried to show as clearly as possible the sort of quilting used to cover the mouse and the eye, not unlike basketwork.

Mouse for a stay: This is a particularly fine example of sailor's "fancywork", carried out as follows. With the stay bowsed taut with a tackle and placed so that it can be worked on comfortably, a distance equal to the length of the masthead is measured off from the bight forming the collar, this representing the correct position for the mouse; the length of the mouse should be roughly equal to the circumference of the stay.

With that done, the stay must be parcelled over the full extent of the eye of the mouse and that part of the stay which will form the collar, continuing down for one or two fathoms [1.60 – 3.20 m] below the mouse, this being the part of the stay most exposed to wear from the yard as it is braced. The next step is to raise the mouse, in the manner which will be described. First of all the stay is wound round tightly with spun-yarn for the length of the mouse; over this first layer, a second layer is wound on, then a third, a fourth, and so on, until the mouse has reached the necessary size, which ought to be about twice the thickness of the stay. Care is taken to reduce each successive layer of spun-yarn by two or three turns at the beginning or head of the mouse (which is always pointing towards the mast), and by a single turn only at the bottom, so that the head of the mouse gradually forms a point, while the lower end or tail is more the shape of a rounded cone.

Next, the various layers of spun-yarn are covered with a network of line (see below) proportionate to the size of the stay, forming *knittles* which are interlaced as in pointing (see page 210): lengths of line one fathom long are laid out from head to tail of the mouse until its entire circumference is covered, and these are secured with a *warp* of marline passing alternately over and under the odd and even knittles, gradually forming an interweaving which is not unlike the effect produced in basketwork. The ends of line are then unravelled, combed down with a knife and laid down along the stay so that they prolong somewhat the swelling of the mouse as it decreases.

Knittle or ***nettle:*** small lines composed of two or three ropeyarns plaited or twisted.

Warp: strictly speaking the ***woof***: the transverse threads in pointing.

The eye is pointed over in the same manner, and the scraped-down ends of the line used are also laid along the stay.

The mouse and the eye thus complete, the stay is now served with spun-yarn for the whole length which was previously parcelled, so that the scraped-down ends of the line used for the pointing are covered over and hidden by the serving.

Mouse of the messenger: See page 213.

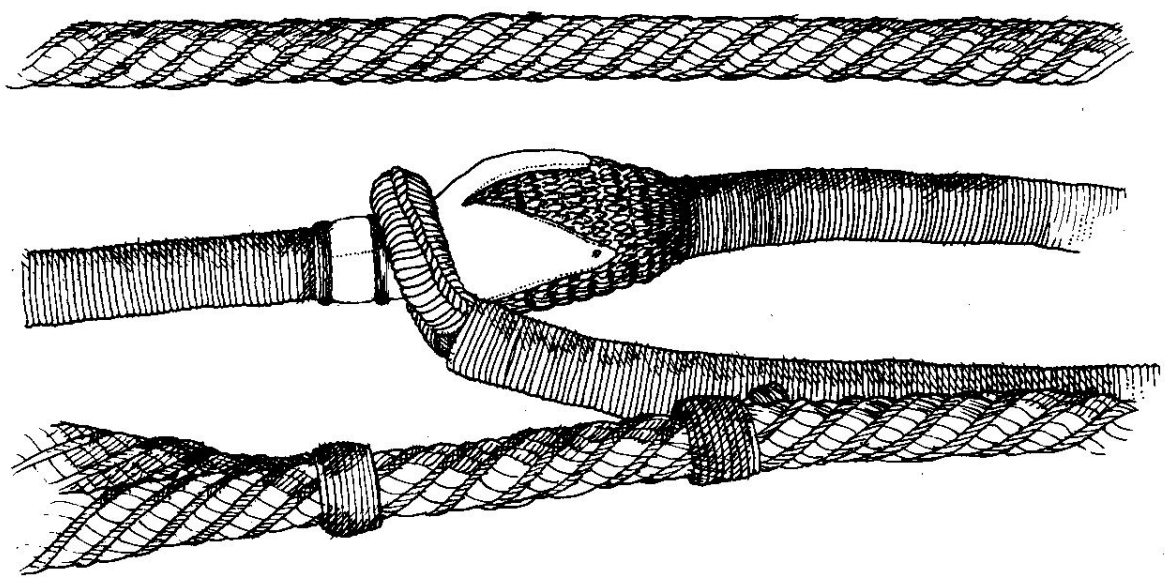


Fig. 265
Mouse and Eye of a Stay

This sketch is somewhat different from the last one. Part of the mouse has been leathered, while the eye has been served and marled. Note the way the stay is wormed.

PLAITING AND WEAVING

Whenever possible all kinds of fancy ropework are fashioned on board ship from junk unpicked from old ropes. The strands are unlaid and the yarns separated so as to make spun-yarn, after first tarring them. The Bo'sun has two *spun-yarn winches*, usually installed on the riding-bitts, and he also has a tar-kettle and Stockholm tar.

Spun-yarn winches: rudimentary hand-operated spinning-wheels.

Reef-points, nippers: Reef-points are long and flat, formed by hand from *foxes* of spun-yarn and tapered by removing a fox at suitable intervals and cutting it off. For ships-of-the-line, reef-points are formed from three or even five foxes, the end is whipped, and in principle their length varies according to their position on the yard, because of the variations in its diameter.

Foxes: "Foxes for gaskets, etc. are made by taking a number of Rope-yarns from three upwards, according to the size intended, and twisting them on the Knee, rubbing them well backwards and forwards with a piece of Canvas". [Darcy Lever, op. cit.]

Nippers for the messenger are made in the same way, and are described in the section on the ground tackle.

Nippers.

Ropebands, earrings, gaskets: These are all similar in the way they are made. Rope-bands, sometimes written robands, are simply short lengths of rope passed through the eyelets in the head-tabling of square sails.

Leech-earrings strengthen the leech-ropes and are four fathoms long [6.5 m], three-stranded, and made from ratline.

Head-earrings are similar, serve essentially the same purpose, and complement the former.

Gaskets or furling-lines are of *sennit* or wove mats (see below), used to furl the sails or in other words to fold them back over the yard and secure them on the forward side with two turns and a knot. They are 3 to 4 inches [81 – 104 mm] wide, and are fastened to the yard by means of a running knot, so that at one end they have an eye; often they are shortened with knots so that they take on the appearance of small chains left hanging down in front of the sails; they are tapered to a point.

Sennit: "is made by plaiting Rope-yarns in the same Manner that the Foxes were worked for the Gasket". [Darcy Lever, op. cit.]

There are a variety of other similar items of cordage such as muzzle-frappings for the guns when they are bowsed up against the clamps, port-ropes for closing the gunports on the inside, steering wheel beckets, hammock-knittles, rope-bands for flags (described in Volume IV).

Mats: These are sorts of plaits fashioned from foxes of spun-yarn interlaced. The variety called a *wrought mat* is thickened with short lengths of rope-yarn or spun-yarn passed through the mat and then unravelled and fluffed up into tow, so as to form a protective layer on the surface against wear. Mats are fitted for example to the forward side of the lower yards, to the arms and blades of the anchors when they are catted home, etc. Thrum mats are generally placed wherever the risk of wear is greatest, their hairy surface providing much greater protection.

Wrought mat: or ***thrum mat***; the extra yarns worked in and opened out being called ***thrums***. Blemishes in the even working of such mats were called ***hag's teeth.***

Sword mats: These are a sort of cloth made of rope-yarn or spun-yarn and serving the same purpose as the other mats. They are made on a loom, and require the efforts of three men, having a warp and a weft, the warp being passed through with a flat piece of wood called a *sword*. The width never exceeds 6 inches [16 cms], and they are placed over the rim and the stanchions of the tops, on parts of the bolt-ropes of the sails, etc.

Sword: sort of shuttle.

Other mats: There are other kinds of wove mats, but larger and coarser. They are used under the capstans, and are sometimes nailed to the deck so that the animals do not slip as the ship pitches and rolls.

Sennit: This is another kind of material plaited by hand, still from rope-yarn or spun-yarn, and the number of yarns is always an odd number between three and fifteen*. Sennit is used for a host of applications.

*In English practice, between five and thirteen. [Trans.]

Puddings: These are made up from two lengths of rope with a swelling formed in the middle from oakum; they are pointed over with spun-yarn and an eye is formed at either end. There is another variety which is crown-shaped. These puddings are used under the yards*, or below the rigging where it fits over the masthead (see section 3 of this chapter).

*When a pudding is clapped on below a yard a ***dolphin*** must first be nailed to the mast to prevent it slipping. The thick part of the pudding is abaft the mast, while the eyes are lashed together on the fore side.

This section has not covered anything to do with the ground-tackle, which figures in section 6. Likewise, ropework relating to the strapping of blocks is covered in the next section.

2. Blocks and block-making

Since this section deals essentially with the running rigging, I thought it would be convenient to go on from the section on blocks to items relating to the way the rigging is belayed, such as the bitts, and various sorts of cleats made up by the shipwrights and carpenters.

BLOCKS

Shell.

These "machines" are composed of a *shell* or outer part made of knotty elm for its toughness and are more or less the shape of a flattened sphere; in the edge of the shell is a mortice or *sheave-hole*, in which there is a pulley or *sheave* made of lignum vitae and having a groove or channel in its circumference; the sheave rotates on a *pin* of holm-oak. The two sides or *cheeks* of the shell have grooves or *scores* cut in them to take a length of rope running round the block and called the *strap*. The lower end of the block is called the *arse* or *tail*.

Sheave-hole: the space between the top of the sheave and the shell is called the ***swallow.***

Sheave: sometimes written ***shiver.***

Pin; Cheek; Score.

Strap: "Often spelled *strop*, but always pronounced *strap*". [Clifford W. Ashley, *The Ashley Book of Knots*, New York 1944.]
There are also straps of iron.

Arse or ***tail of a block.***

Figure 266 shows the various parts of a *single block*. The same principles apply to blocks with more than one sheave: *double blocks*, *treble blocks*, and *four-fold blocks**, only the shell being thicker.

Single block: block with a single sheave.

Double block; treble block or ***threefold block; fourfold block.***

*Fourfold blocks are sometimes used for the mainstay or forestay.

On Figure 267 I have shown the proportions given to a single block, double block and threefold block, determined by the thickness of the rope to be rove through it. It should be noted that irrespective of the number of sheaves, blocks come in inch sizes, the smallest being 5 inches long [13.6 cms], and the largest 20 or even 22 inches [54.2 – 59.6 cms]; the small table on page 118 gives the breadth of the sheave-hole for each size of block, and I would add that this breadth is 1/6th of an inch [4.5 mm] greater than the thickness of the sheave, which is itself equal to the diameter of the rope. Thus for all the various sizes of rigging on board it is possible to determine the size of the single, double or threefold blocks which must be used.

Treble blocks are sometimes called "winding-tackle blocks" (although double blocks are also used for the winding-tackles), or "gun-tackle blocks".

Some of these blocks have a double score in the cheeks of the shell; in Figure 267 I have shown a single block, a double block and a treble block, and both single- and double-scored cheeks, representing in total therefore six varieties of block. The double score is for a double strap.

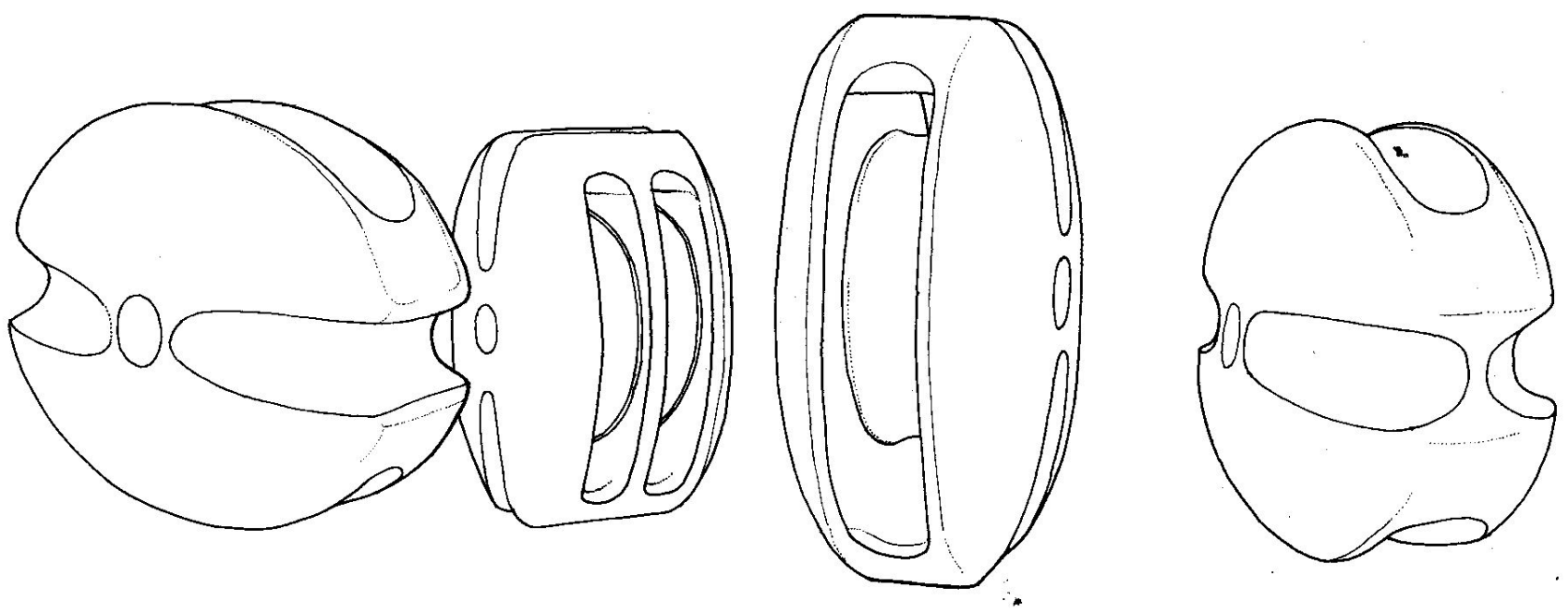


Fig. 266
Parts of a Block

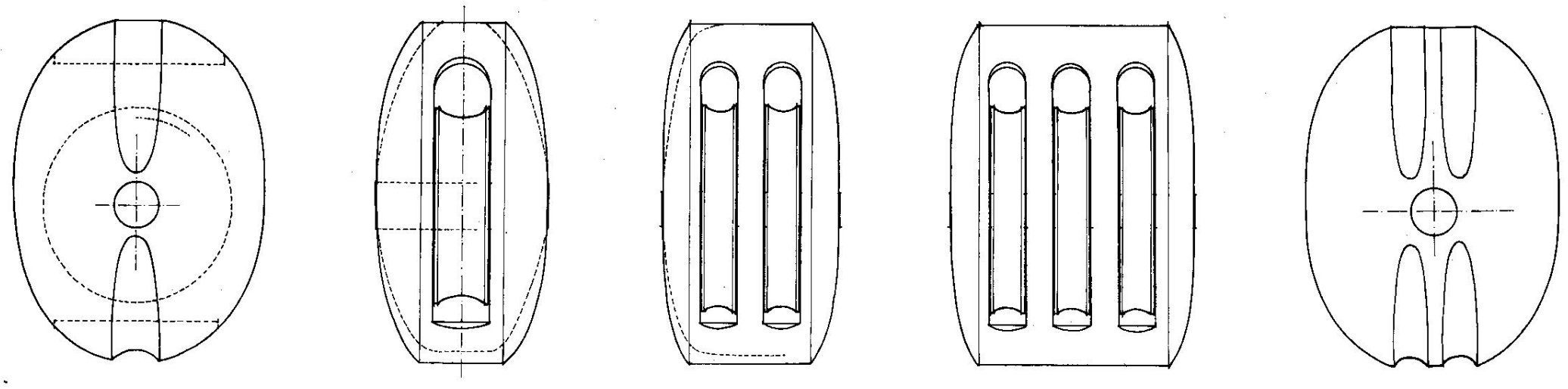
On the block shown at the left note how the score is continued round the arse of the block. The block on the right has a score which does not run fully round its head.

Among the various types of single block I should mention:

Buntline blocks*: The shell is shouldered above the sheave, so that the upper part forms a sort of hat designed to protect the buntlines from chafing (see page 183).

*There is no such block in English; on the other hand there is a ***clue-line block***, which is identical in shape. To avoid confusion in their use I have preferred therefore to invent a term. [Trans.]

In French this type of block is sometimes called a "monk's head", because of the resemblance of the shouldered part to the shaved pate of a monk above his tonsure.



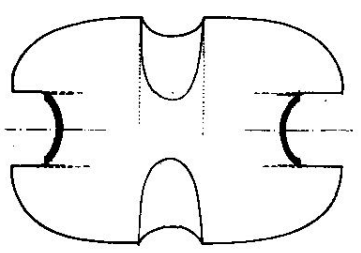


Fig. 267
Single, Double and Treble Blocks

The length of the sheave-hole determines the height of the shell, while the width of the shell is 7/9ths of its height. Single blocks are half as thick as they are high.

The thickness of double and treble blocks is dictated by the thickness of their sheaves which is only 2/3rds that of single block sheaves for the same diameter. The partition separating the sheave-holes is 2/3rds the thickness of the sheaves.

Shoulder-blocks*: Have a projection or shoulder at the tail or arse; since the shoulder is below the sheave, it protects the rope from chafing and forces the block to remain in the desired alignment.

*Often referred to more specifically in the English Navy as *topsail-sheet blocks*, from their function.

On our 74 the bumpkin is fitted with a shoulder-block for the foretack (see page 186). The same type of block is sometimes used for the topsail-yard lifts, and for this reason it is also sometimes called in French a "lift-block".

Coak: bush, to preserve the block from wear and to some extent to reduce the friction. Such coaks were also commonly inserted in the cheeks of the shell, and with iron-bound blocks the strap also performed this function.

Tye-blocks: Designed to be placed against the hounds of the topmast, this block has one flat cheek and is usually double-scored.

Top-blocks: These are strongly made single blocks which differ from other common blocks only in that they are iron-bound with a strap of flat iron and fitted with a hook; the sheave-pin of top-blocks is of iron, and for this reason a bronze *coak* is inserted in the sheave to receive the pin.

Fig. 268
Various Types of Single Blocks

1. "Buntline block".
2. Shoulder-block.
3. Tye-block.
4. Top-block.
5. Snatch-block.

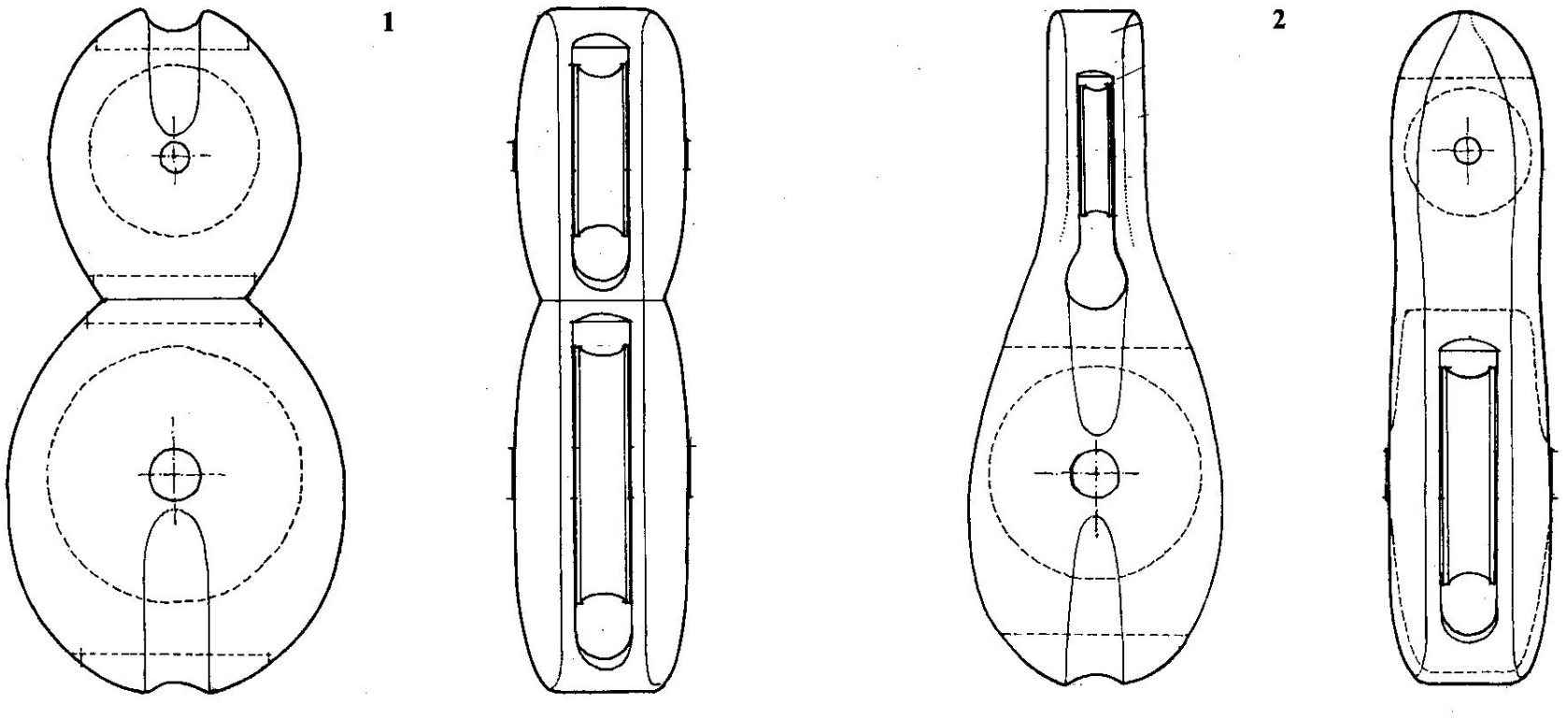


Fig. 269
Special Blocks

1. Long-tackle or fiddle-block.
2. Shoe-block.
3. Leg-and-fall block.
4. Cat-block.

Snatch.

Snatch-blocks: The shell has an opening or *snatch* in one cheek which allows the rope to be removed easily without unreeving it. Snatch-blocks are principally used for the main bowlines (see page 190). There is also a variant which is iron-bound with a strap that hinges over the snatch.

This concludes my description of the various varieties of single block; they are all illustrated in Figure 268, while double and treble blocks are also shown in Figure 267. Later on we will come to another form of single block when we examine the ninepin-bitts.

Let us now look at some rather special double blocks, with sheaves which are not parallel to each other.

Fiddle-block.

Long-tackle blocks: The two sheaves are placed one above the other and in the same plane, one sheave being larger than the other. This type of block is also called a *fiddle block*, which is both more expressive and more specific than long-tackle block.

As a rule the diameter of the smaller sheave is only 2/3rds that of the larger sheave. The shell of these blocks can be extremely long, the most powerful being up to 32 inches [88 cms] in length.

Shoe-blocks*: Have two sheaves, one larger than the other and running at right-angles. As can be seen in Figure 269, the strap of the block must be arranged to pass between the two sheaves. The larger sheave at the lower end takes the topsail-sheet, while the smaller one takes the lower yard lift (see below).

*These terms are only approximate equivalents; English ***shoe-blocks*** generally had two sheaves of equal size; ***leg-and-fall blocks*** are described by Darcy Lever [op. cit] as being synonymous with shoe-blocks, while Lees [op. cit] illustrates two sheaves of equal size running in the same direction. The French terms are respectively *poulie de bout de vergue* ("yardarm-block"), and *poulie de cargue-fond* ("buntline-block"). [Trans.]

Leg-and-fall blocks: Have two equal sheaves running at right-angles to each other; leg-and-fall blocks have no strap.

I will only talk about one treble block variant:

Cat-block: Differs only from winding-blocks with three sheaves in that it is iron-bound and fitted with a massive iron hook which is passed through the ring of the anchor. The sheaves are often of bronze.

All the four types of block listed above are shown in Figure 269.

HEARTS

Having completed our examination of blocks*, let us now move on to some other examples of the blockmaker's art, such as hearts and euphroes, which are essentially blocks without sheaves, and which are mainly used for the standing rigging.

*Apart from those used ashore for special applications which are discussed in Chapter XV.

Closed hearts: Approximately oval in shape and somewhat flattened, hearts have one large hole in the centre which is well chamfered with a number of small scores to receive the laniards. The circumference is worked with one or two scores for the stay or stay-collar.

Mizen-parrel deadeye: This special item* is a type of deadeye; there is one only on our 74, for the mizen-parrel deadeye has only two holes.

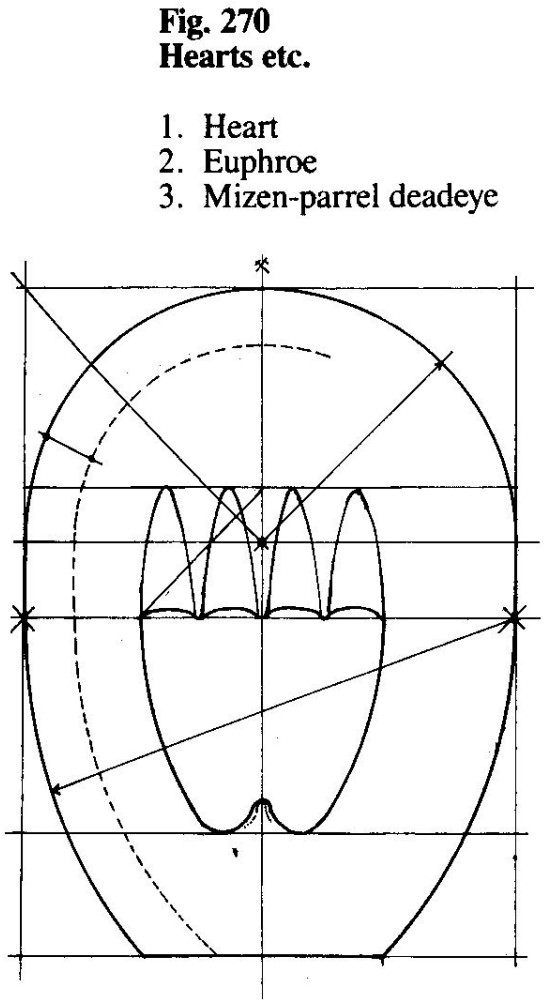
*According to Lees [op. cit], it was superseded on English ships by parrel trucks and ribs in about 1670. [Trans.]

Euphroes: Very elongated in shape, they have a score round the whole circumference to receive the strap which secures them to the stay. A series of holes are cut in the euphroe through which reeve the fan-shaped arrangement of light cordage called a *crow's foot* which runs up from the stay to the forward edge of the top, in order to protect the topsails from chafing.

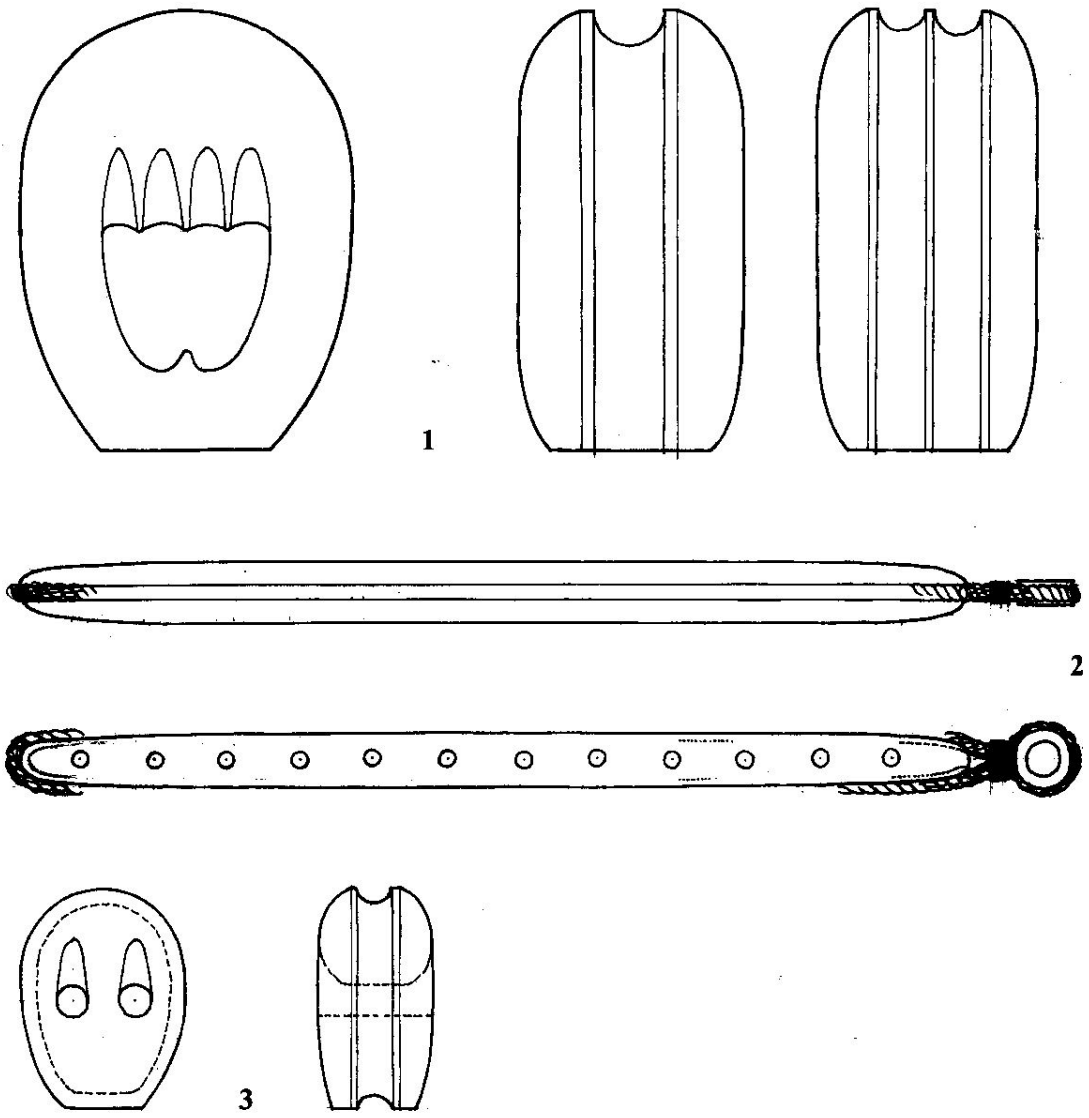
Crow's-foot or ***crow-foot***.

Fig. 270
Hearts etc.

1. Heart
2. Euphroe
3. Mizen-parrel deadeye



outline of a heart



STRAPPING OF BLOCKS

Strap.

As we have seen, the shells of blocks have one or two grooves or scores cut in them to take ropes called *straps* which run round and seize the block fast.

Single strap: If a thimble is to be strapped to the block, the strap must be one and a half times the length of the circumference of the block and the thimble. The strap is served overall, except at the two ends which are left exposed for a sufficient distance to form a short splice, which may or may not then be served over. The strap is then clapped on the block so that the splice is under the arse of the block, and a thimble-seizing is made fast between the thimble and the block; sometimes a hook is fitted through the thimble*.

*Occasionally a swivel-hook, especially in the case of lead-blocks [q.v.].

Becket: small eye made of rope.

As an alternative, a *becket* (see below) may be made fast to the arse of the block and the strap passed through it; the becket takes the bight of another rope, or else the bight is seized directly to the splice.

Obviously it is possible to lengthen the strap if required, and the thimble can be spliced in at the end of a long tail, in which case a second seizing is required.

The strap can finish in two eyes spliced in the strap itself, in which case there is no splice at the arse of the block; another variant is to form two wall-knots instead of eyes.

The thimble can be omitted, with the strap forming an eye.

In the case of a shoe-block, the splice is placed at the side, the strap surrounding only the lower part of the shell and passing through its centre in a score cut between the two sheaves for this purpose. For shoe-blocks the thimble is replaced by a plain eye, an arrangement which is in fact commonly adopted for many kinds of blocks, and this eye fits over the end of the yard, is clapped over the head of the mast, or has a toggle rove through it and seized on with a round seizing.

When the two legs of the strap are passed round a yard for example, they end in eyes which are then seized together; hence the expression to "seize" a block to a yard, spar, etc.

Tail-block.

To lash a tail-block.

Dogged: snaked, so as to hold it fast.

The strap can equally well be formed by passing a rope round the shell and seizing it together underneath, thereby forming two legs – as for example with the port-tackle spans; alternatively, it may have a single leg (in which case it is called a *tail-block*): the rope is passed round the shell of the block and either several seizings are clapped on, or alternatively an eye-splice is formed. Tail-blocks are designed to be *lashed* to the rigging, the tail being *dogged* round the rigging like the tail of a lash.

Everything which I have said above concerning the strapping of blocks applies also under certain circumstances to hearts and deadeyes, when for example they are not turned in to the stays or shrouds with throat-seizings.

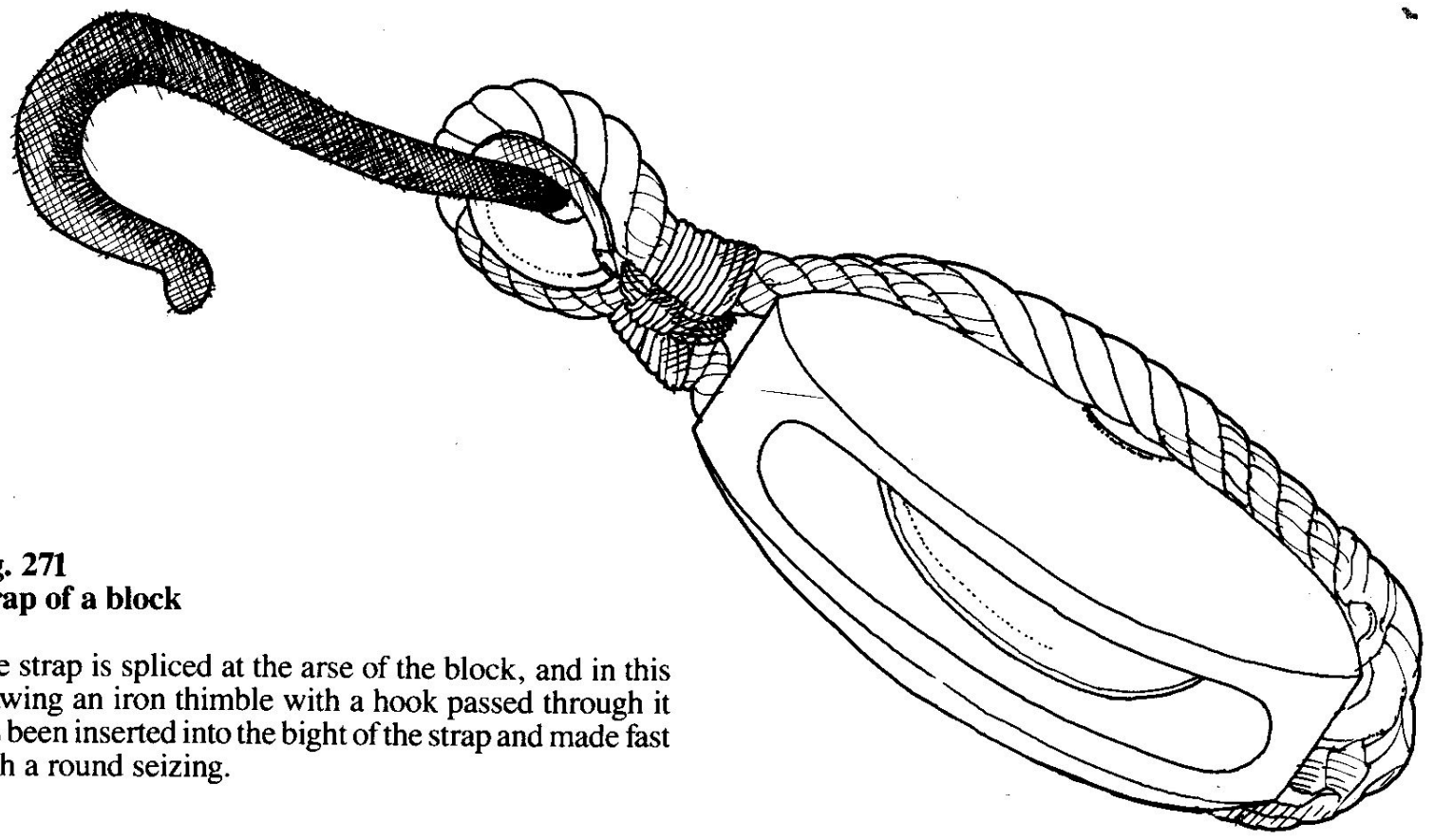


Fig. 271
Strap of a block

The strap is spliced at the arse of the block, and in this drawing an iron thimble with a hook passed through it has been inserted into the bight of the strap and made fast with a round seizing.

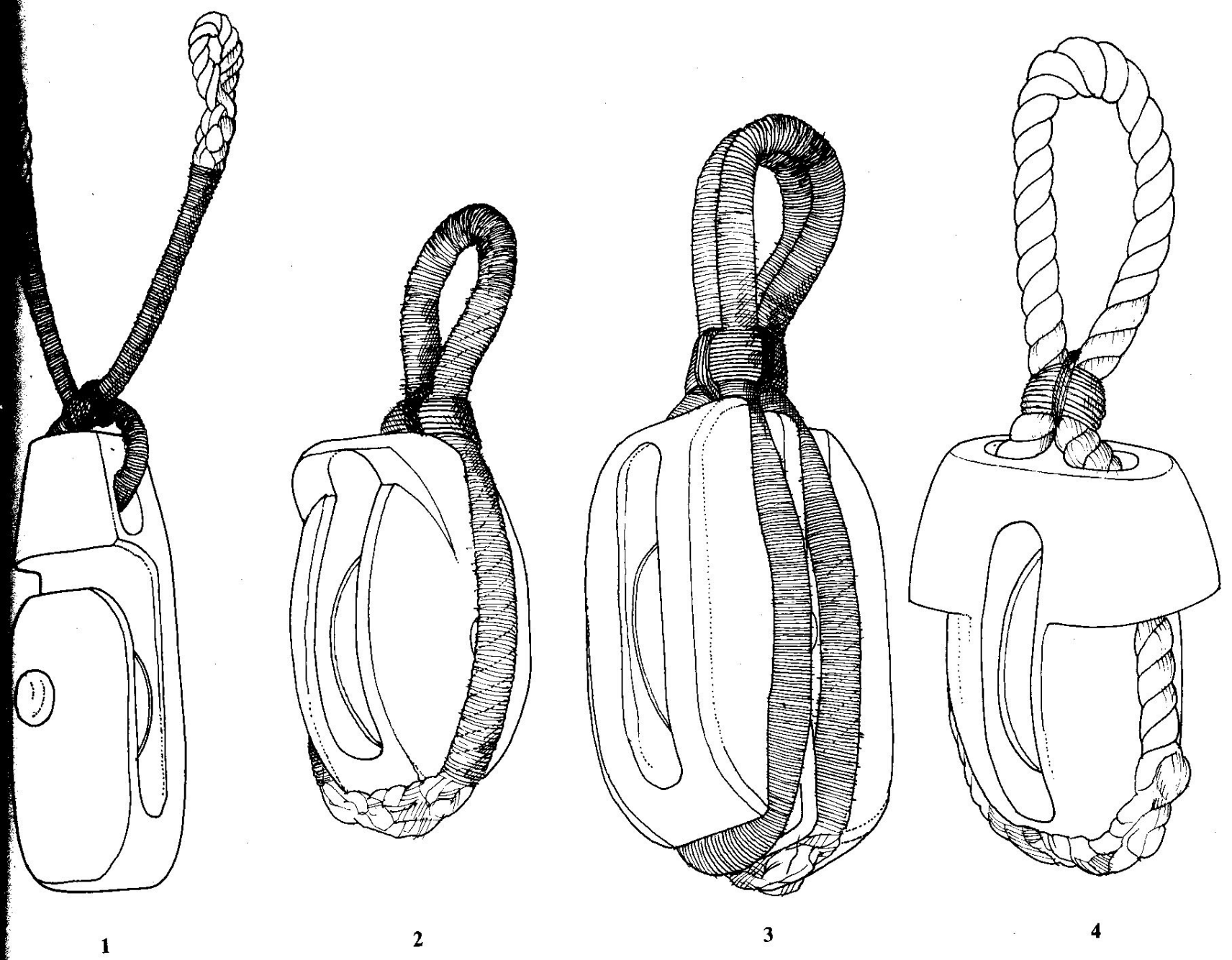


Fig. 272
Strapping of Various Types of Single Block

1. Snatch-block; the two legs of the strap end in eyes.
2. Shoulder-block; the strap is served overall except for the length of the splice.
3. Double-scored tye-block; the strap is formed from a single piece of rope which is spliced.
4. Buntline or "monk's head" block.

Figure 272 at the top of this page shows various forms of strapping of blocks.

Double strap: When blocks are double-strapped the strap must be twice the length of the circumference of the shell and the thimble, plus the amount necessary for the splice; as already mentioned, the shell has two scores to contain the strap.

There are two different ways of fitting a double strap: if the thimble is parallel to the sheave, the strap is doubled and the thimble (which has a wide groove) is inserted into the two bights; the strap is made fast with a thimble-seizing between the block and the thimble. Alternatively, if the thimble is at right-angles to the sheave two single straps are used.

Obviously double straps can, like single straps, end in a long leg with a thimble fitted at the end, or in an eye, etc.

Forming grommets: Grommets are used for small blocks; to form one for example in a four-stranded rope, take one strand which should be at least three times the length of the strap to be made. This strand is then laid up again as three strands and when the two ends meet after the last turn an over-hand knot is cast and the ends are pushed through the strands; the protruding ends are cut off, the grommet is served, and the block is inserted; a thimble-seizing is clapped on between the thimble and the block.

For a double grommet, the strand must be six times the length of the strap.

Iron straps: The shell of the block is bound with a strap of flat iron holding a short hook (in the case of the top-blocks), or a long and much larger one in the case of the cat-block. The sheave-pin of such blocks is of iron, with a head at one end and a mortice for a forelock pin at the other; the sheave is protected from wear by a bronze coak inserted in the middle, and other coaks are let into the cheeks of the block; the pin turns in the iron strap which widens out in the centre for this purpose.

DEADEYES

Like the blocks, the deadeyes are made of elm. They take the shape of a flattened sphere, with three holes pierced in the middle.

Lower shroud deadeyes: Have a groove or score round their circumference shaped to take the strap or bindings of the chains.

Upper shroud deadeyes: Identical to the lower ones, except that the score is cut to the size of the shrouds.

Topmast shroud deadeyes: Similar in shape, but the iron binding is continued down to form the futtock-plate, which has a hole in it to take the futtock-shroud hook (see Fig. 273).

Deadeyes are not only used for the shrouds, but they are always used to draw a rope taut using laniards, as we shall see in the following pages. Other deadeyes can have a double score round their circumference, which is never the case for the shroud deadeyes.

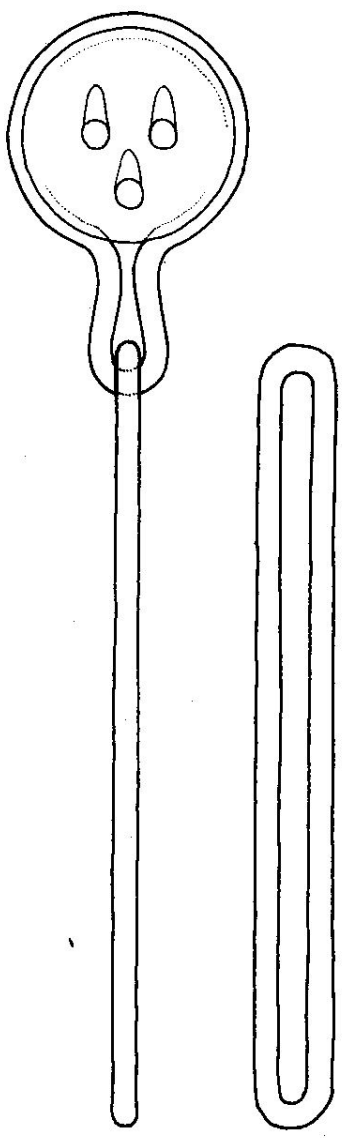
In Figure 273 I have shown all the details of the deadeyes, and I have taken the opportunity to show the chains as well.

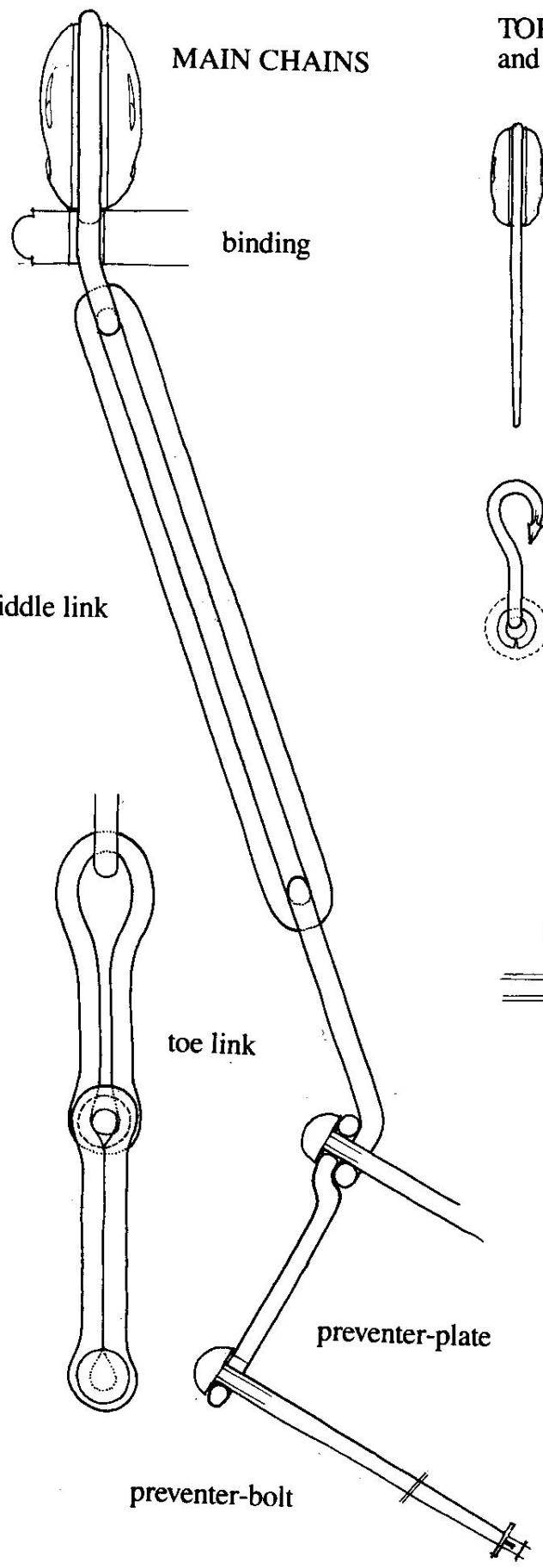
Fig. 273
Chains and Deadeyes

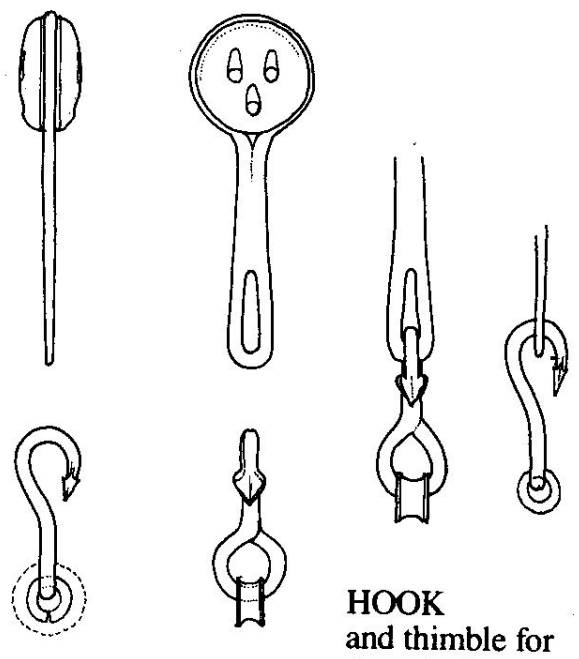
As a general rule the ironwork of the main chains has a section in lines (1/12″) equal to half the value of the beam expressed in feet (i.e. for our 74, 22 lines or 50 mm).

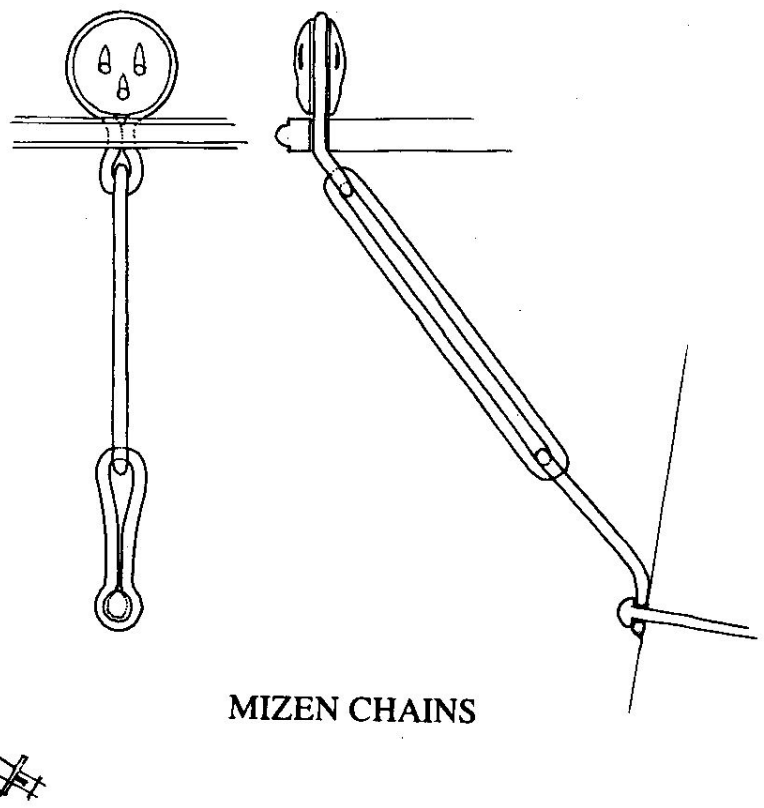
The fore chains are 1/10th less thick than the main chains, and the mizen chains 7/12ths of the main chains.

Scale: 1/20









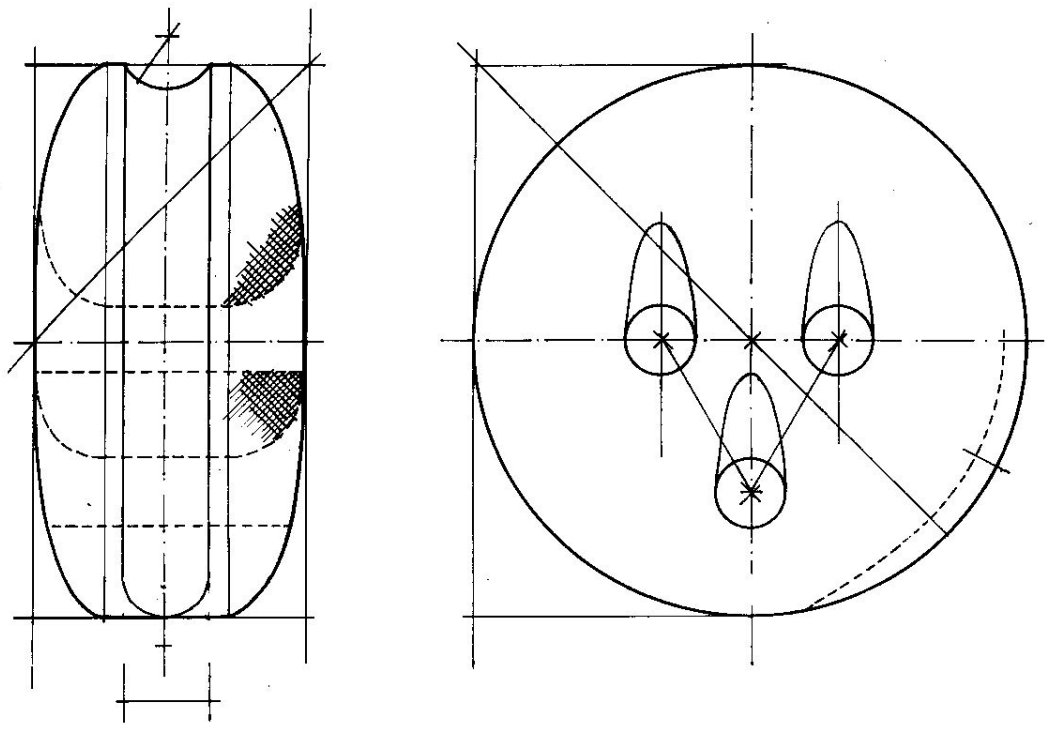
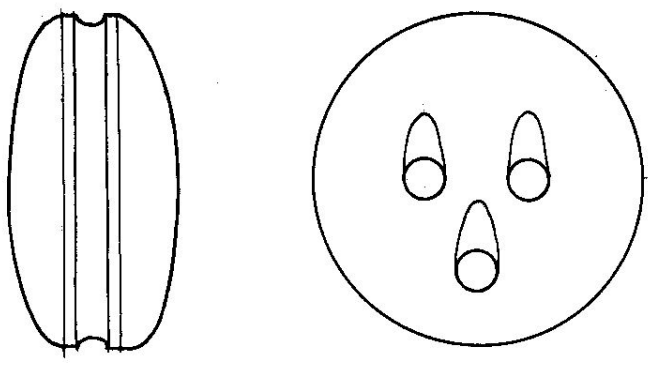
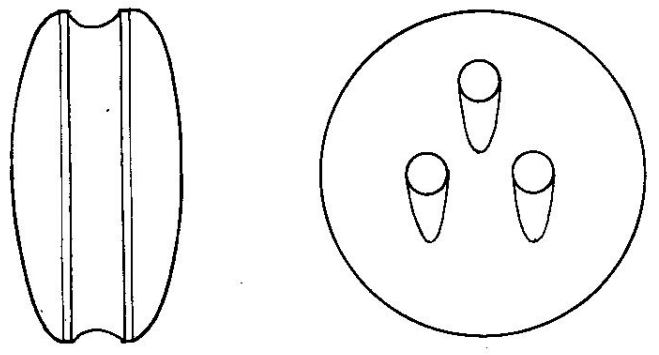


Fig. 274
Deadeye (Detail)



binding score



shroud score

OTHER ITEMS

Thimble: Sort of ring of wood, or more commonly of iron; its external circumference is grooved to receive a rope.

Bull's eye: Ring of wood serving to guide a line running through the middle. The external circumference is scored to take a strap and a semi-circular cut-out allows it to be made fast to a rope such as a bolt-rope.

Shroud-truck: Similar to a bull's eye, the shroud-truck is usually seized to the shrouds as its name implies* and serves as a fairlead for small to medium-sized running lines.

*But also sometimes simply called a ***seizing-truck.***

Travellers: Iron or rope rings (the latter spliced), used for the jibs of our 74. The standing-jib traveller is of bar-iron and is fitted with trucks to allow it to move freely along the jibboom. On the top is a large ring, a smaller ring and a hook. The rings take the tack of the jib and the jibstay, while the hook serves the outhauler (see page 200).

A rope traveller is used for the inner jib; it is frequently provided with trucks, and takes the outhauler and the tack (there is no stay for this sail, it being set flying).

Sister-blocks: Sort of long blocks with two equal-sized sheaves one above the other; sister-blocks are seized between two shrouds which hug the cheeks on either side. Sister-blocks can also be fitted to the hounds of the topmasts; they are usually flat and long.

Rack-blocks: Effectively a very long shell containing half-a-dozen or so sheaves. Rack-blocks are seized on either side of the bowsprit to the gammoning (see Figure 306), from which they derive their alternative name of *gammon-lashings*; a large number of lines reeve through them before being belayed at the beakhead bulkhead, and thus on occasions double sheaves can be fitted, simply by making the cheeks somewhat thicker.

Gammon-lashing.

Toggles: Cylinders of wood turned on a lathe and used to secure the sheets and lifts of the topsails, topgallants, etc.

Other shorter toggles are used for many purposes, but mainly to fasten two straps together through their eyes.

The tops are fastened in place by means of toggles passed through the eyes of eyebolts in the trestletrees and crosstrees.

Parrel-ribs and trucks: These make up a sort of collar or necklace, used to hold the yards against the masts but still allow them to be hoisted and lowered.

The trucks are simple spheres of elm with a hole through the middle to allow them to be strung on a rope*, while the ribs are lengths of wood which separate the trucks; there are ribs for two or three rows of trucks, and they also have holes in them so that the parrel-ropes run through both the trucks and the ribs. They are illustrated below in Figure 275, and in Figure 276 opposite.

*Called the ***parrel-rope***.

Masthead trucks: Take the form of a flattened sphere; masthead trucks are twice the diameter of the polehead to which they are affixed. The truck is fitted with two sheaves for the flag halliards.

Vane-truck.

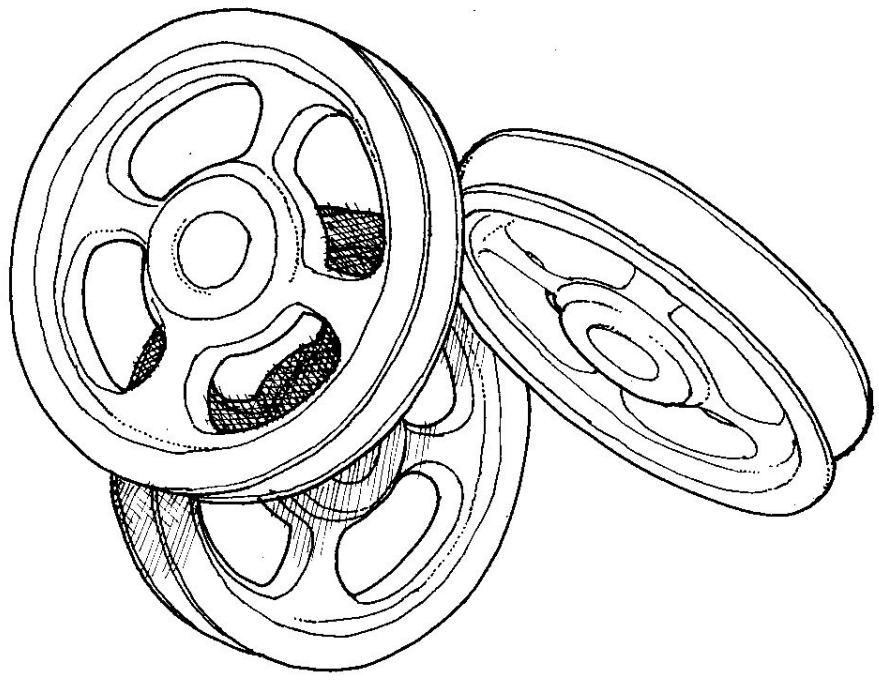
Vane acorns: Roughly acorn-shaped (although sometimes called *vane-trucks*), they are fitted to the top of the spindle of the vane to prevent the vane-stock from lifting off.

Pendant-staff acorn: Used to cap the staff from which pendants and command flags are flown.

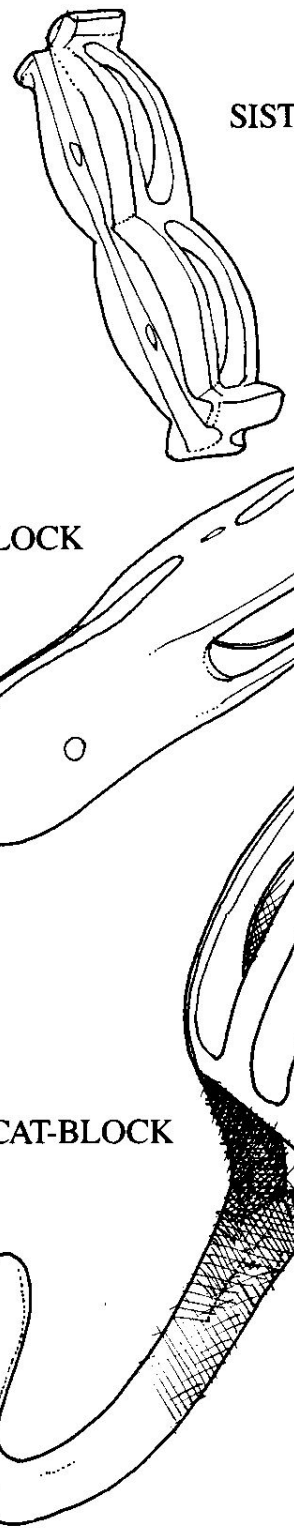
Fig. 275
Various Items of Rigging

For all these various trucks and acorns, see the section on the Master in Volume II.

Fig. 276
Assorted Bronze Sheaves – Blocks – Parrel

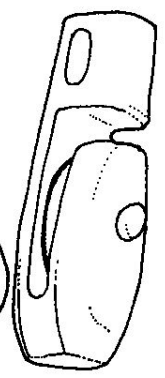


BRONZE SHEAVES FOR CATHEAD

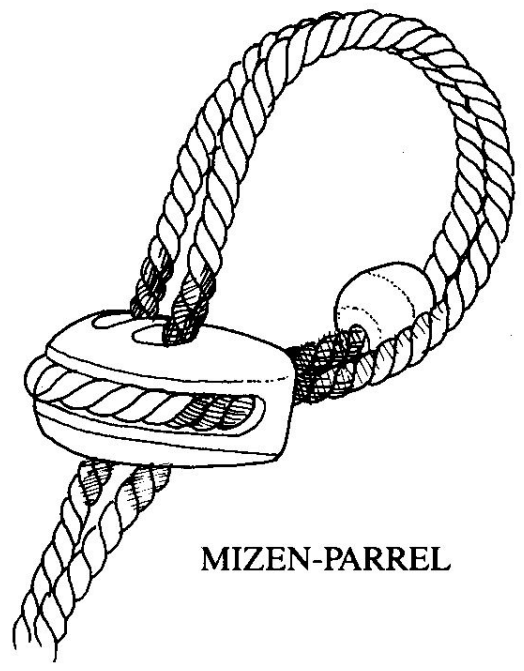


SISTER-BLOCK

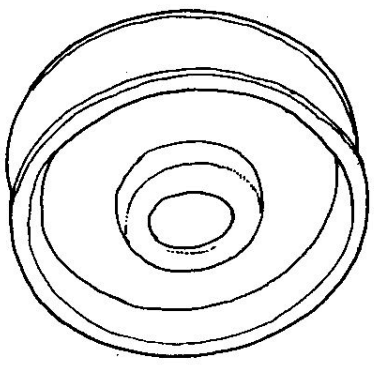
SNATCH-BLOCK



SHOE-BLOCK



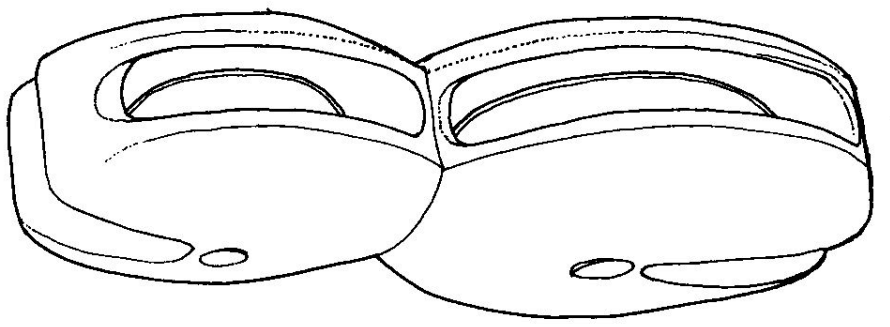
MIZEN-PARREL

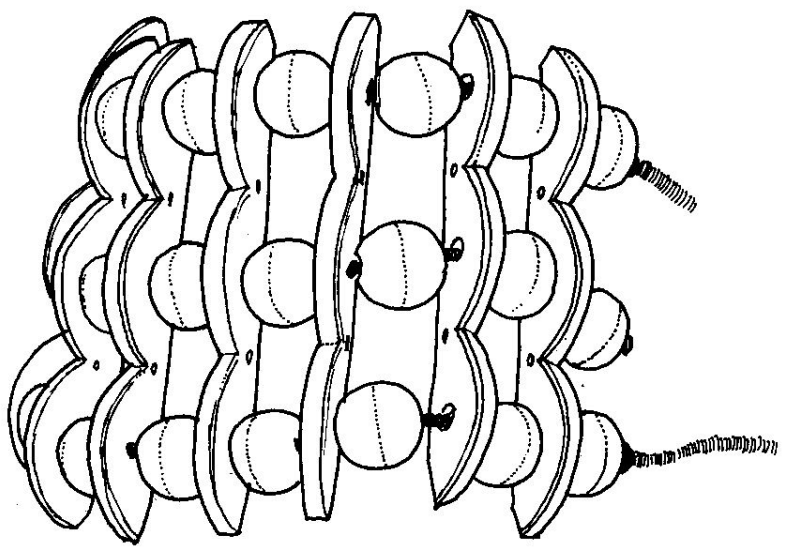


BRONZE SHEAVE

CAT-BLOCK

FIDDLE-BLOCK

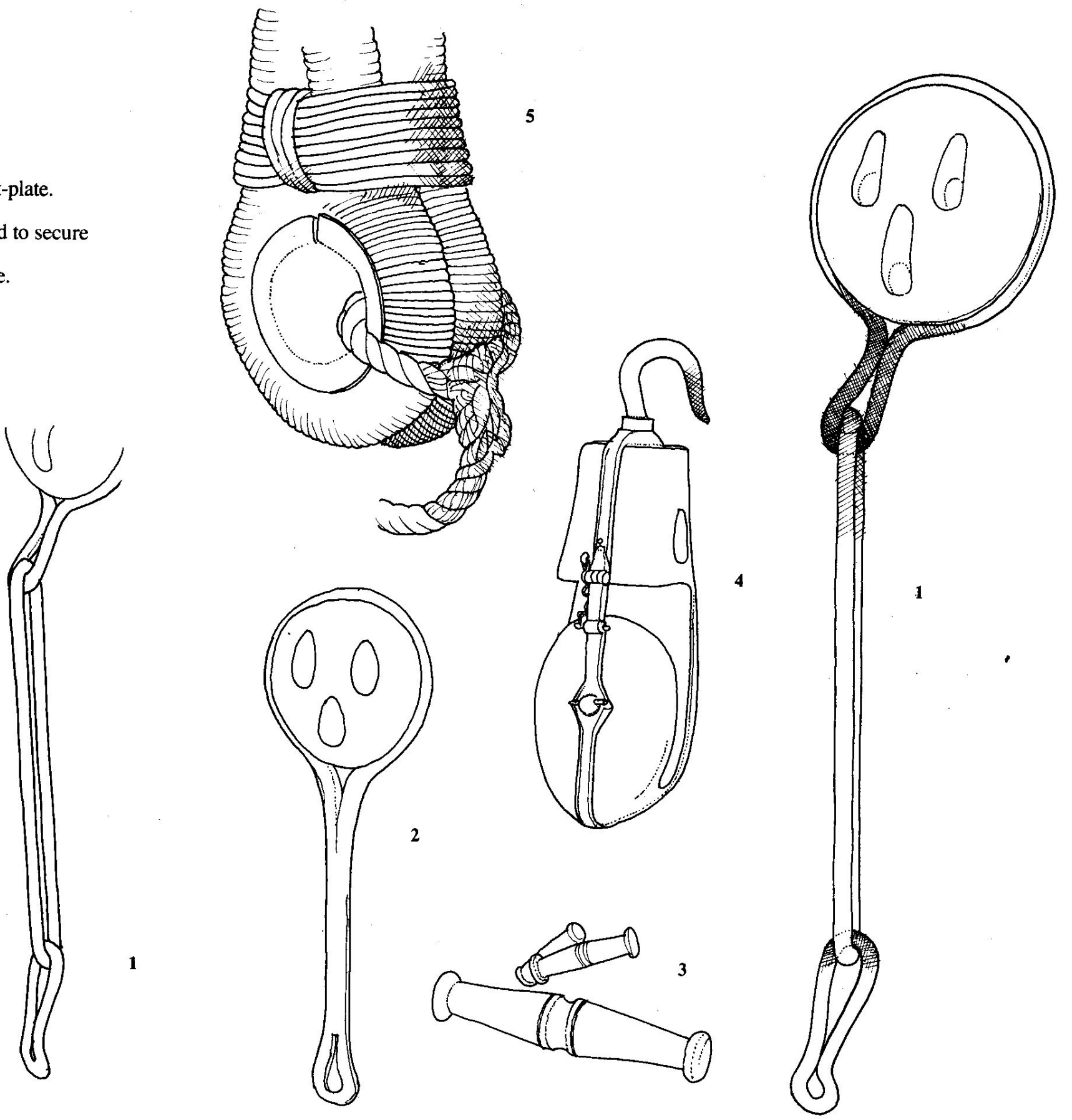




PARREL TRUCKS AND RIBS

Fig. 277
Various Items of Rigging

1. Chains.
2. Topmast deadeye and futtock-plate.
3. Toggles.
4. Iron-bound snatch-block used to secure the gammoning.
5. Double-strapped iron thimble.



Sizes of the Principal Blocks
(all dimensions in millimetres)

Diameter of the Ropes	17	19	22 24	26 28	30 32	34	36	39	43	50 41 54 56	60 48	63 52 67	69 65	73 76 80 82	86
Breadth of the swallow*	23	27	32	34	38	41	43	47	54	63	68	77	81	88	95
Shell length: Single Blocks	136	163	190	217		244 271			298 325		352 379	461	488	515	542
Shell length: Double Blocks				271 325			352 379	407 434	461 488	517 542					
Shell length: Treble Blocks				271 325			352 379	407 434	461 488	517 596					
Shell Length: Fiddle Blocks		271 298		379 434	461 515	542 596	650 678	759	813	867					

*There is nothing absolute about the relationship between the size of the swallow and the size of the rope. An old proverb "small line large block" provides a general rule, and it should be noted that the sheave is 4.5 mm narrower than the swallow.

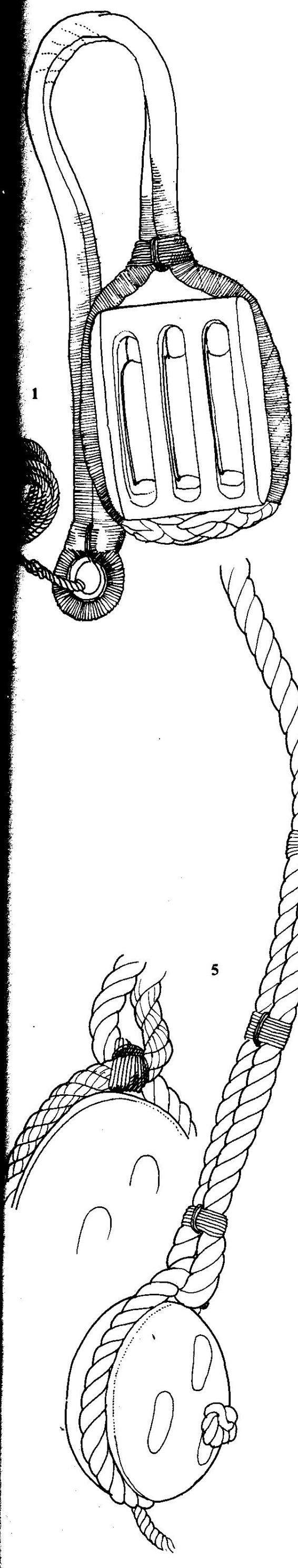


Fig. 278
Various Types of Strapping

1. Upper jeer-block.
2. Strapping of the heart of the mainstay.
3. Strapping of a shoe-block.
4. Two legs of a strap ending in eyes with a seizing.
5. Deadeye turned in a shroud with a throat-seizing and three round seizings.
6. Double-strapped treble block.
7. Tack and clue-garnet blocks with the straps finishing in crown knots.

BITTS ETC.

In the two earlier Volumes I described the various bitts of our 74, but I thought it might be helpful to cover them again here and add some further details.

Main topsail-sheet bitts: As we have seen, these are situated on the upper deck a little way forward of the mainmast. As the name suggests, they are principally used for belaying the main topsail-sheets (see section 5). They are composed of two vertical pins which come together in the between decks and are bolted to the beams of the upper deck and the gundeck. An alternative arrangement to this fork is for the pins to run down parallel the whole way.

The head of the pins is shaped to a knighthead, and the two pins are joined by a cross-piece. The pins are morticed to take three bronze sheaves which turn on an iron sheave-pin, which bears on bronze coaks let into the sides of the bitt-pins. Note that the sheaves and the sides of the pins are not aligned with the longitudinal axis of the ship, but incline outwards at an angle, the apex of which faces aft. This arrangement is designed to allow the men to haul on the ropes rove through the sheaves without the ship's boats getting in their way.

Fore topsail-sheet bitts: These bitts are situated on the forecastle somewhat forward of the foremast, and they are smaller than the main topsail-sheet bitts. Their general arrangement is the same, but the pins are not angled outwards and have only two sheaves.

Ninepin-bitts: Abaft the foremast and the mainmast and situated respectively on the forecastle and on the quarterdeck are two further bitts similar to those already described. Of lighter construction, their pins are merely scored into the beams of the forecastle and quarterdeck, and bolted. The pins are worked to knightheads at their head, and their cross-pieces are similarly worked at their outboard ends. A shole is nailed to the deck-planking directly below the cross-piece; it is the same length and breadth as the cross-piece but not as thick.

Iron sockets are let into the lower face of the cross-piece and the upper face of the shole to take the pivot-pins of nine swivelling blocks, seven between the pins and one outboard of each bitt-pin. These blocks are roughly skittle-shaped, or in the form of ninepins, hence their name*. They are iron-bound with flat iron straps which take the iron sheave-pins, and iron pivots are welded to the straps top and bottom to fit into the sockets in the cross-piece and the shole. In addition to these nine ninepin-blocks there are two bronze sheaves in each of the bitt-pins. Belaying-pins are placed in the cross-piece between each ninepin-block, allowing the lines rove through the blocks to be belayed.

*In French they are called *poulies marionnettes*, a different but equally colourful image. [Trans.]

Catheads: I thought it might not be out of place to describe the catheads in detail – not the whole cathead, but just the outboard end.

At the end there are three bronze sheaves with iron sheave-pins. On our 74 these pins are extra long, since they also serve for the sheave of a *snatch-sheave* nailed to the forward face of the cathead.

The three sheaves are used for reeving the cat-fall, while the snatch-sheave (the sheave of which is also of bronze) is used for the anchor-stopper, which explains its greater breadth.

*The purpose of this ***snatch-sheave*** or ***thumb-block*** will be explained in detail in Volume IV.
There is another kind of snatch-block used sometimes for the maintack: it is strapped with a tail, which is made fast to the carling of the gangway. The snatch is closed by a pin which can be removed when required. It is called a ***rouse-about block***.

The extreme end of the cathead has a score cut in it, through which the anchor-stopper passes as it runs out along the cathead when the anchor is being lowered; sometimes, to reduce chafe on the stopper, a *chock* is nailed to the end of the cathead so that the stopper is led through an angle of more than ninety degrees.

Chock: a word with many meanings in shipbuilding, but here a small block of wood fayed to the upper surface of the cathead, the outboard end of which is shaped to a curve.

A hoop of flat iron binds the end of the cathead, and there is a hole for the stopper inboard of the sheaves; just behind the hole is a ringbolt, and at about the same point there are two other ringbolts, one on the forward face and one on the after face of the cathead.

Fixed-blocks: Fixed-blocks* are let into the side of the ship slightly forward of the mainmast. These are blocks of wood fitted with four sheaves canted in the direction of the lines which reeve through them (see the following sections); these lines are then belayed inboard. Sometimes other dead-blocks called *cavel-blocks* are nailed to the gunwale. and the number is a matter of choice for the riggers; thus there are cavel-blocks situated on the bulwarks towards the after end of the poop.

*Sometimes called ***deadblocks.***

Cavel-blocks.

CLEATS

Range-cleats: Sometimes simply called *ranges*, these are nailed either vertically or horizontally. The arms or "horns" of the cleats curve outwards at their ends; the larger ones are made with a shole, as for example are the *mast-cleats* nailed to the lower masts. Other special cleats are the powerful ones used when manoeuvering the anchors: they are nailed to the forecastle and are called *stopper-cleats*, because the stoppers are belayed to them.

Ranges or ***range-cleats.***

Mast-cleats.

Stopper-cleats.

Shroud-cleats: These are belaying-cleats similar to those mentioned above, but they have a small base which is grooved to take the shroud and a score at either end for the seizings which fasten them to the shrouds.

Jeer-bitts: The jeer-bitts consist of a single massive knight situated abaft the mainmast and fitted with five bronze sheaves. It serves principally to raise and lower the mainyard. Our 74 still has jeer-bitts for the mainmast, but there are no fore jeer-bitts, and more and more the tendency is to replace the jeer-bitts with a winding-block made fast to a ring in the deck.

Kevels: More complex than the range-cleats described above, kevels are made up of several pieces; there is a cross-piece nailed to the bulwarks and the two horns pass through this to meet at the heel where they are nailed to the ship's side. Their general shape takes the form of a pair of horns, from whence their alternative name of *staghorns*. Some are made somewhat differently, with the horns fitting at the bottom into a foot or step nailed to the side, while the upper part curves backwards so that they look like a pair of shoes upside-down.

Staghorns.

Somewhat analogous to cleats are the bolsters of soft wood nailed to the port and starboard sides of the foremast and scored to take the legs of the mainstay and main preventer-stay collars.

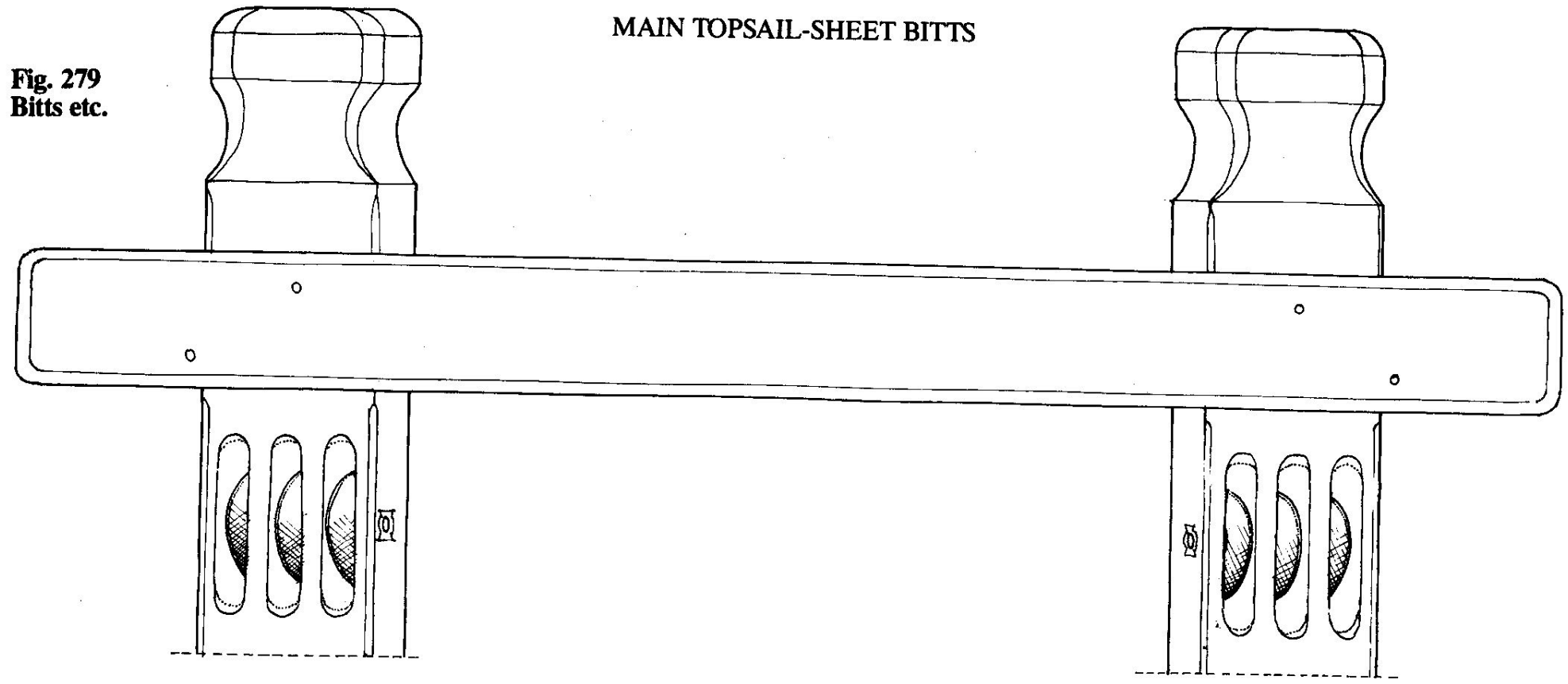
Pin-rails: Nailed to the stanchions of the forecastle breastrail and the poop breastrail, and to the bulwarks of the quarterdeck, are strong shelf-like timbers called pin-rails; they have holes in them to take the *belaying-pins*, which are hardwood pins turned on a lathe and measuring about 1 1/2 inches [4.1 cms] in diameter and 16 inches [43 cms] in length.

Belaying-pin.

Sometimes there are pin-rails against the beakhead bulkhead, and you will have observed that the stanchions are provided with a sheave; the lines rove through these sheaves are belayed to the timber heads at the head of the stanchions.

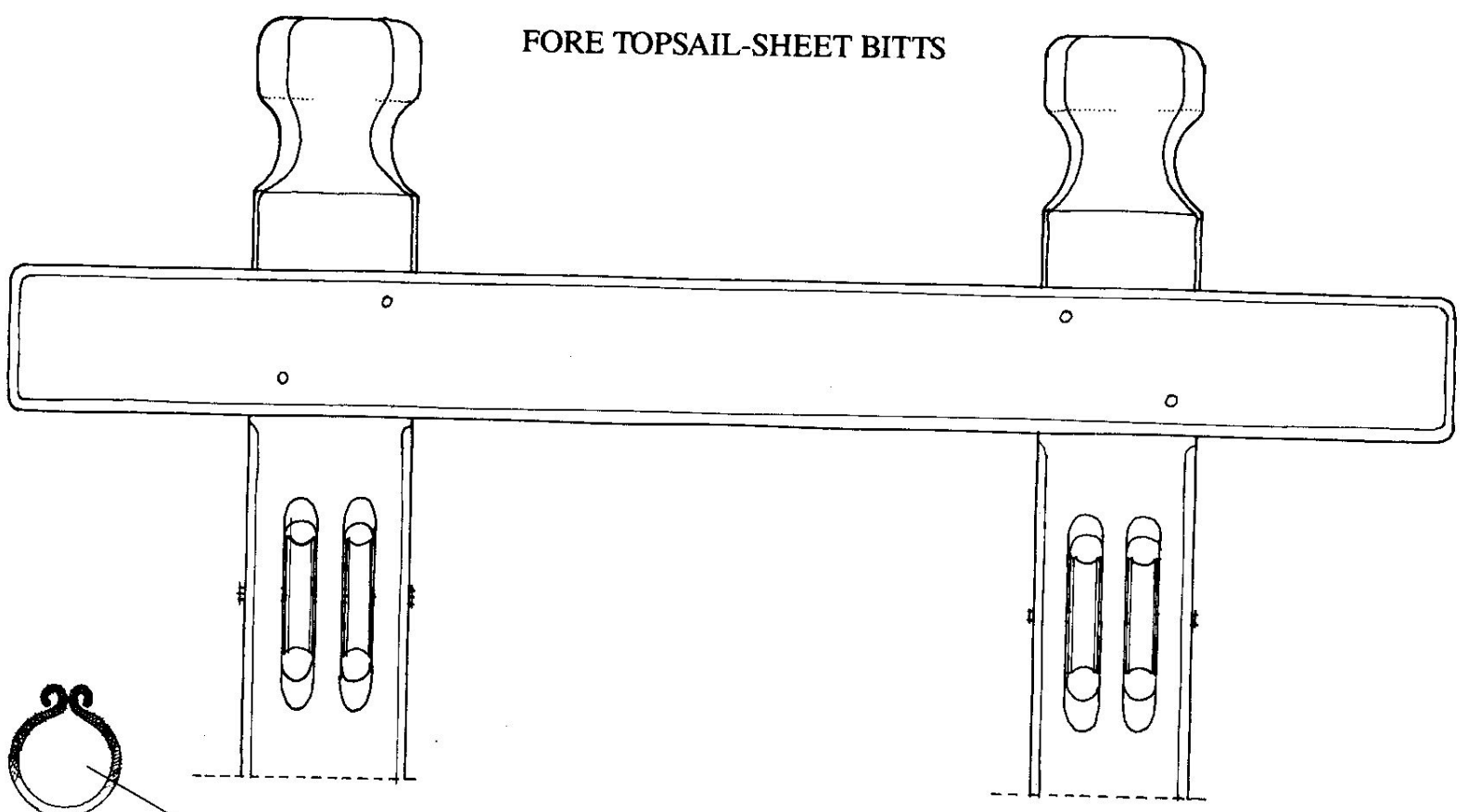
Fig. 279
Bitts etc.

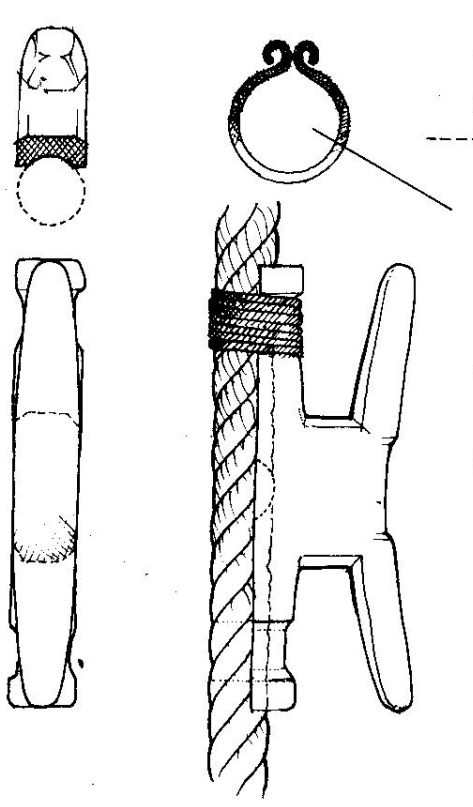
MAIN TOPSAIL-SHEET BITTS



FORE TOPSAIL-SHEET BITTS

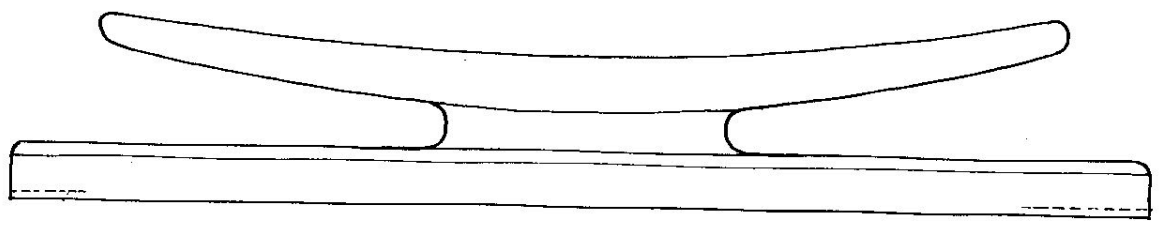
Scale: 1/18





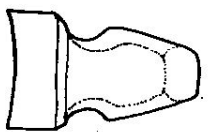
HANK

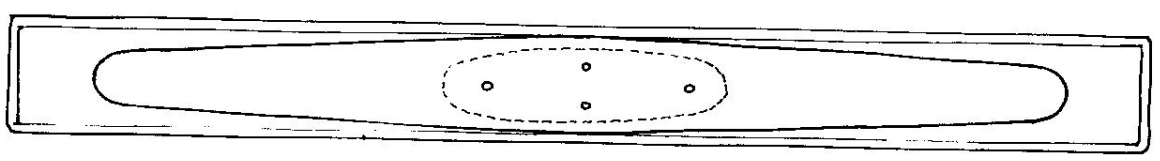
The iron rings on which the jibs and staysails travel are called hanks. They are "moused" or closed with a few turns of line.



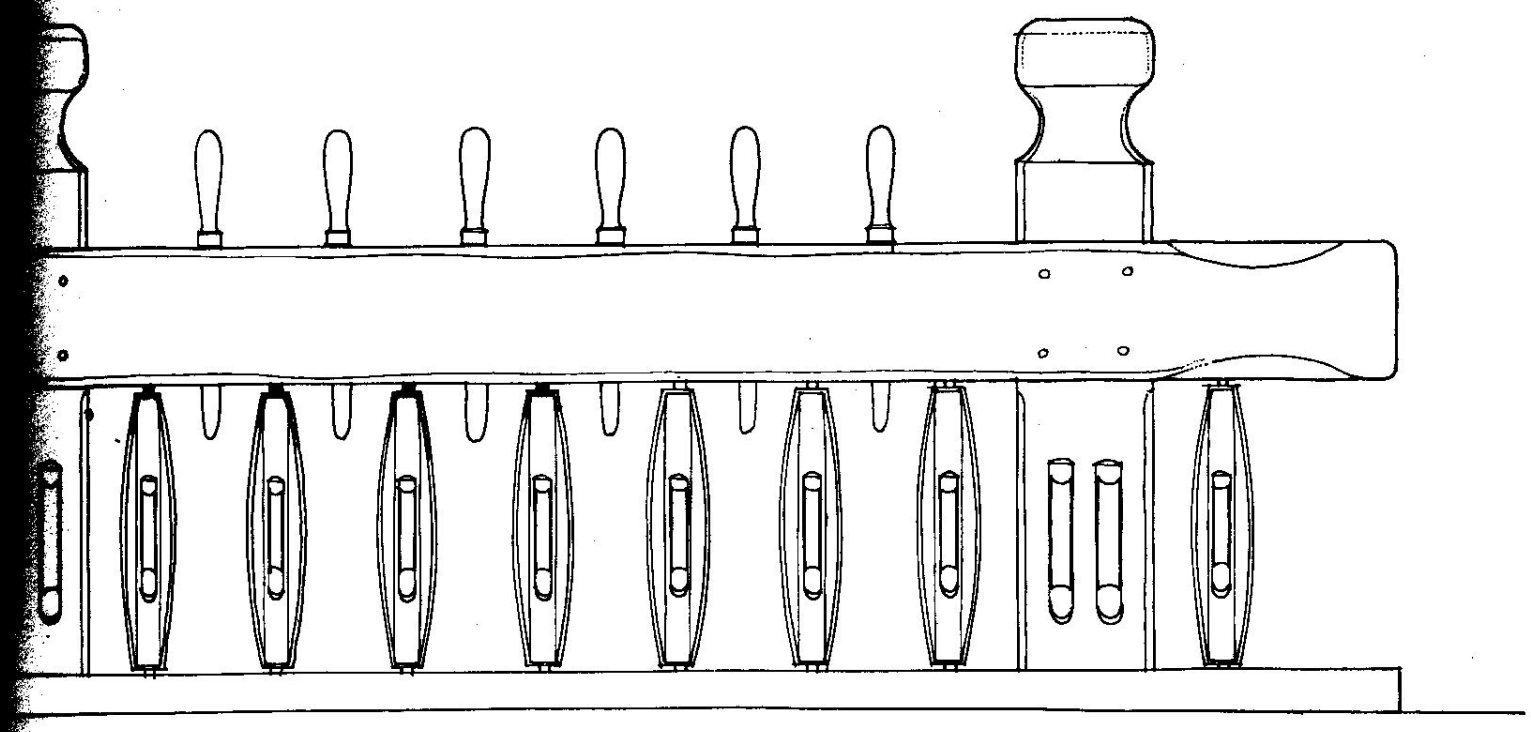
RANGE-CLEAT OR MAST-CLEAT

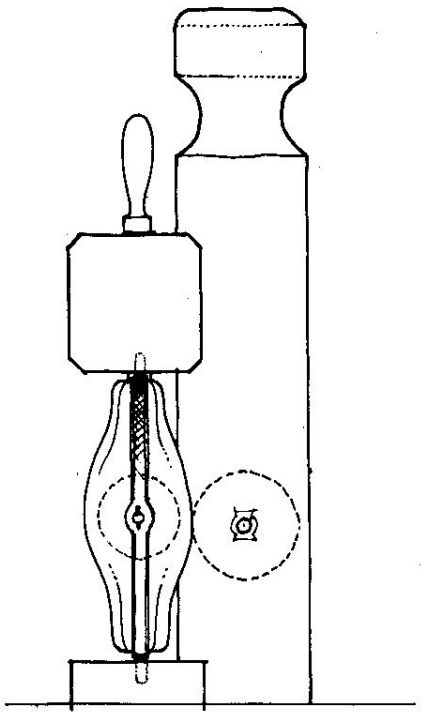
SHROUD-CLEAT





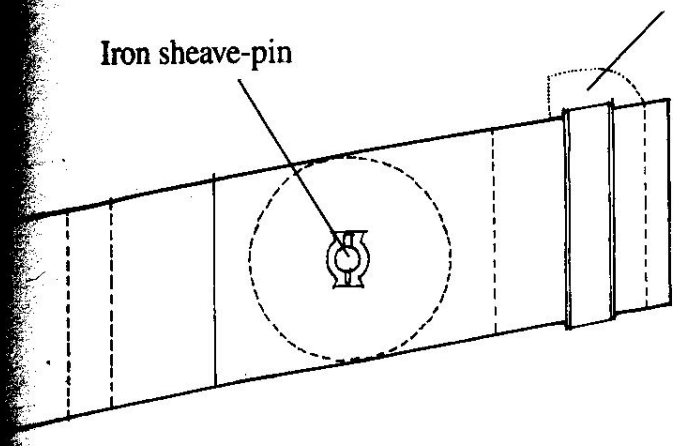
NINEPIN-BITTS

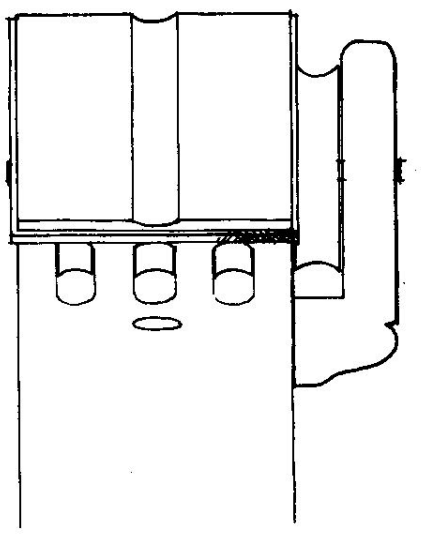


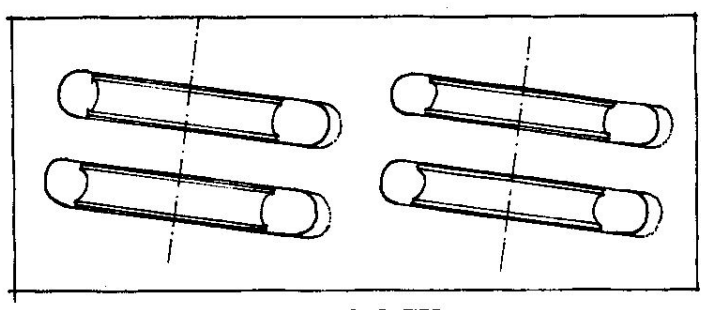


Chock

Iron sheave-pin





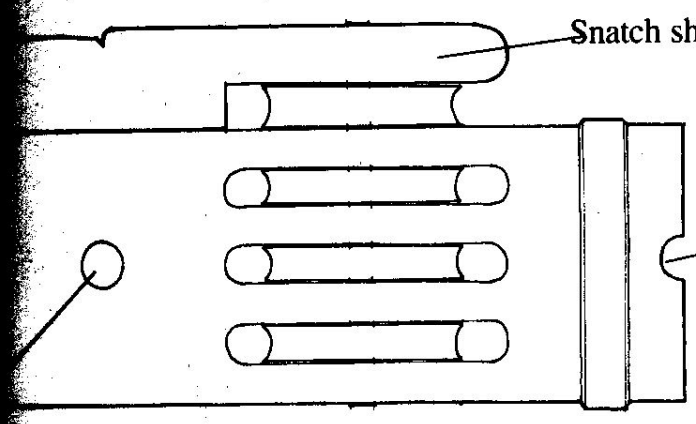


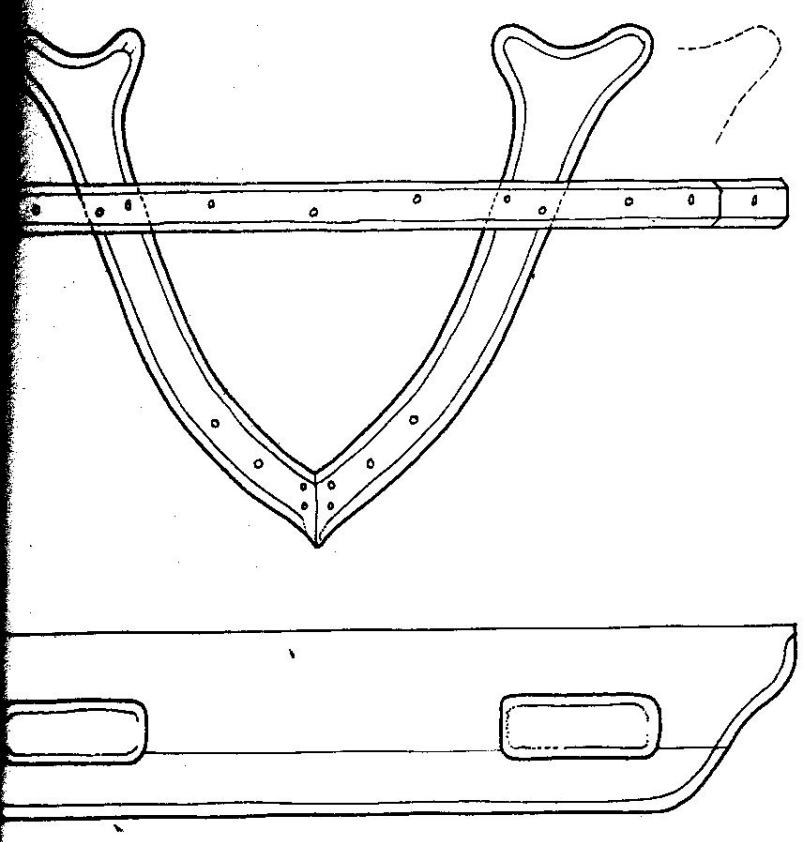
FIXED-BLOCK

OUTBOARD END OF
THE CATHEAD

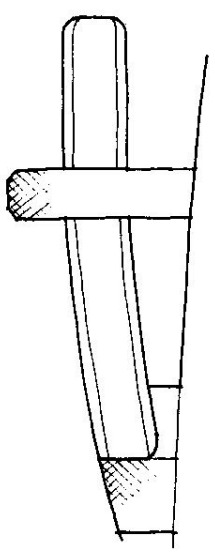
Snatch sheave

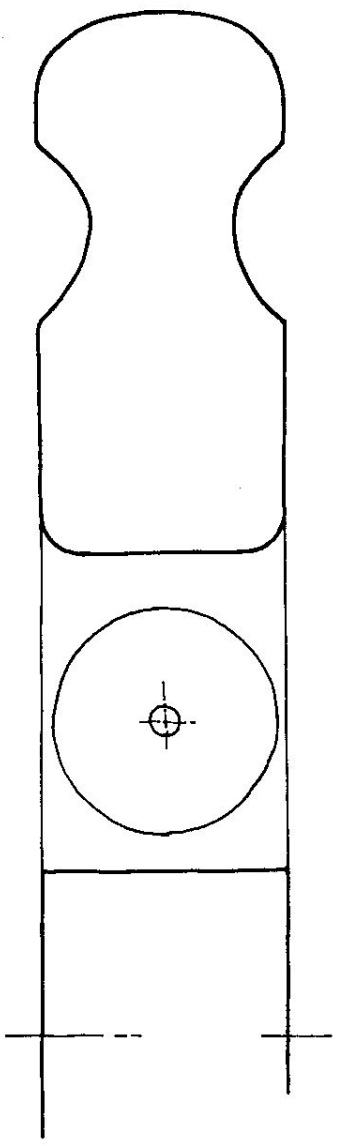
Score for stopper

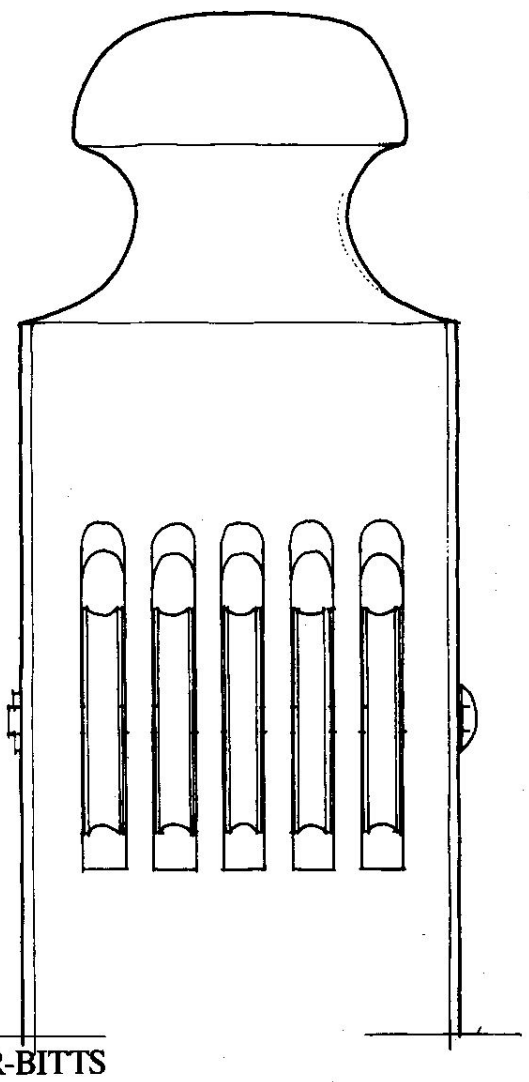




KEVEL (two sizes)







JEER-BITTS
(bronze sheaves)

3. STANDING RIGGING

Shrouds – Backstays.

It is obvious that the masts have to be supported if they are to stand up to the forces to which they are subjected, whether the force of the wind or the forces due to the movement of the sea. With regard to the latter a distinction must be drawn between rolling and pitching movements. To compensate for the effects of rolling, *shrouds* and *backstays* are used, and these are secured at one end to the masthead so that they hang down on either side. The shrouds must form the widest angle possible, for the wider the angle the greater the support provided. In order to obtain the greatest "spread" possible the lower end of the shroud is secured to the outboard edge of the channels, and, in the case of the topmast and topgallant shrouds, to the rim of the tops and to the ends of the topgallant crosstrees. By means therefore of the shrouds and backstays, the masts are adequately supported laterally, but they are also "summoned" aft, since the foremost shrouds are opposite their masts and the others tend aft from there; this arrangement is designed to balance the efforts of the stays.

Preventer-stays or *spring-stays.*

The stays are arranged fore-and-aft and serve to counteract the effects of pitching. They have a bight taken over the masthead on top of the shrouds and are then taken forward at as wide an angle as possible, which means that they are made fast at their lower end a long way forward of the mast to which they belong. Some of the stays are doubled by other smaller ropes called *preventer-stays*.

The tension of all these items of rigging must be able to be adjusted depending on the strength of the wind and how heavy the sea is running. This is achieved by means of a tautening arrangement at the lower end of the standing rigging.

Thus, in simple terms, it can be said that the shrouds placed at either side of the masts counteract the effects of rolling, while the stays running fore-and-aft compensate for pitching.

Tackle pendants: lengths of rope suspended from the masthead to which tackles are affixed.

To the above should be added a relatively large number of *tackle pendants* which are made fast at the mastheads; these can also be considered as part of the standing rigging, and will be covered in this section, as will a variety of other items which relate to the rigging of the masts.

After some hesitation, I have decided to follow in my description of the standing rigging the "progressive" method – to cover each item in the order in which it is set up; do not therefore be surprised if for the fore lower mast I describe first the tackle pendants and then the shrouds, for it is in that order that they are fitted over the masthead. To describe each rope according to its type is admittedly another possible approach, but one which lends itself, I believe, above all to illustrations; for that reason I have adopted it only for that purpose, as will be seen from Figures 286 to 289.

BOWSPRIT (see Figure 280)

The bowsprit is not rigged like the masts, both because of its steeve and because of its position relative to them, which means that one of its functions is to provide support for a number of the stays. It is particularly affected by pitching motions, but very little by roll.

Gammoning: As we have already seen, the heel of the bowsprit is solidly fastened by its two steps in the between decks, and supported by several timbers (described in Volumes I and II); however, forward of the apron it is unsupported, since the head is only a fragile assembly of light timbers. For this reason the projecting part of the bowsprit is secured to the hull by means of two* lashings called the gammoning, which in a sense are similar in function to the shrouds. The gammoning

*English ships were often only fitted with one.

is made up of several turns of heavy rope, generally top-ropes which have already served, and are thus no longer prone to stretching. This is important as the bowsprit must be totally unable to move. Gammoning must be carried out in fair weather, so as to avoid the risk of wetting the rope which would then inevitably stretch as it dried out. It goes without saying that the old top-ropes used for the gammoning must still possess all their strength.

The first gammoning to be made is the outboard one, i.e. that which is placed furthest forward. This is because if one started with the inboard one the process of putting on the second one might draw the bowsprit lower and produce some slack in the first gammoning.

The number of turns varies; usually there are eleven, but some people prefer to use a heavier rope* and take only six to eight turns, which makes the process of hauling the turns taut less lengthy, although more onerous for each turn. Our 74 has two gammonings each composed of six turns.

*Which cannot then be old top-ropes.

I will not explain how each turn is tautened* – suffice to say that a weight of some kind such as an anchor or one of the ship's boats is suspended from the end of the bowsprit so as to pull it down towards the stem.

*Although I will go into some details in Volume IV in the sections on seamanship.

The gammoning rope is first made fast to the bowsprit with a running knot or a bowline hidden underneath. Stop-cleats called *gammoning-cleats* are nailed to the bowsprit (see Fig.280), whose purpose is to prevent the gammoning from slipping backwards. The turns are taken on forward of the standing end.

Gammoning-cleats.

The free end is taken down at an angle to the forward part of the upper mortice or *gammoning-hole* in the knee of the head; it is passed through from port to starboard and runs up on the starboard side, also at an angle, back towards the standing part, against which the first turn is made over the bowsprit. The rope is then led back **aft** of the previous turn in the gammoning-hole and up again **forward** of the previous turn on the bowsprit until six turns have been completed. This will be clearly seen on the drawing.

Gammoning-hole.

The remaining length of rope is taken in a series of *frapping* turns round the gammonings between the bowsprit and the knee of the head in order to seize them hard together, and the whole is finished off with half-hitches pulled very tight. Frequently the forward gammoning has one more turn in it than the after gammoning, which is executed in exactly the same fashion, save that the rope is passed through the lower gammoning-hole from starboard to port.

Frapping: turns taken at right-angles to the first.

In Figure 280 I have drawn a little sketch to show how the gammonings are put on, which should make everything clear.

Bobstays: These are the bowsprit stays, and they restrain it from the effects of pitching, at the same time providing a counter-strain to the effort of the fore stays (see below). The bobstays on our 74 are arranged in what is called "English fashion" A long rope is passed through a hole in the bobstay-piece, just below the feet of the figure. The two ends of the rope are passed up towards the bowsprit and spliced together, forming a bight into which a deadeye is turned by making a throat-seizing under the deadeye. The whole length of the rope is wormed and served with spun-yarn. A second deadeye is turned in to a collar long enough to pass round the bowsprit, below the forestays (see Fig. 280), and the collar ends in two eyes which are seized together. A laniard joins the two deadeyes in the manner which I shall come to in a moment when discussing the shrouds of the fore lower mast. The laniard is passed alternately through the holes of the upper and lower deadeyes and then dogged for several turns round the bobstay below the lower deadeye and made fast with a flat seizing of spun-yarn.

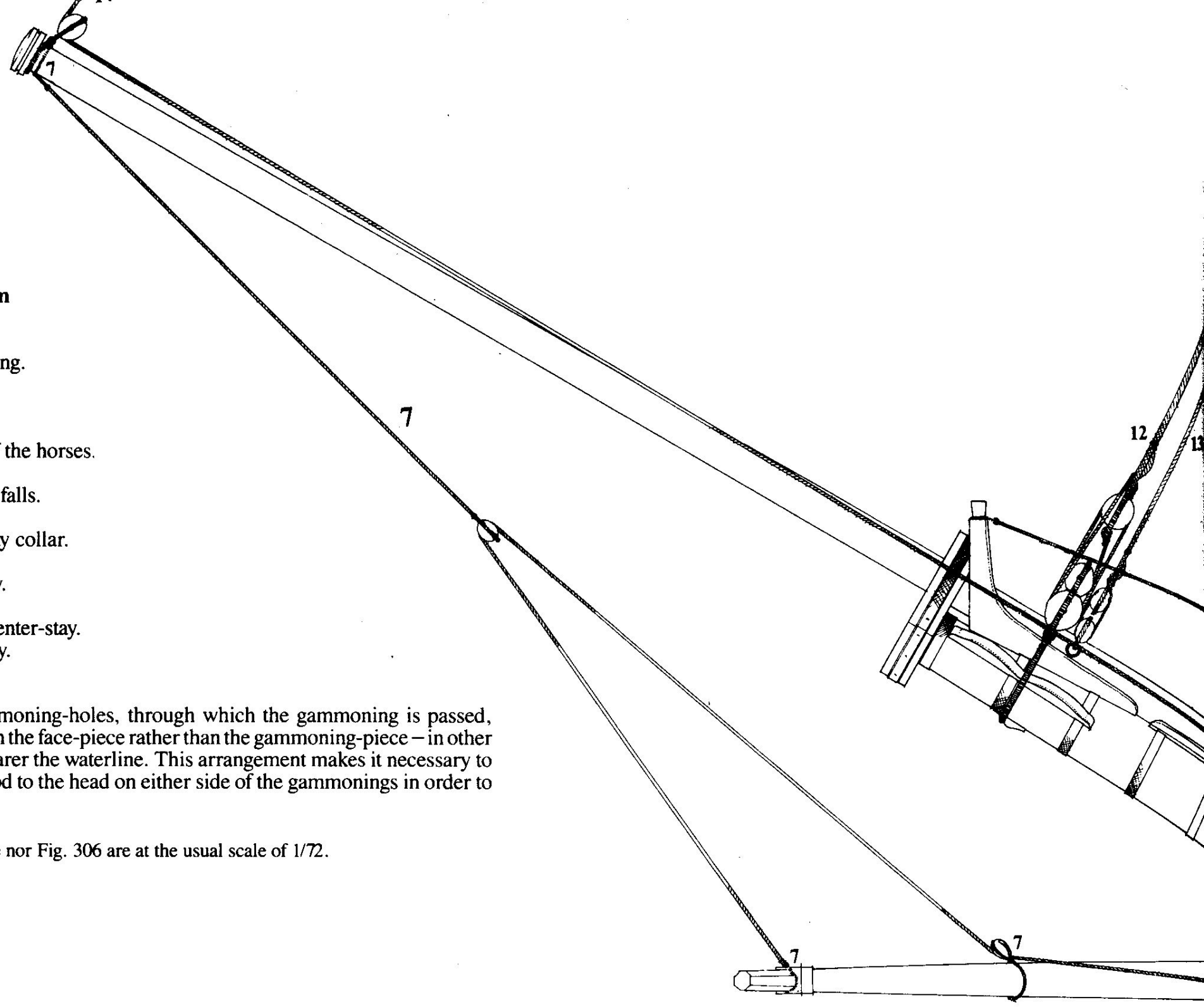


Fig. 280
Bowsprit and Jibboom
Standing Rigging

1. Forward gammoning.
2. After gammoning.
3. Bobstays.
4. Horses.
5. Legs or stirrups of the horses.
6. Crupper.
7. Guy pendants and falls.
8. Mainstay collar.
9. Main preventer-stay collar.
10. Forestay.
11. Fore preventer-stay.
12. Fore-topmast stay.
13. Fore-topmast preventer-stay.
14. Fore-topgallant stay.
15. Bumpkin stays.

*The mortices or gammoning-holes, through which the gammoning is passed, may sometimes be cut in the face-piece rather than the gammoning-piece – in other words, significantly nearer the waterline. This arrangement makes it necessary to nail bolsters of soft wood to the head on either side of the gammonings in order to protect them.

*Note: Neither this Figure nor Fig. 306 are at the usual scale of 1/72.

Both bobstays are rigged identically.

*On English ships one bobstay was used until about 1719, when two were fitted. A third bobstay was authorised on May 14th 1800. [Lees: op. cit.]

Often there is only one bobstay on French ships*, rigged as follows: a single block is made fast to the bobstay-piece, and a long-tackle block fastened beneath the bowsprit between the forestays; a line is made fast at its standing end in the strap of the single block, while the running end is passed successively through the sheaves of the blocks and belayed towards the top of the stem after being hauled very taut*.

*Alternatively there may be two double blocks rigged like a gun-tackle.

Horses: On our 74, the horses are formed of a long rope served with spun-yarn middled and seized to a ring passed over the head of the jackstaff-standard; the two ends are then turned round a small deadeye, joined by a laniard to a second deadeye in a collar fastened to one of the stanchions of the beakhead bulkhead. The horses are then bowsed taut by means of the laniard, and four *legs* help to trice it down; these legs pass under the bowsprit and have eyes formed in their ends, through which the horses reeve; the legs are also served.

Legs or *stirrups.*

Fore-topmast staysail netting.

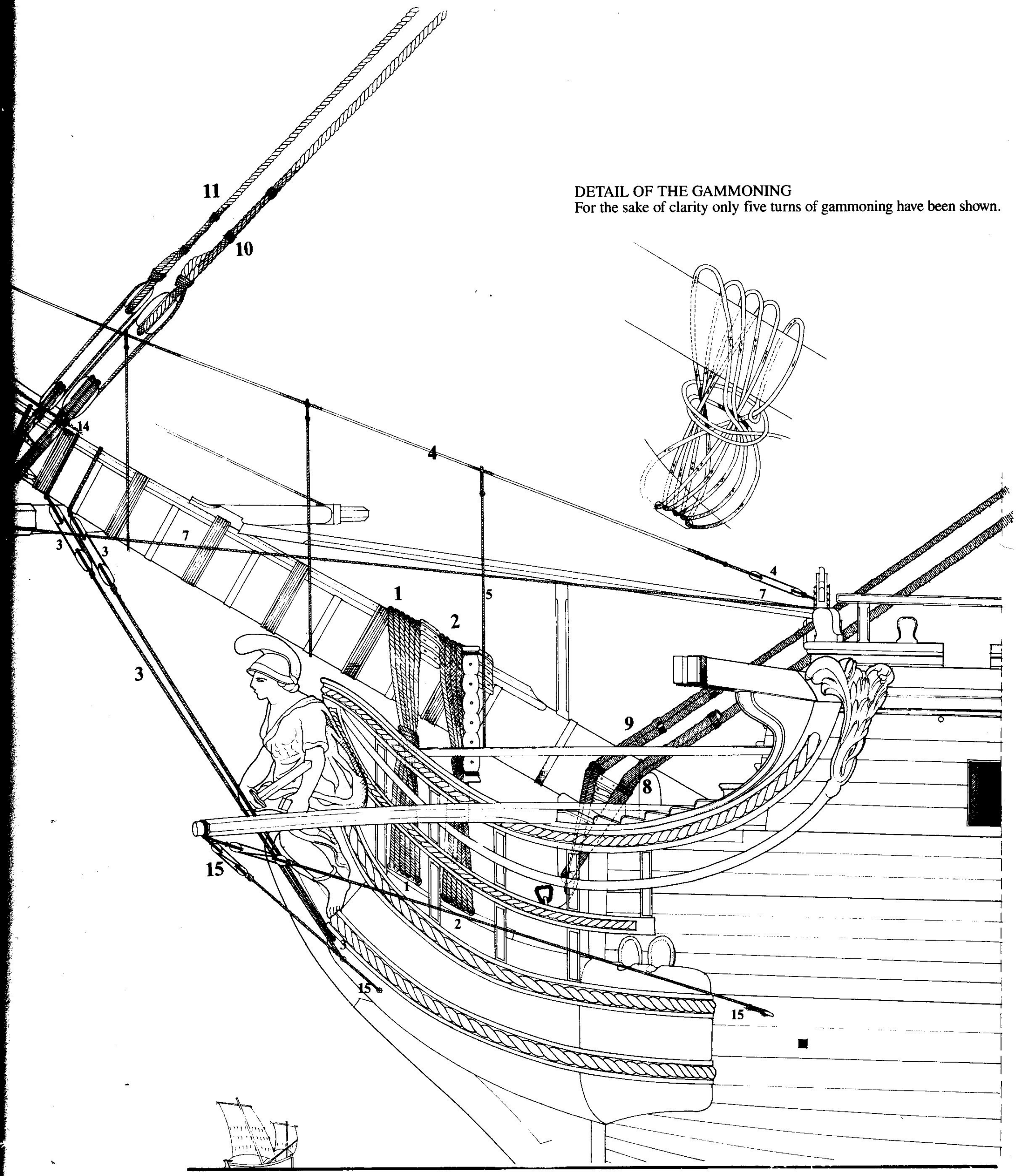
The horses may be used to support a netting into which the fore-topmast staysail is stowed as it is lowered. This netting, which is rectangular in shape, is laced on its longer sides to the horses between the cap of the bowsprit and the *crupper*, and on its shorter sides to two *stretchers* lashed at their ends to two of the legs of the horses, thus serving to spread them as well.

Crupper: Jibboom lashing, similar to that used to lash the heeling of the topmast to the head of the lower mast.

Stretchers.

When however the jibs are secured along the bowsprit (see Volume IV), this netting is no longer required.

DETAIL OF THE GAMMONING
For the sake of clarity only five turns of gammoning have been shown.



JIBBOOM

The jibboom is in a sense like a topmast, albeit a "mast"which is nearer the horizontal than the vertical.

As we have seen, the jibboom's projection outboard varies, but may be as much as two-thirds of its length; the remaining third is secured to the bowsprit by the crupper, and runs out along it to pass through the cap so that it is suitably secured to the bowsprit which it extends. I should add at this point that the jibboom may itself be extended by a further spar called the *flying jibboom*, used to spread a *flying jib*; however, as we saw in the chapter on the sails, these are not used by ships of the line.

Flying jibboom.

Flying jib: this term can be confusing, because strictly speaking any jib can be said to be "flying" when not rigged to a stay; thus the inner jib is in this sense also a "flying" jibsail. In this context however the meaning is clear.

Crupper: At the beginning of this chapter I explained how a lashing was executed, and these explanations apply equally to the crupper which secures the jibboom to the bowsprit.

Outhauler: If it is necessary to extend the jibboom further outboard, a rope called the *jibboom outhauler* is used. Its standing end is made fast to eyebolts in the bowsprit cap, and the running part reeves through a sheave in the heel of the jibboom, runs up then towards the cap where it reeves through a block, and back down again to be belayed on the forecastle, from where any adjustments are carried out.

Jibboom outhauler: essentially performing the same function for the jibboom as the top-ropes for the topmasts.

This tackle is only used to increase the projection of the jibboom, and once it is correctly positioned the outhauler is unrove and used for the crupper.

Guy pendants and falls: The extreme projection of the jibboom means that it must be supported port and starboard by what are effectively shrouds, although called *guys*. A pair of *pendants* is made fast over the forward end of the jibboom below the truck. Each pendant has a block turned in an eye in its lower end. A rope called the *fall* has its standing end made fast by means of an eye spliced round the yardarm cleat of the spritsail yard, while the hauling part reeves through the pendant block, then through a second block lashed to the inner quarter of the spritsail yard, and is then bowsed taut and belayed to one of the stanchions of the beakhead bulkhead.

Jibboom guys.

Guy pendant: (here) a short length of rope fitted over the jibboom and with a block seized in its lower end.

Guy pendant fall: essentially a tensioning device for the "'shrouds" of the jibboom.

It will be clear from this that the spritsail yard plays an important role in spreading these quasi-shrouds.

Footropes: The footropes or horses of the jibboom are made fast round the forward end of the spar and lashed to either side of the bowsprit cap. At regular intervals the horses are knotted so as to provide some purchase for the men's feet, an essential precaution in view of the steep steeve of the jibboom.

FORE LOWER MAST (see Plate LI).

In general the word foremast is applied to all three spars which go to make up the whole, and in order to avoid any risk of confusion I am in this section referring specifically to the lower mast only, not to the topmast or topgallant-mast.

Before fitting the standing rigging over the mast, the head is first tarred, and small filling-pieces called *bolsters* are fitted over the trestletrees (see Chapter XII) and covered with leather or tarred canvas*.

Bolsters.

*Sometimes a pudding is clapped round the masthead so as to form a cushion for the pendants and shrouds.

This now is the order in which the various items of standing rigging are fitted over the fore lower mast:

Tackle pendants: There are two tackle pendants which hang down on either side of the lower mast. The more powerful of the two tackles has a treble block seized to the pendant and a double block below: this is the *fore winding-tackle*, and it is used for swaying the ship's boats in and out,

Fore winding-tackle.

and hoisting in and out anchors, masts, yards, etc. The other tackle is less powerful and is made up of a fiddle block seized to the pendant and a single block below. This is the *fore tackle*, and it is used to hoist lighter loads, to set up the lower shrouds, manoeuvre the anchors, etc.

Fore tackle.

Tackle-pendants are required in order to rig the winding-tackles and fore-tackles, and these are the first items of standing rigging to be brought overhead the lower mast. The pendants are ropes of the same thickness as the shrouds but much shorter. There are two on each side. A bight is taken in the rope, leaving two legs of unequal length; the after one, which is the longer of the two, is about a quarter the length of the shrouds. A seizing is clapped on below the bight so as to form an eye, and sometimes a second seizing is clapped on a little lower than the first*. This eye then fits over the masthead and rests on the bolsters; the pendant is wormed and parcelled for the part where it bears on the bolsters, the parcelling being made of leather, and the seizing or seizings which form the eye are clapped on over the parcelling. The remaining length of the pendants is served overall with spun-yarn. The lower ends of the pendants are taken back on themselves and eye-spliced round a thimble so that the rope fits into the groove surrounding it.

*The seizing is composed of 10 or 11 double turns of line or ratline of a thickness proportionate to that of the pendant. It is then covered with a short parcelling in order to protect it from chafing, and also from the rain which might otherwise seep in between the turns of the seizing and cause it to rot. Often only one seizing is clapped on.

At the beginning of this chapter I explained how such splices were made, but with the splice finished the ends of the strands are unlaid and tapered with a knife so that no swelling is formed as it is gradually brought down along the pendant, and the serving lies snugly over it.

The pendants take the upper blocks of their respective tackles; the blocks are strapped with an iron thimble, and this is lashed to the thimble in the pendant. The lower blocks are fitted with strong hooks. The fall is seized at its standing end to the strap of the lower block, and the hauling part reeves alternately through the sheaves of the two blocks, to run down to the deck where it reeves through a *lead-block* hooked temporarily to a ring. The purpose of the lead-block is to change the direction of the fall so that it is horizontal rather than vertical, which allows as many men as necessary to tail onto the tackle, or for it to be rigged to the capstan.

Lead-block or ***leading block***; sometimes also called a ***return block***.

When the tackles are not in use they are stowed on the inboard side of the shrouds; as already noted, their lower blocks are fitted with hooks which are passed through a thimble seized into the long single tail of the strap. The hook is led to an eye in the spirketting in the way of the foremast in the case of the fore-tackle, and somewhat forward of the third gunport of the forecastle in the case of the winding-tackle.

The first pair of shrouds to be placed overhead is the port-side pair, followed by the starboard pair.

Fore lower mast shrouds: There are eight* shrouds on either side, and they, like all the shrouds on board and all the tackle-pendants, are laid up from hemp of the first quality (see the first section of this chapter), and hawser-laid so that between a quarter and a third of the length is lost in laying. It is important that the shrouds should stretch as little as possible since it is difficult *to set them up* afresh once at sea because of the almost continuous rolling.

*Sometimes there are nine on the foremasts of 74's. A set of shrouds is called a ***gang of shrouds.***

To set up shrouds: to tighten them by means of the deadeyes and their laniards.

Since there are an even number of shrouds they are cut in pairs, each pair being formed from a single length with a bight taken in the middle, the bight thus forming an eye in the same way as was described for the pendants.

From the bight downwards, for a distance equal to half the breadth of the top, the two shrouds forming the pair are served with spun-yarn, and the eye is also protected like that of the pendants.

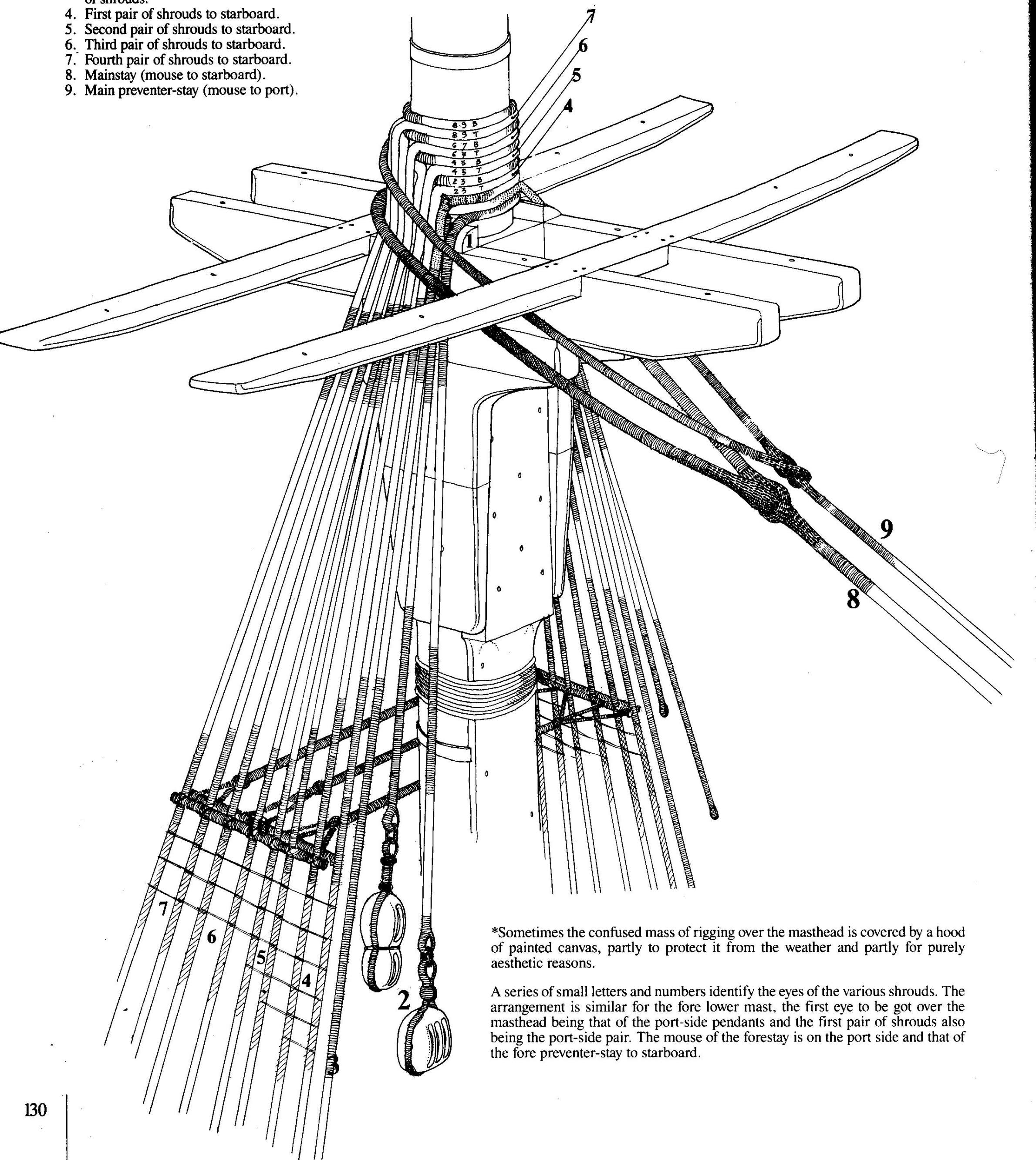
*Since worming with spun-yarn has the disadvantage of causing the rope to rot, some riggers prefer to cover the shroud with a sword mat which can be laced on or unlaced at will.

As a rûle the foremost shroud is wormed* and served overall, in order to protect it from the chafe caused by the foreyard and the bolt-rope and the sheets of the forecourse. This chafing is particularly severe when the sail is masked or begins to flap* (see Volume IV).

*The sail flaps when its wind is "stolen" by another sail; if not filled it will flap as the vessel rolls.

Fig. 281
Close-up View of the Pendants and Shrouds Overhead the Mainmast

1. Bolster of softwood cut to a quarter-round and nailed to the trestletrees where the pendants and shrouds bear.
2. Eye with two legs forming the main winding-tackle and main-tackle pendants (starboard side).
3. Eye in the bight of two single shrouds (swifters) placed one to port and one to starboard where there are an uneven number of shrouds.
4. First pair of shrouds to starboard.
5. Second pair of shrouds to starboard.
6. Third pair of shrouds to starboard.
7. Fourth pair of shrouds to starboard.
8. Mainstay (mouse to starboard).
9. Main preventer-stay (mouse to port).



*Sometimes the confused mass of rigging over the masthead is covered by a hood of painted canvas, partly to protect it from the weather and partly for purely aesthetic reasons.

A series of small letters and numbers identify the eyes of the various shrouds. The arrangement is similar for the fore lower mast, the first eye to be got over the masthead being that of the port-side pendants and the first pair of shrouds also being the port-side pair. The mouse of the forestay is on the port side and that of the fore preventer-stay to starboard.

The first pair of shrouds to be got over the masthead is the port-side pair, on top of the eye of the starboard pendants; with the first pair in place, the second eye follows for the first pair on the starboard side, and so on. When all the shrouds are overhead there are ten eyes in all, one on top of the other, riding on the bolsters of the fore lower mast trestletrees. The eyes must be forced hard down one on top of the other, leaving no space in between.

In many ships the foremost shroud of the lower masts is set up by means of a tackle composed of two treble blocks rather than the two deadeyes.

At the lower end of each shroud is a deadeye of the same size as its partner in the channels (see the table of diameters of the deadeyes on page 142), and the two deadeyes are used to set up the shroud*. The deadeye is *turned in* to the end of the shroud by means of its score and it is seized by a throat-seizing above the deadeye and three round-seizings.

Turned in: like the strapping of a block.

It is important for the outward appearance of the ship that the shrouds be carefully cut to length so that their deadeyes are perfectly parallel with those in the channels, leaving a distance between them of about 4 to 5 feet [1.29 – 1.62 m].

Let us examine now how the shrouds are set up.

A length of rope called a *laniard* ends in a wall-knot which prevents it from pulling through the after hole of the upper deadeye; the knot is on the inward side. The laniard passes down from this after hole and through the after hole of the lower deadeye, then up and through the central hole in the upper deadeye, and so on, the laniard moving forward at each pass. Once it has been rove through all the holes, finishing in the forward hole of the lower deadeye, it is bowsed very taut and passed up the shroud, taking several turns round the throat-seizing and then being stopped at its end by a seizing of spun-yarn.

Deadeye laniard.

Ratlings: The ratlings serve as ladders for the crew and they are made* in the same manner, whether it be for the shrouds of the lower masts or for those of the upper masts. The description which follows is valid for all the ratlings.

*Making the ratlings was called ***rattling down the shrouds***.

The ratlings are lengths of ratline running across the shrouds 13 to 14 inches [35 – 38 cms] apart; they are made fast to either the second or the third shroud (the first and sometimes the second being left free of ratlings on the lower masts) by means of an eye spliced in the end which is seized to the shroud with a length of marline. The ratling is fastened to the intermediate shrouds by means of two turns and a half-hitch*, and to the aftermost shroud by means of an eye and a seizing.

*On English ships a clove-hitch was always used.

I should mention the fact that the ratlings of the lower masts start fairly high up because of the deadeyes and their laniards, and so a number of small ladders (generally made of rope) must be fitted so that the crew can climb up to the ratlings.

Preventer-shrouds: These are used to reinforce the lower shrouds and are usually made of heavy ropes or cablets which have already served; one is fastened to the head of the lower mast from either side, both the foremast and the main being so strengthened. To fit preventer-shrouds, the end of the cablet is sent up round the forward side of the masthead and brought down again on the same side of the ship from the after side, so that the bight fits round the masthead. An eye is formed by clapping on several seizings below the bight, the bight is rotated, and the two ends are bowsed down hard to the channels, one on either side of the ship. Preventer-shrouds are only used if heavy weather is expected or if the shrouds are old. However, they are also employed when the ship is hauled down on a careen (see Chapter XV). Preventer-shrouds are thus items of temporary rigging.

Forestay: This is made up from a very heavy cable-laid rope (i.e. laid up from 3 hawser-laid ropes as explained at the beginning of this chapter). The stay is fastened to the head of the fore lower mast by means of a *collar* which fits down over the eyes of the tackle-pendants and shrouds, pressing them down against the *horns* of the trestletrees. The lower end of the forestay is taken down to the bowsprit where it is set up by means of a laniard and two hearts.

Stay collar.

Horns of the trestletrees.

Eye of the mouse.
Mouse of the forestay.

Let us now examine the forestay in detail. The collar is formed by passing the lower end of the stay through an eye (the *eye of the mouse*) spliced in the other end and the bight thus formed is stopped by a swelling called the *mouse*; at the beginning of this chapter I described in some detail how to raise a mouse, so I will not go over the same ground again. The mouse blocks against the eye from the port side. We have already seen how the collar is served, and sometimes the stay is wormed, parcelled and served overall; if not, a series of snaked seizings are clapped on to secure the worming.

A heart is turned in to the lower end of the stay in exactly the same way as the deadeyes are turned in to the lower ends of the shrouds, and the stay is seized round it likewise with a throat-seizing and two or three round-seizings.

About two-thirds of the way up the projecting part of the bowsprit, forward of the stem, a double-scored heart is fastened by means of a strap or collar; this is formed of a single piece of rope of an appropriate length, spliced together at its ends, and doubled round the heart so that the two bights are brought together beneath the heart by a seizing*. In Figure 280 it will be seen that a *stop-cleat* is nailed to either side of the bowsprit to prevent the collar containing the heart from slipping down. The laniard used to bowse the two hearts together has its standing end secured in the upper heart (the one closed in by the stay), and is then passed up and down several times between the hearts so that the turns lodge in the internal scores of the hearts; it is then made fast by taking a number of turns round the throat-seizing of the lower heart.

*The collar formed by this double strap can be seized underneath the bowsprit by bringing together the two bights, and a second (throat-)seizing is clapped on above the bowsprit, below the heart.

Stop-cleat: a small wedge of wood tapering away from the rope which it blocks.

As an alternative, the two hearts can be replaced by two fourfold blocks.

Preventer-stay: sometimes called a ***spring-stay***.

Preventer-forestay: Above the forestay a *preventer-stay* is fitted, which in everything except its diameter is identical to the forestay; its mouse is however on the starboard side.

The hearts can be replaced by deadeyes, one of which has a double score round its circumference. The collar of the lower part may also be single, irrespective of whether hearts, blocks or deadeyes are used, and then of course only a single score is required; the strap then has two long legs which encircle the bowsprit with eyes at their ends which are seized together underneath.

Sometimes the stay and preventer-stay may be fastened together by a thin line which is snaked up and down diagonally between the two, being seized alternately to each*, so that if one or the other should part, the severed ends are prevented from falling. This method of joining the preventer-stay to the stay is called *snaking*.

*The line is seized at each point of contact before it angles away again.

Snaking.

As an alternative to snaking, short lengths of ratline may be fastened between the two stays at intervals of two or three fathoms [3.25 – 4.90 m]; this method is lighter.

Staves.

With either method small pieces of wood called *staves* may be fastened between and perpendicular to the two stays, their purpose being to hold them a regular distance apart.

However, all these arrangements have the effect of weighing down the rigging, and I have not therefore adopted them for our 74.

On occasions the preventer-stay may be rigged below the stay, and serve to bend a fore-staysail. In this case the two stays cannot be snaked.

FORE-TOPMAST

It must be remembered that the topmasts (and for that matter the topgallants) have to be able to be raised and lowered, as was explained in Chapter XII, and this means that certain special provisions must be taken with regard to their standing rigging, which must be able to be sent down if necessary or set up again without difficulty.

Before putting the rigging over the head of the topmast, the first step is to fit bolsters of soft wood over the topmast trestletrees, on which the shrouds will rest; a piece of leather or tarred canvas is placed over the bolsters.

The part of the masthead over which the pendants and shrouds lie must then be tarred.

Once this has been done, the first rigging to be placed overhead are the tye-blocks, which we will examine more closely in the next section, but it should be said at this stage that the strap of the tye-blocks is long enough to form an eye above the throat-seizing (an alternative method is shown in Fig. 282), so that the tye-blocks hang down on either side of the topmast.

Burton-pendants: The burton-pendants and falls are used to set up the topmast shrouds, but they are similar to the tackle-pendants of the lower masts. The first step therefore is to place the pendants overhead, one hanging down on either side of the topmast. Taking a piece of rope of a suitable length for the pendants and a second short piece of the same thickness, the short piece is spliced into the longer piece at the middle, with two splices, and an eye is thus formed which must fit tightly over the masthead.

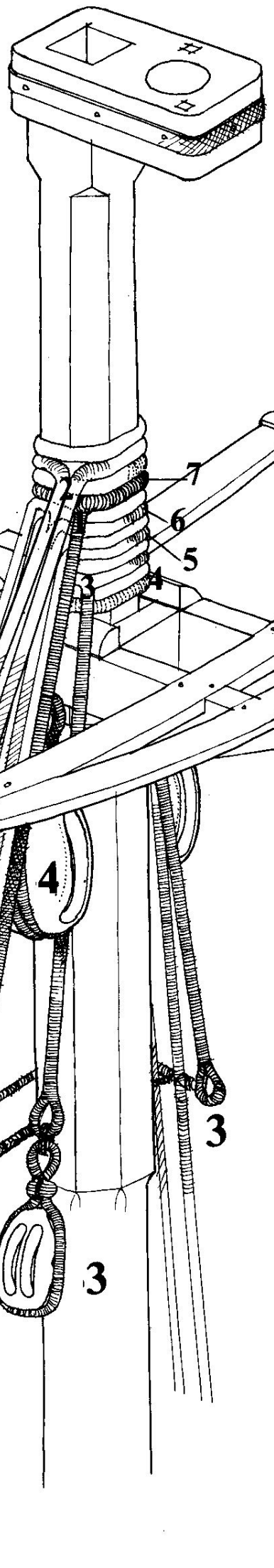
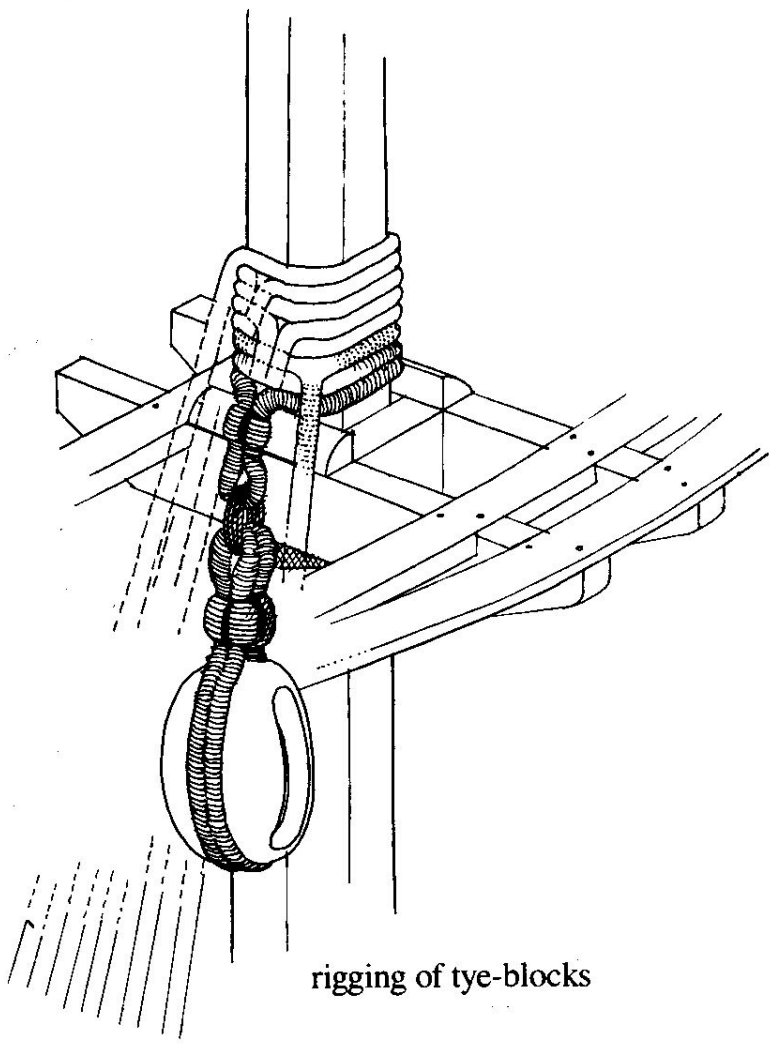


Fig. 282
Topmast Head-Rigging

1. Running backstay.
2. Pair of standing backstays.
3. Burton-pendants.
4. Tye-blocks.
5. 1st and 2nd topmast-shrouds.
6. 3rd and 4th topmast-shrouds.
7. 5th shroud (single: an eye formed in the middle and one leg at either side).

*The small sketch on the left shows an alternative way of rigging the tye-blocks: instead of the strap of the block being doubled over the masthead, I have shown a pendant instead, which has an eye on either side formed by means of seizings, the tye-block straps being in turn seized to these eyes.



rigging of tye-blocks

This eye is snugged down over the straps (or pendants) of the tye-blocks, so that one pendant hangs down on either side, with a thimble spliced in the end; the upper part of the tackle is formed by a double block with a thimble or hook spliced into the strap, and the block is either seized or hooked to the thimble of the pendant accordingly. The lower part of the tackle consists of a single hook-block. The *burton-falls* have their standing end made fast to the strap of the lower block, reeve through the sheaves of the blocks, and have a hauling part which is long enough for the tackles to be hauled on from the deck (and taken to the capstan) if necessary.

Burton-falls.

When the burton-tackles are not in use, the hook of the lower block is hooked into the rim of the top inboard of the foremost shroud, or else the tackle is completely unrigged from the pendant and secured by lashings inside the shrouds.

The burton-pendants are served like the tackle-pendants.

Topmast-shrouds: There are five topmast-shrouds in all. Like the lower mast shrouds, each shroud is served from and including the eye for about one-tenth of its length. The foremost shroud is however served overall with spun-yarn in order to protect it from the chafing of the topsail-yard as it is raised and lowered.

The first pair of topmast-shrouds to be fitted overhead are the first port-side pair, and as there is an odd number of shrouds the last one has its eye formed in the same way as for the burton-pendants (unless it is preferred to rig them singly*), with one leg passing down either side of the mast. The topmast-shrouds are rattled down in the same way as the lower mast shrouds, and the ratlings cross all five shrouds.

*i.e. with the end turned back and spliced below the bight to form an eye and a single leg.

Catharpins and Futtock-shrouds: This is an arrangement designed to use the lower shrouds to stiffen the topmast-shrouds.

The catharpins are rigged in the way of the *futtock-staves*, which are short lengths of rope of the same thickness as the lower shrouds. One length is placed inside and the other outside, and they are arranged horizontally (i.e. parallel to the rim of the top), about the same distance below the top as the length of the masthead of the lower mast.

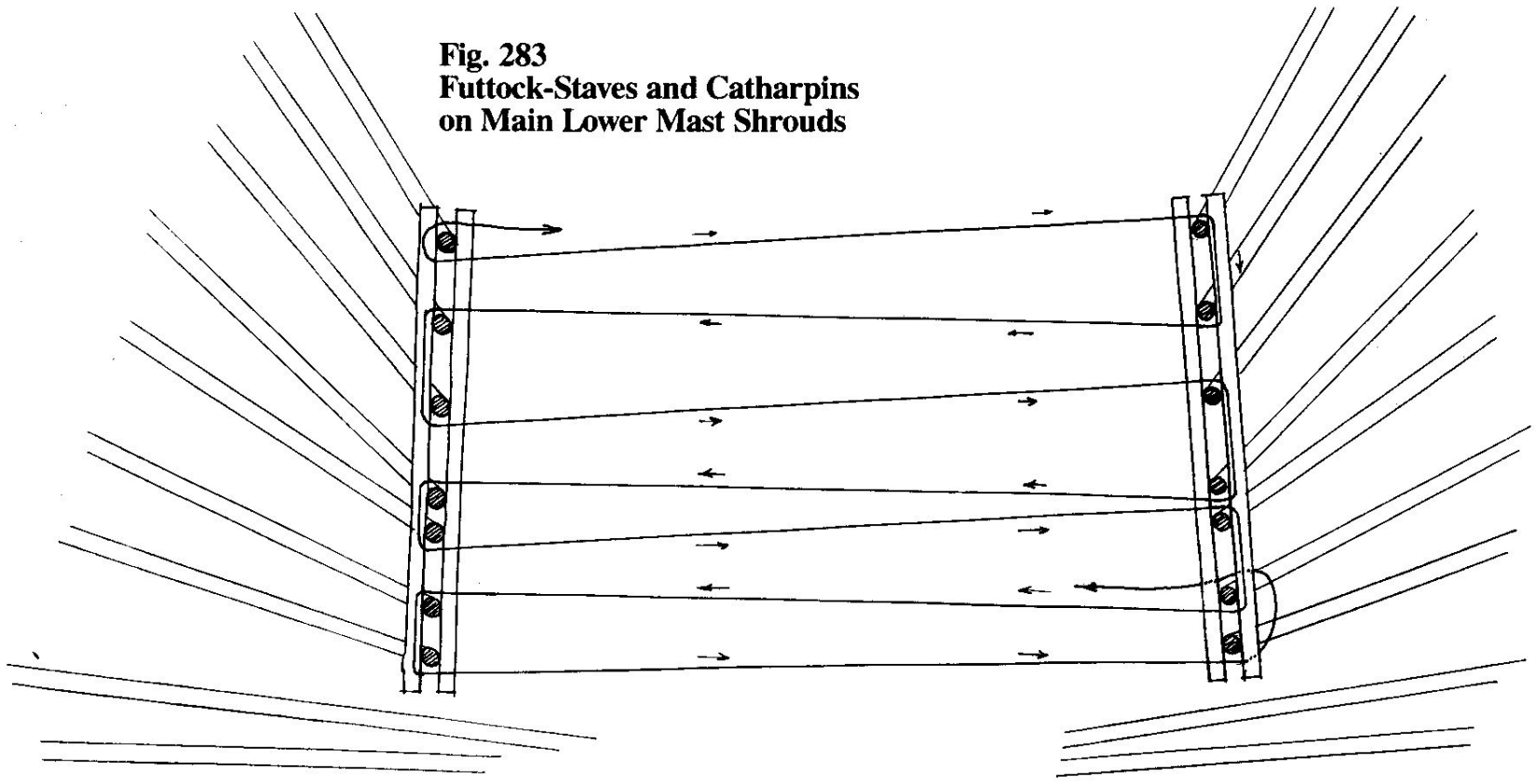
Futtock-staves: formerly made of wood, which explains the appellation "staves", but now invariably of rope.

The futtock-staves cross all the lower shrouds save the first two*. They are parcelled and served, and seized with a few turns of spun-yarn to the shrouds.

*The position of the mast makes it difficult for the catharpins to run between the first one or two shrouds. Furthermore, when the first shroud has to be eased to allow the yard to be braced, it must be unhampered by the catharpins.

With the futtock-staves in place, the next step is to rig the catharpins, which are composed of a single long rope made fast to the aftermost shroud on the starboard side just below the futtock-staves; this rope passes to the port side, round the two aftermost shrouds, and then back to the starboard side; here it passes round the next two shrouds, and so on.

Fig. 283
Futtock-Staves and Catharpins on Main Lower Mast Shrouds



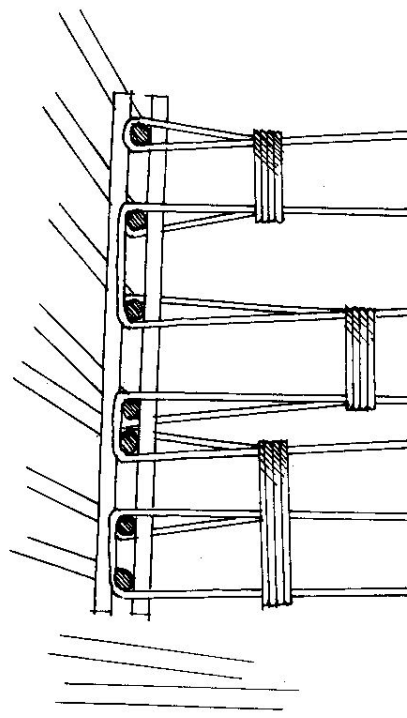


Figure 283 shows how the rope forms the legs of the catharpins by being passed to and fro alternately from one pair of shrouds to the next. Once the rope has been passed once, the end is passed from the last shroud back to the first again, following the same route, and the other end of the rope, which was deliberately left long when starting the first leg, is also passed forward to the last shroud. Thus each of the seven legs of the catharpins joining each pair of shrouds is composed of three ropes, and it is of no consequence whether the rope starts at the first port-side shroud and is passed aft, or the other way round as I have described.

I repeat that only seven shrouds are joined by the catharpins on the foremast and the main.

This interlacing web of cordage must be bowsed taut, and this is achieved by putting two frappings on every two or three legs. Thus the shrouds on both sides of the ship should now be tauter, and as far as possible the forward ones will be tautened more than the after ones.

Futtock-shrouds, or ***foothook shrouds.***

With the catharpins completed the next step is to rig the *futtock-shrouds*. These serve to secure the topmast-shrouds and at the same time provide a continuous ladder to the tops.

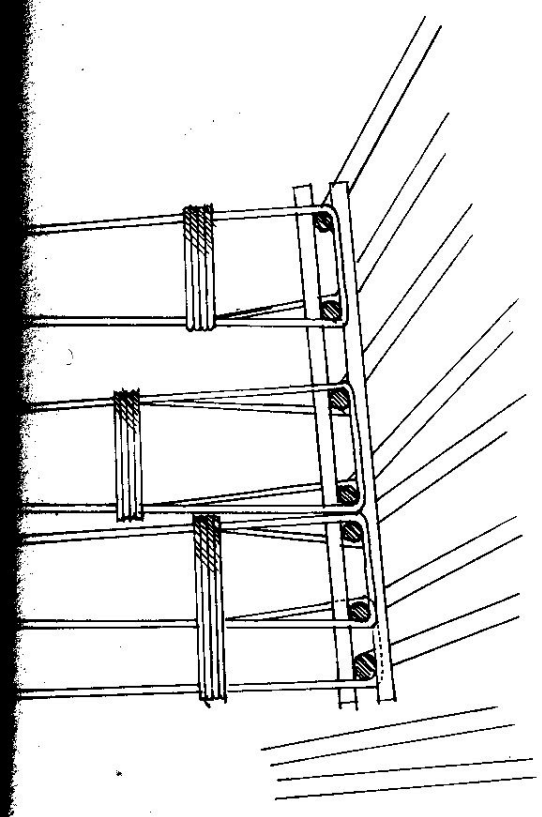
Futtock-plates.

The iron *futtock-plates* which form the bindings of the topmast deadeyes pass down through small oblong slots cut in the iron band fastened over the rim of the top (see Fig. 238 on page 46), and have an eye at the lower end (see Fig. 273, p.114). It is this lower end which passes down through the iron band and to which the futtock-shroud is made fast, the shroud being no more than a length of rope fitted with a hook for this purpose; the hook has a thimble through which the rope forming the futtock-shroud is middled and passed, and the lower ends are then made fast to each shroud by means of a round turn and two seizings on the futtock-staves. The foremost futtock-shroud is served overall with spun-yarn, but the others are only served where they pass through the thimble.

Alternatively, each futtock-shroud may be single, in which case it is eye-spliced to the thimble; the fastening at the lower end is unchanged.

The reason for the foremost one or two lower mast shrouds not being catharpinned is theoretically so that they can be eased if necessary to allow the lower yards to be braced more easily; for the same reason the foremost shroud is not fitted with deadeyes but with two threefold blocks. In practice however most Captains are reluctant to ease the foremost shrouds, and it is more the fact that they are athwart the axis of the of the masts which prevents these shrouds from being catharpinned.

The futtock-shrouds are rattled down in the same way as the lower shrouds, forming a continuation of the "ladders" used by the men to reach the tops.



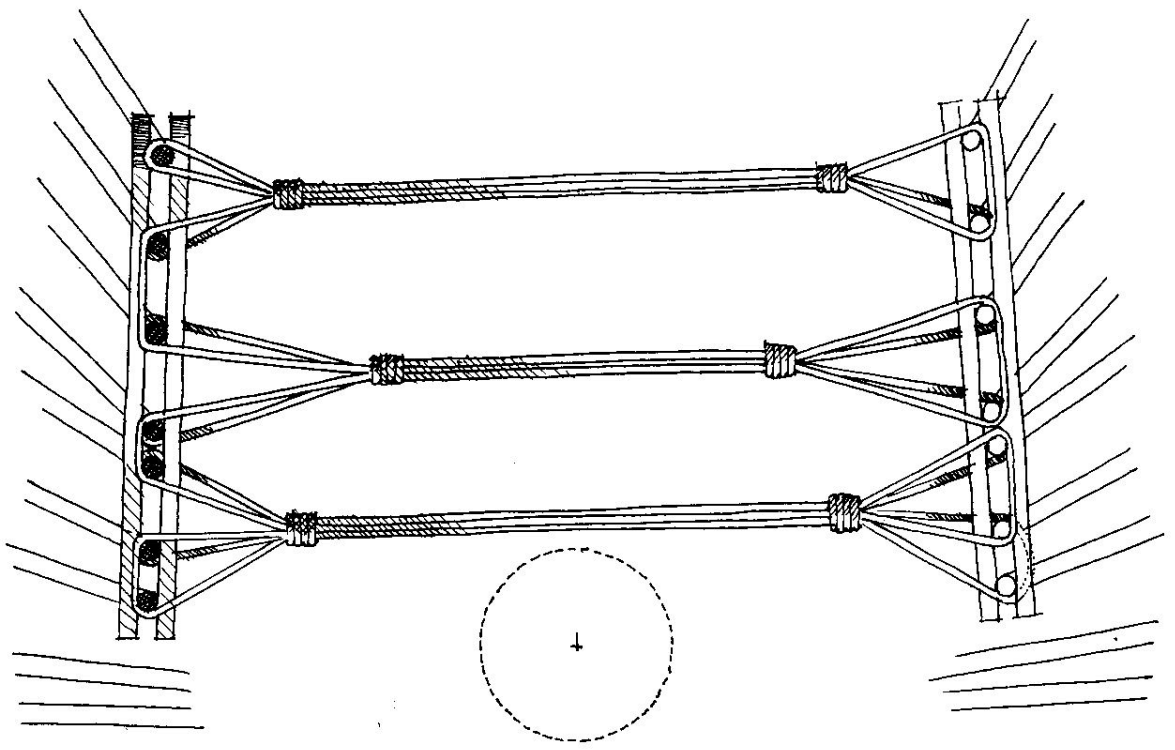
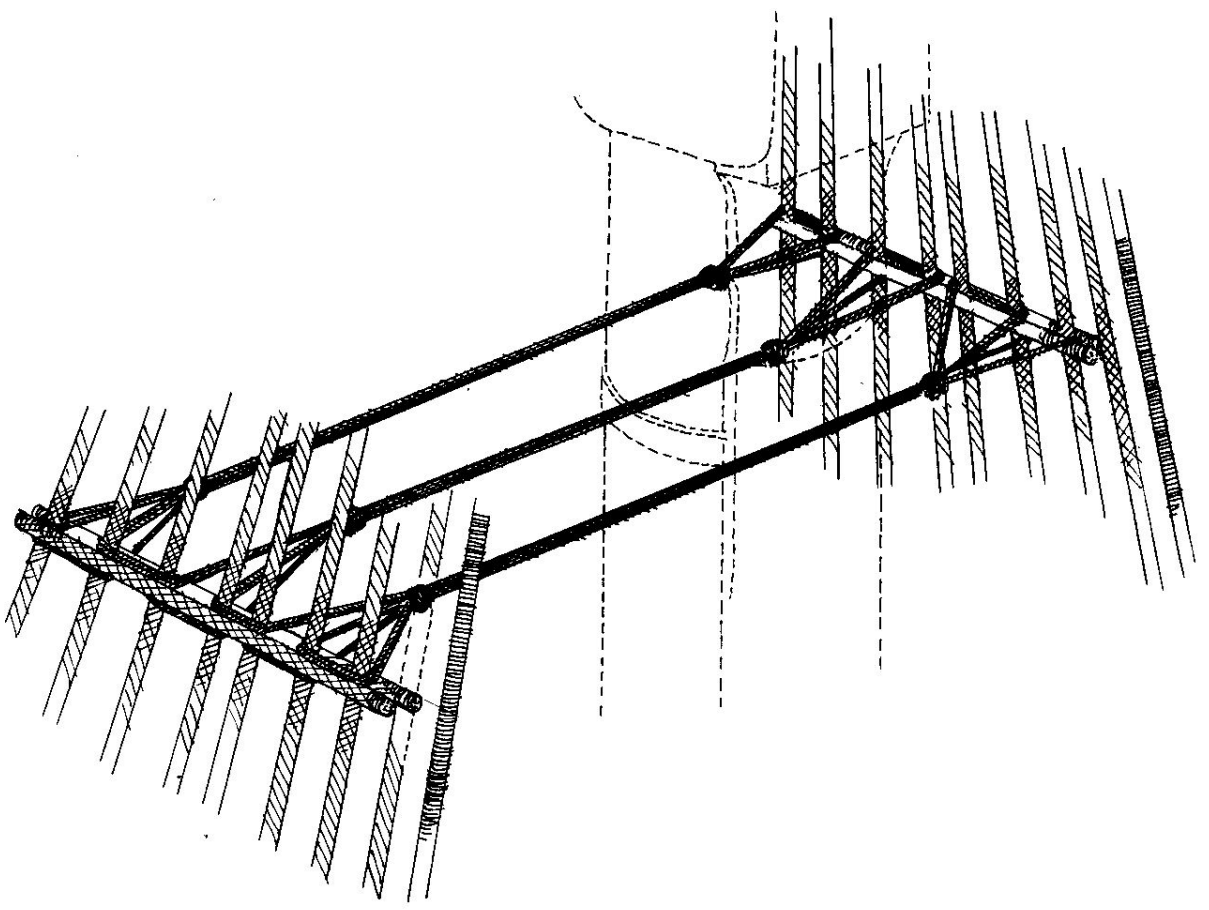


Fig. 284
Lower Mast Catharpins



Lower catharpins: These are sorts of preventer-catharpins clapped on lower down. They take the form of a rope joining the two gangs of shrouds which is then bowsed taut by means of a tackle. Lower catharpins are only fitted in order *to swifter* in the shrouds during a blow, when they have stretched. I should perhaps have mentioned the lower catharpins earlier when I was talking about the standing rigging of the fore lower mast, but since this item of rigging is only a temporary measure I though it better to cover it here, after the upper catharpins.

To swifter: to bowse the shrouds taut. Not to be confused with ***a swifter*** (noun), which has various meanings including the aftermost shroud (when it is a single one).

Fore-topmast backstays: Only the topmasts and topgallants are rigged with backstays, and a distinction should be drawn between the *standing backstays* and the so-called *shifting backstays*. The role of these items of standing rigging is important because thay support the heads of the topmasts and topgallants more effectively than the shrouds, which would be inadequate on their own.

Standing backstays: strictly speaking, stays which run backwards towards the stern of the vessel; those which come down on either side of the mast are more correctly called ***breast backstays.***
Shifting backstays or ***running backstays*** (or ***breast backstays***).

There are three fore-topmast backstays in all on either side, the foremost one being a *running backstay*, which can be tightened or loosened at will by means of a tackle composed of two threefold blocks. The running backstays are fitted over the masthead first, directly over the last topmast-shroud, beginning with the port-side one. The running backstays are eye-spliced at their heads, and they are wormed and served overall with spun-yarn since they are very liable to chafing from the yards as they are lowered and hoisted. Often, in order to increase their effect, they are extended outboard on the windward side by means of *outriggers* in the tops, which can be hauled out by small tackles, thereby increasing the spread of the backstays.

Backstay outriggers.

Following the running backstays, the next items of rigging to be placed overhead are the port-side standing backstays, followed by the starboard pair. Their eyes are formed in the same way as for the shrouds, and they are set up with deadeyes. The running backstay tackle is made fast abaft the third deadeye of the lower mast shrouds.

Fore-topmast preventer-stay: The preventer-stay is hove overhead first because the fore-topmast staysail is hoisted on it* (rather than on the fore-topmast stay). Its collar is formed like those of the lower mast stays, with the mouse to starboard. The lower end has a deadeye turned in it, the corresponding deadeye being seized to a small eyebolt in the raked part of the jackstaff-standard. A laniard reeves through the deadeyes in exactly the same way as for the shrouds. Alternatively, the deadeyes may be replaced by an arrangement similar to that of the fore-topmast stay, which I am just about to describe. Another alternative is that the lower deadeye may be strapped in a collar passed round the bees and seized underneath the bowsprit through eyes spliced in the ends of the collar.

*Stays to which the staysails are bent are called ***staysail stays***.

Fore-topmast stay: The fore-topmast stay rides on top of the the preventer-stay, to which it is very similar, save that the mouse is to port*. The lower end of the stay turns in a single block; the corresponding lower block is a long-tackle block seized in a collar which is taken round the bowsprit at the bees, the collar fitting into the groove in the middle. The fall of this tackle has its standing end made fast to the strap of the single block, reeves through the sheaves of the blocks and after the stay has been bowsed taut it is belayed to the stay itself above the throat-seizing of the single block, like a shroud laniard.

*The stay-collar is served with spun-yarn and sometimes leathered as well; this protection continues down for about half a fathom [78 cms] below the mouse in order to protect the stay from the chafing of the topsail-yard when it is braced up. This arrangement applies to all the topmast stays, of the other masts as well.

Alternatively, the fore-topmast stay may reeve directly through the sheave of a single block seized to the end of the bowsprit, and from there pass down towards the gammoning where it is bowsed taut by a tackle. The same arrangement may be adopted for the fore-topmast preventer-stay.

There are thus twelve eyes overhead the fore-topmast head: two for the tye-blocks, one for the burton-pendants, five for the shrouds, two for the running backstays and two for the standing backstays. Over these twelve eyes are placed the two stay-collars.

FORE TOPGALLANT-MAST

Fore topgallant-shrouds: There are three shrouds on either side, and these are the first items of rigging to be got overhead. The first pair is the port-side pair, then the starboard pair, and the third pair has one shroud on either side; in other respects they are like the topmast-shrouds.

The shrouds pass down through holes in the ends of each of the topgallant trestletrees and through the hole in the iron strap joining them (see Fig. 240, p.50). A thimble is spliced in the lower end of the shroud, and this is seized to a second thimble made fast to the corresponding topmast-shroud at the height of the topmast futtock-staves (see below). Alternatively, the shroud is made fast directly to the futtock-stave itself without the use of thimbles. The topgallant-shrouds are set up extremely simply for there are no deadeyes.

Topmast catharpins*: These serve to secure the topgallant-shrouds which also double as futtock-shrouds, and they are situated about 5 feet [1.60 m] below the trestletrees. The futtock-staves are single and are seized to the outboard side of the shrouds. The catharpins have only one or two legs. The explanations given previously regarding the catharpins of the lower mast shrouds apply equally to the topmast catharpins.

*According to Lees [op. cit.], these were evidently rare at this time on English ships-of-war.

The topgallant-shrouds are rattled down for their whole length*, including the lower parts which serve as futtock-shrouds beneath the topgallant trestletrees.

*Except right at the top where they are too close together.

Backstays: There is a running backstay on either side, the tackle being made fast in the fore-channels between the fifth and the sixth lower shroud deadeyes; there is also a standing backstay. The explanations given regarding the fore-topmast backstays apply equally to those of the fore-topgallant.

Fore-topgallant stay: The collar is not moused but simply eye-spliced. There is no preventer-stay, and the stay is rigged directly over the top of the shrouds and backstays. The stay runs down to the outer end of the jibboom, passes through the central sheave of a treble block seized beneath the truck, runs back along the jibboom and the bowsprit and is belayed to the collar of the forestay.

The rigging of the fore-topgallant is placed over the hounds, and there are five eyes in all: three for the three shrouds, and two for the backstays; the stay-collar rides on top of these five eyes. The first eye is shrugged down over the stop of the hounds.

MAIN LOWER MAST (see Plate L)

Tackle-pendants: The main winding-tackle and main-tackle pendants are rigged in exactly the same way as the fore-tackle pendants, save that the longer leg of the pendant taking the winding-tackle is on the fore side, with the other leg for the main-tackle on the after side.

When the winding-tackle is not in use, the lower block is hooked just forward of the first quarterdeck gunport, while the main-tackle block is hooked just abaft the same gunport.

The first pair of pendants to be got overhead is the starboard pair, followed by the port-side pair*.

*Sometimes, when there is an odd number of shrouds, the same rope may serve as the odd shroud and the pendant (the eye having a long and a short leg).

Main lower mast shrouds: There are nine* shrouds in all, or one more than for the fore lower mast. Since there is an odd number, the first shroud on either side is formed as a pair; an eye is spliced in the middle (in the way I explained above for the burton-pendants), and one leg runs down to port and the other to starboard. Next the first starboard pair of shrouds is got overhead. For the rest, unless I say anything to the contrary, it is all rigged in exactly the same way as on the foremast; I shall follow this principle now until the end of the section therefore, noting only what differs from the fore lower mast, topmast and topgallant-mast, and thereby avoid unnecessary repetition.

*Some 74's have 10 main lower shrouds.

Ratlings: As for the fore lower shrouds.

Preventer-shrouds: As with the foremast, one leg of the pair comes down on either side.

Lower catharpins: As with the fore lower shrouds.

Mainstay: The mainstay is rigged differently from the forestay at its lower end, in that it is secured not to the bowsprit but to the hook in the gammoning-knee (see Volume II). Since the foremast stands in its path, certain measures must be taken. A collar, which is laid up in the same way and is slightly less thick than the stay, passes round the foremast; it is made fast at its lower end round the hook of the gammoning-knee, and at the upper end a heart is turned in; the bight of the collar passes to port and starboard of the foremast, and small rubbing paunches or chocks of soft wood are fayed to either side of the mast and scored to receive the collar.

Sometimes the collar is spliced, but more commonly it is middled with a heart seized in the bight with several seizings; the two legs then pass down on either side of the bowsprit and the bollard-timbers, meet under the hook of the gammoning-knee, and are then brought back over each other again, so that the starboard one is seized to the port-side one and vice versa, on top of the bowsprit. Round seizings are clapped on every few inches.

The collar is wormed, parcelled and served with spun-yarn overall, and sometimes the part which bears on the rubbing-paunches is leathered.

The path of the mainstay and its collar runs down under the timber which forms the plankshear of the beakhead bulkhead. Note also how the collar embraces the bollard-timbers, which are shaped to receive it.

In an alternative arrangement the hearts can be replaced by two fourfold blocks.

There is another way of rigging the mainstay collar: a much shorter collar acts as a strap for a heart a short distance above the bollard-timbers; the stay passes to starboard of the foremast, has a corresponding heart turned in its lower end, and the two hearts have a laniard rove through them above the beakhead.

Main preventer-stay: Rigged in exactly the same manner as the mainstay. The preventer-stay also fastens round the hook in the gammoning-knee, but passes over cleats nailed to the bowsprit rather than over the bollard-timbers, and over rather than under the planksheer of the beakhead bulkhead. The same alternatives described for the mainstay apply also to its preventer-stay. If a short collar is used, the preventer-stay passes to port of the foremast.

The mouse of the mainstay is on the starboard side, and that of the preventer-stay to port.

There are eleven eyes overhead the mainmast, plus the eyes of the two stays.

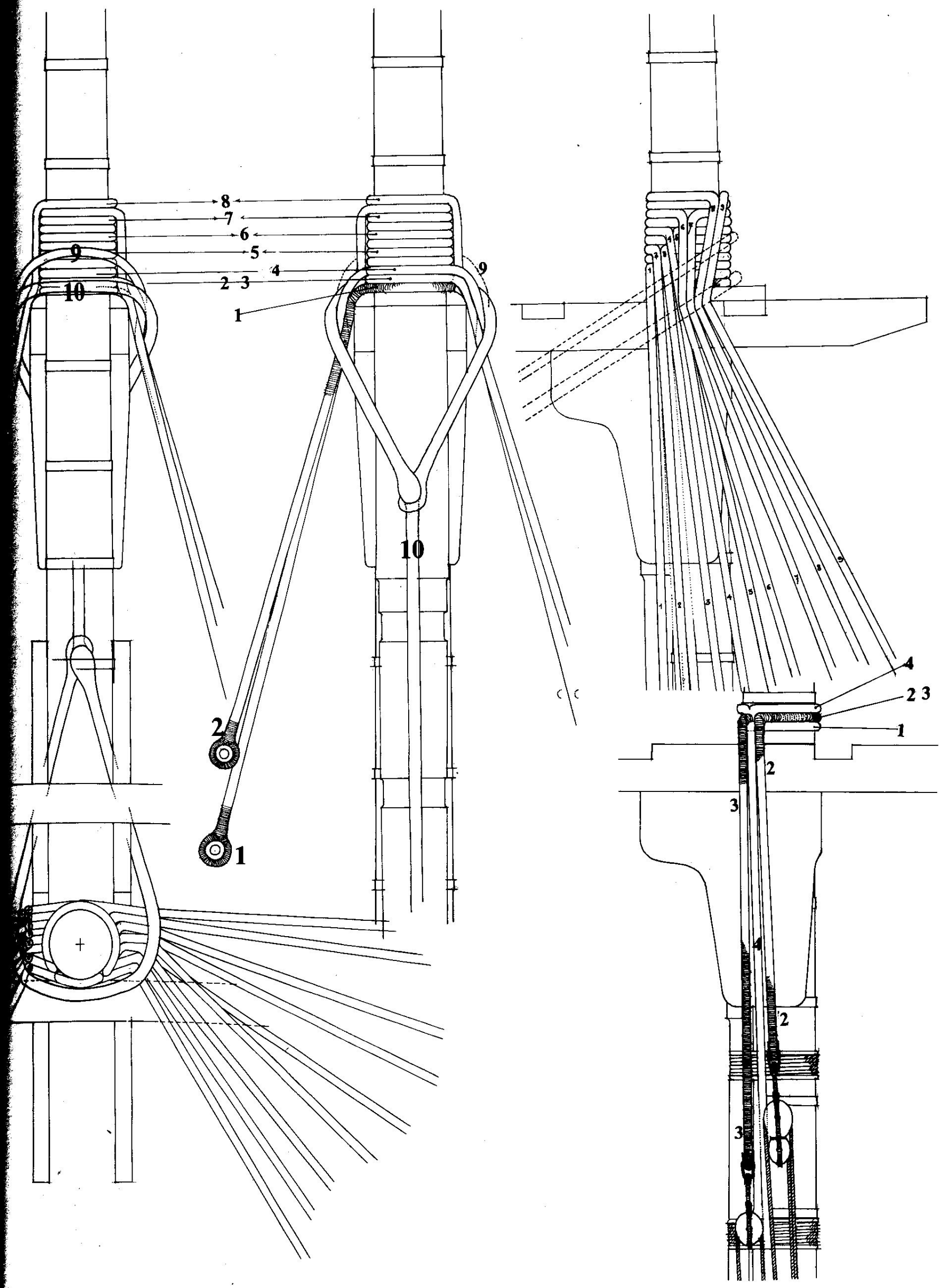


Fig. 285
Rigging Overhead the Main Lower Mast

These drawings are taken from Plate L. Bottom right shows the first items of rigging to be got overhead: 1. starboard tackle-pendants – 2. & 3. port-side pendants (2. the main-tackle and 3. the main winding-tackle) – 4. the third eye overhead, with one leg either side forming the first shroud.

The other drawings show at: 5. the eye of the 2nd and 3rd port-side shrouds – 6. the 4th and 5th – 7. the 6th and 7th – 8. the 8th and 9th. The small numbers on the top right-hand drawing identify the successive eyes overhead. Note in the drawings on the left how the main preventer-stay (9.) and the mainstay (10.) tend to haul the shrouds forward at the masthead.

MAIN-TOPMAST

Burton-pendants: As for the fore-topmast.

Main-topmast shrouds: There are 5 in all as with the fore-topmast, and they are rigged in exactly the same way except that the first pair to be rigged are the starboard pair.

Catharpins, futtock-shrouds, lower catharpins, breast backstays: All these items of standing rigging go on exactly as they do for the fore-topmast.

Main-topmast stay: The collar is made up in the same way as that of the fore-topmast stay. The stay runs forward to the head of the foremast where a heavy single block is made fast round the masthead rigging; reeving through this block*, the stay runs down abaft the mast and reeves through a second single block hooked into an eyebolt to port of the foremast; the end of the stay is then brought back up and seized to its standing part by two or three seizings.

*The whole length of the stay which is exposed to the chafe of this sheave must be served with spun-yarn and leathered.

As an alternative, the stay can be shorter and have a long-tackle block turned in its end; a corresponding single or double block is made fast at the head of the foremast, the two blocks forming a tackle which allows the main-topmast stay to be set up or eased from the foretop.*

*This arrangement is simpler, and it is even possible to do away with the tackle and replace it with a heart or a thimble through which the end of the stay is passed, turned back on itself and held by two or three seizings.

The mouse of the stay lies to starboard.

Main-topmast preventer-stay: May be rigged exactly like the stay and pass down to a block to starboard of the foremast before doubling back and being seized to itself. Alternatively, a deadeye may be turned in its lower end, with a second deadeye turned in to a strap round the foremast head.

The mouse of the preventer-stay lies to port.

MAIN TOPGALLANT-MAST

All the standing rigging of the main topgallant-mast is rigged in exactly the same way as that of the fore topgallant. The only exception is the main-topgallant stay, which runs to a single block fastened to the rigging of the fore-topmast head. The stay reeves through the sheave of this block, passes down through the lubber's hole of the foretop and is belayed underneath in the catharpins.

Alternatively, the stay may be set up by means of a block made fast to the after crosstree of the foretop and then taken back and seized to itself; or else by means of a tackle, the upper block of which is turned in the end of the stay while the lower block is made fast to the after crosstree.

The main-topgallant stay serves as a staysail-stay for the main-topgallant staysail.

MIZEN LOWER MAST (see Plate LI)

Tackle-pendants: There are only two pendants, for the mizen-tackles, there being no winding-tackles on the mizen. When the mizen-tackles are not in use they are hooked into a ringbolt in the spirketting of the poop, by the poop breastwork. The pendants are formed from a single piece of rope with an eye spliced in its middle, and as we have seen one leg hangs down on either side.

Mizen shrouds: There are six in all, and the first starboard pair are got overhead first. The foremost shroud is served overall, and the ratlings are secured across all the shrouds.

Preventer-shrouds: As for the foremast and the main.

Mizen-stay: Its collar is made up like the other lower mast stay collars, with the mouse lying to starboard. It runs down towards the foot of the mainmast and to a strap lashed tightly round the mainmast by means of a seizing about four feet [1.30 m] above the planking of the quarterdeck*; this strap turns in a heart, and there is a corresponding heart turned in the lower end of the stay. A laniard made fast to the stay heart allows the stay to be set up. Sometimes the hearts are replaced by deadeyes, or else by threefold or fourfold blocks.

*Sometimes the strap is higher up, at about a quarter of the height of the mainmast above the deck-planking.

Yet another arrangement is to turn in at the lower end of the stay a block, a heart or a thimble. Through this a rope is passed which has previously been made fast to a ring set in the deck to port of the mainmast. The hauling end of this rope is then hardened up by means of a laniard and two deadeyes (or thimbles), one in the end of the rope and the other turned in a ring to starboard of the mast.

There is no preventer mizen-stay.

There are seven eyes over the mizen-mast head, and the stay collar rides down over them.

MIZEN-TOPMAST

It will be remembered that this is a pole-topmast, the polehead serving as a mizen-topgallant.

Burton-pendants: Exactly as for the other topmasts.

Mizen topmast-shrouds: Placed over the eye of the burton-pendants, the shrouds seat over the stop of the hounds. There are four shrouds in all and the first pair to be rigged is the first starboard pair. In all other respects the explanations already given for the other topmasts apply equally to the mizen-topmast.

Catharpins and futtock-shrouds: These are rigged as on the other topmasts, save that the futtock-staves are run across only five of the lower mizen shrouds, and the catharpins have only two legs.

Preventer-shrouds: As for the other masts.

Backstays: There are two, the starboard pair being rigged first. Occasionally there are three, in which case the forward one is a running backstay, the other two being standing.

Mizen topmast-stay: Its collar is formed like those of the other topmast-stays, with the mouse to starboard. The stay is led to the head of the main lower mast where a strap turning in a single block is made fast round the head-rigging; the stay reeves through the sheave of this block, passes down the mast to the deck and is set up there in the same way as I explained for the main topmast-stay.

This stay serves for the mizen-topmast staysail.

There are thus seven eyes overhead the mizen-topmast, plus the collar of the stay.

Mizen topgallant-stay: An eye is spliced in its upper end and this eye is hove over the pole of the topmast just below the truck. The stay is led to the cap of the main (lower) mast where it reeves through a single block made fast to an eyebolt in the after side of the cap. The stay then passes down the mast and is set up like the topmast-stay.

———*———

There is one more subject which ought to be covered while we are examining the standing rigging of the masts, and that is the pendants of a number of tackles serving a variety of uses, notably when loading the ship.

LOADING-TACKLES (see Figure 286)

Garnet-tackles: There are two garnet-tackles, and each has the strap of its upper block spliced into the eye of a long *pendant* which is seized or made fast to the head of the mainmast. This upper block is a long-tackle block.

Garnet-pendant.

A rope is spliced into the pendant about two fathoms [3.24 m] above the eye; it has a single block seized in the middle and the free end is then eye-spliced to the strap of the long-tackle block so that it forms a triangle; the three corners of this triangle are marked by the single block (the forward corner), the long-tackle block (bottom), and the point where the rope is spliced into the pendant (aft).

Guy of the garnet; garnet-guy

A rope called the *guy of the garnet* or *garnet-guy* reeves through the single block with its standing end made fast to the fore-crosstrees or to the strap of a block secured in the same place. The guy, after reeving through the single block in the garnet pendant, returns back and through the second single block fastened beneath the foretop, runs down along the second-to-last fore lower mast shroud and is belayed to a cleat in the pin-rail. It will be realised that by heaving on the garnet-guy the garnet-tackle is hauled forward in order to position it for example over the main-hatchway; the

Garnet-falls

garnet-tackle consists of the long-tackle block already mentioned and a hook-block and *garnet-falls*; it is used in particular for loading casks of water and wine. When not in use, the lower block is hooked to a ring or an eye in the forecastle breastwork.

Stay-tackle: This is a small tackle made fast to the upper part of the mainstay below the collar. The stay-tackle is only rigged in port or in the harbour roads. It is composed of a double block on the stay and a single hook-block forming the other part. The fall reeves through the blocks and is then led down to the deck, where the hauling part sometimes reeves through a lead-block.

Luff-tackles: These are not fixed tackles, and are the smallest used on board. They are generally rigged in the tops, and instead of a hook they may have a tail-block, in which case they are called

Tail-tackles; jigger tackles

tail-tackles or *jigger-tackles*.

When we come to the yards I shall describe a number of other tackles which are also used for loading.

NUMBER OF SHROUDS AND BACKSTAYS AND DIAMETER OF DEADEYES (in mm).

	110-gun Ship	80-gun Ship	74-gun Ship	64-gun Ship	50-gun Ship	12-pdr Frigate	Storeship 450 tons	Brig	Cutter
No of shrouds MAINMAST	11	10	10/9	9	9	8	6	6	5
ø Deadeyes	434	407	379	352	339	312	287	270	270
No of shrouds FOREMAST	10	9	9/8	8	8	7	6	6	
ø Deadeyes	434	407	379	352	339	312	287	270	270
No of shrouds MIZEN-MAST	7	6	6	6	6	5	4		
ø Deadeyes	270	263	236	236	230	203	189		
No of shrouds FORE- & MAIN-TOPMASTS	6	6	5	5	5	5	4	3	4
ø Deadeyes	216	216	203	189	189	175	155	135	
No of backstays FORE- & MAIN-TOPMASTS	4	3	3	3	3	3	3	2	2
ø Deadeyes	257	243	236	230	216	209	203		
No of shrouds MIZEN-TOPMAST	5	5	4	4	4	3	3		
ø Deadeyes	189	189	175	162	162	148	135		
No of backstays MIZEN-TOPMAST	3	2	2	2	2	2	2		
ø Deadeyes	203	189	189	175	175	162	155		
No of shrouds TOPGALLANTS	3	3	3	3	3	3	3	3	3
ø Deadeyes	162	148	148	135	135	135	108	135	
No of backstays TOPGALLANTS	2	2	2	2	2	2	2	2	2
ø Deadeyes	189	189	162	162	148	148	135	135	148

Dimensions of Principal Items of Rigging of a 74-Gun Ship

Standing Rigging

Item	Bowsprit 1	Bowsprit 2	Bowsprit 3	Foremast 1	Foremast 2	Foremast 3	Mainmast 1	Mainmast 2	Mainmast 3	Mizen 1	Mizen 2	Mizen 3
Gammoning	65	7 3/4	67									
Bobstays	22	7	60									
Horses	18	3	26									
Bumpkin shrouds	70	2 1/2	22									
Tackle pendants				24	8 3/4	76	26	9 1/4	80	9	6	52
Winding-tackle falls				130	4 1/4	36	140	4 1/2	39			
Main & fore-tackle falls				140	4 1/4	36	130	3 1/4	28	84	2 3/4	24
Lower mast shrouds				220	8 3/4	76	264	9 1/4	80	132	6	52
Lower deadeye laniards				176	4 1/2	39	180	4 1/2	39	120	3	26
Lower mast stays				18	14	120	24	15	130	18	7 3/4	67
Stay collars				6	13 1/2	116	18	14	120			
Stay laniards				38	4 1/4	36	43	4 1/2	39	13	3 1/2	30
Lower mast preventer-stays				18	8 3/4	76	21	9 1/4	80			
Preventer-stay collars				6	8 3/4	76	18	9 1/4	80			
Preventer-stay laniards				16	3 1/2	30	18	3 1/2	30			
Garnet-tackle pendants							28	7 1/4	63			
Garnet-guys							86	3	26			
Garnet-falls							120	3 1/2	30			

	Fore-topmast 1	Fore-topmast 2	Fore-topmast 3	Main-topmast 1	Main-topmast 2	Main-topmast 3	Mizen-topmast 1	Mizen-topmast 2	Mizen-topmast 3
Burton-pendants	7 1/2	4 3/4	41	7 1/2	5	43	8	3 1/4	28
Burton-falls	70	2 1/2	22	74	2 1/4	19			
Topmast-shrouds	117	4 3/4	41	126	5	43	62	3 1/4	28
Topmast deadeye-laniards	60	2 1/2	22	70	2 1/4	19	56	1 3/4	15
Catharpins	57	2 3/4	24	62	2 3/4	24	40	2 1/2	22
Futtock-shrouds	65	3	26	84	3	26	40	2 1/2	22
Backstays	153	5 3/4	50	164	6 1/4	54	68	3 1/2	30
Top-ropes	80	7 1/4	63	84	7 3/4	67			
Topmast preventer-shrouds	33	5 1/2	48	30	5 1/2	48			
Topmast-stays	34	7 1/4	63	33	7 3/4	67	18	4 1/4	36

	Fore-topgallant 1	Fore-topgallant 2	Fore-topgallant 3	Main-topgallant 1	Main-topgallant 2	Main-topgallant 3	Mizen-topgallant 1	Mizen-topgallant 2	Mizen-topgallant 3
Topgallant-shrouds	48	2 1/4	19	54	2 1/2	22	22	2	17
Backstays	116	3	26	124	3 1/4	28			
Topgallant-stays	30	3 3/4	32	28	3 3/4	32	22	2	17

For each item of rigging the first column indicates the length in fathoms [1.62 m]. The second column shows the circumference in inches [27.1 mm] and lines [2.26 mm]. The third column shows the diameter in millimetres.

Fig. 286
TACKLES

1. **Main winding-tackles:** one tackle on either side.
   Pendants ø 80 mm; Falls ø 39 mm; 2 threefold blocks (length 407 mm); 4 iron thimbles; 2 double hook-blocks (length 407 mm).

2. **Fore winding-tackles:** one tackle on either side.
   Pendants ø 76 mm; Falls ø 36 mm; 2 threefold blocks (length 352 mm); 4 iron thimbles; 2 double hook-blocks (length 352 mm).

3. **Fore-tackles:** one tackle on either side.
   Pendants ø 76 mm; Falls ø 36 mm; 2 fiddle blocks (length 596 mm); 4 iron thimbles; 2 single hook-blocks (length 271 mm).

4. **Main-tackles:** one tackle on either side.
   Pendants ø 80 mm; Falls ø 39 mm; 2 fiddle blocks (length 705 mm); 4 iron thimbles; 2 single hook-blocks (length 298 mm).

5. **Mizen-tackles:** one tackle on either side.
   Pendants ø 52 mm; Falls ø 24 mm; 2 fiddle blocks (length 379 mm); 4 iron thimbles; 2 single hook-blocks (length 190 mm).

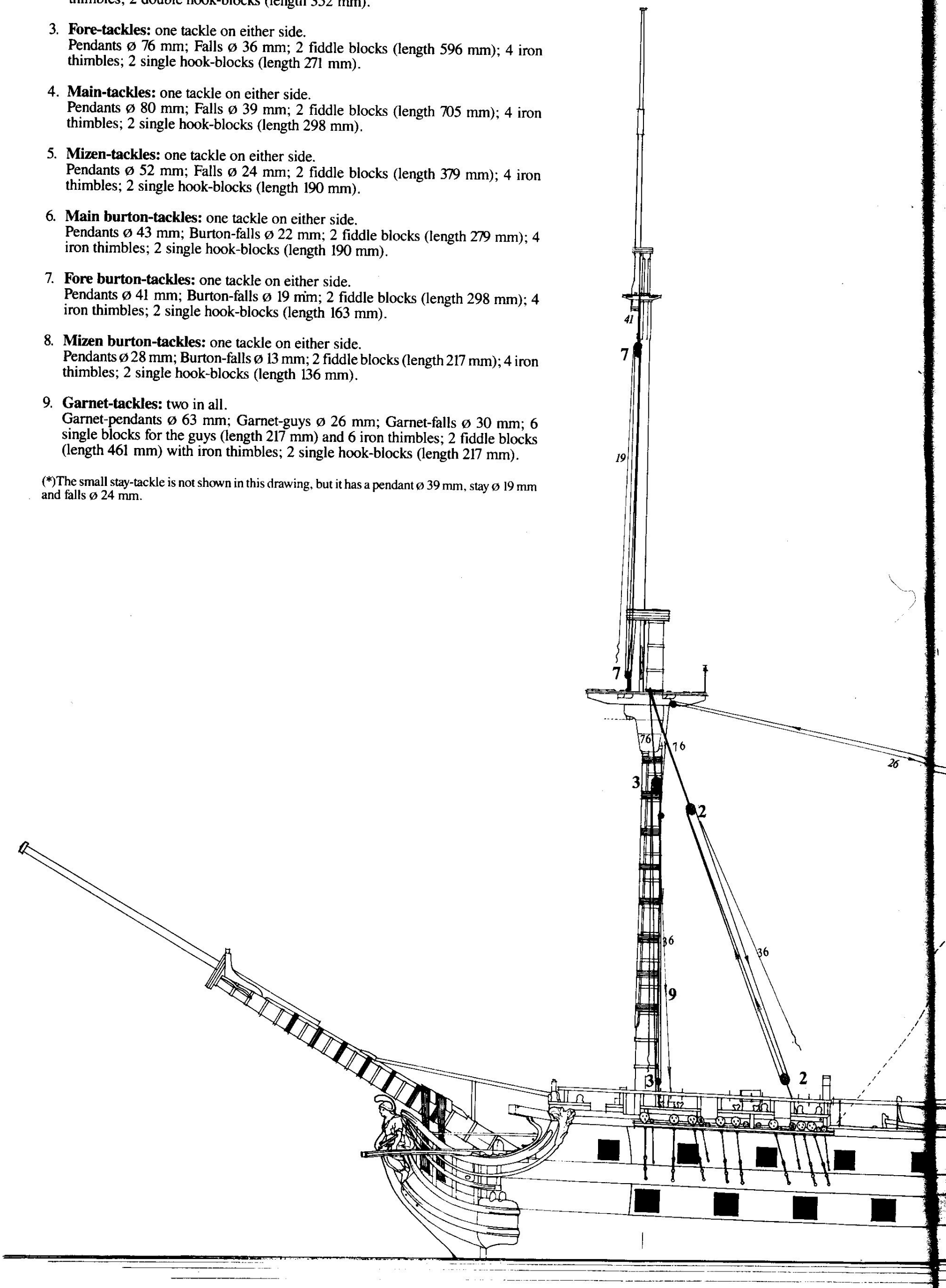
6. **Main burton-tackles:** one tackle on either side.
   Pendants ø 43 mm; Burton-falls ø 22 mm; 2 fiddle blocks (length 279 mm); 4 iron thimbles; 2 single hook-blocks (length 190 mm).

7. **Fore burton-tackles:** one tackle on either side.
   Pendants ø 41 mm; Burton-falls ø 19 mm; 2 fiddle blocks (length 298 mm); 4 iron thimbles; 2 single hook-blocks (length 163 mm).

8. **Mizen burton-tackles:** one tackle on either side.
   Pendants ø 28 mm; Burton-falls ø 13 mm; 2 fiddle blocks (length 217 mm); 4 iron thimbles; 2 single hook-blocks (length 136 mm).

9. **Garnet-tackles:** two in all.
   Garnet-pendants ø 63 mm; Garnet-guys ø 26 mm; Garnet-falls ø 30 mm; 6 single blocks for the guys (length 217 mm) and 6 iron thimbles; 2 fiddle blocks (length 461 mm) with iron thimbles; 2 single hook-blocks (length 217 mm).

(*)The small stay-tackle is not shown in this drawing, but it has a pendant ø 39 mm, stay ø 19 mm and falls ø 24 mm.



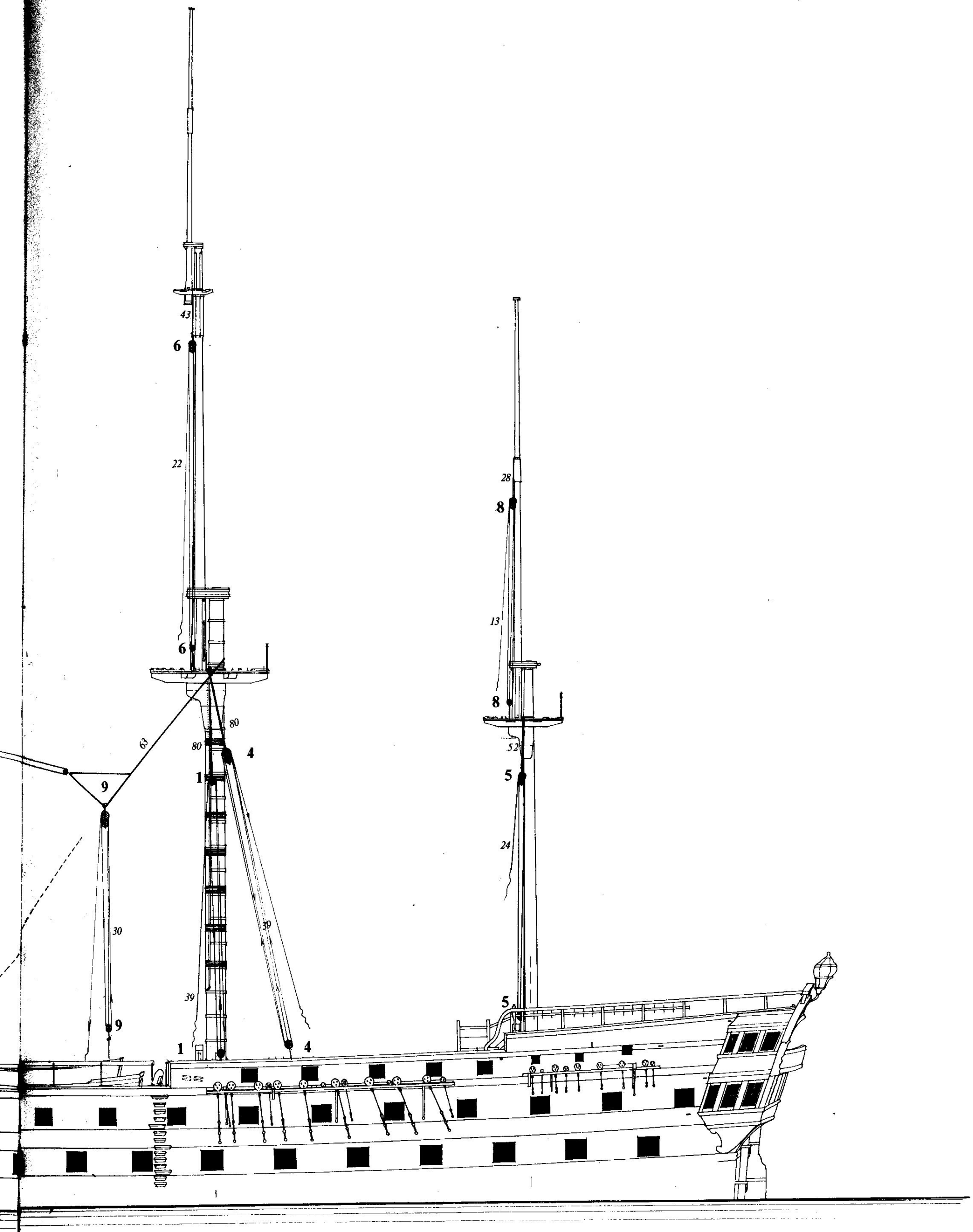

43
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80
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63
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39
39
9
1
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28
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13
8
52
5
24
5

Fig. 287
SHROUDS AND CATHARPINS

LOWER MASTS

1. **Fore shrouds:** eight on each side.
   ø 76 mm; laniards ø 39 mm; 16 deadeyes (*) ø 379 mm.

2. **Main shrouds:** nine on each side.
   ø 80 mm; laniards ø 39 mm; 18 deadeyes (*) ø 379 mm.

3. **Mizen shrouds:** six on each side.
   ø 52 mm; laniards ø 26 mm; 12 deadeyes ø 379 mm.

TOPMASTS

4. **Fore-topmast shrouds:** five on each side.
   ø 41 mm; laniards ø 19 mm; 10 deadeyes ø 204 mm.

5. **Main-topmast shrouds:** five on each side.
   ø 43 mm; laniards ø 22 mm; 10 deadeyes ø 204 mm.

6. **Mizen-topmast shrouds:** four on each side.
   ø 28 mm; laniards ø 15 mm; 8 deadeyes ø 117 mm.

TOPGALLANT-MASTS

7. **Fore-topgallant shrouds:** three on each side.
   ø 19 mm; 6 iron thimbles.

8. **Main-topgallant shrouds:** three on each side.
   ø 22 mm; 6 iron thimbles.

CATHARPINS

9. **Fore lower mast:**
   futtock-staves (double) ø 76 mm; catharpins ø 24 mm.

10. **Futtock-shrouds, fore-topmast:**
    five on each side (double). ø 26 mm; 10 deadeyes ø 204 mm with iron futtock-plates; 10 thimbles and 10 hooks.

11. **Fore-topmast:**
    futtock-staves (single) ø 41 mm.

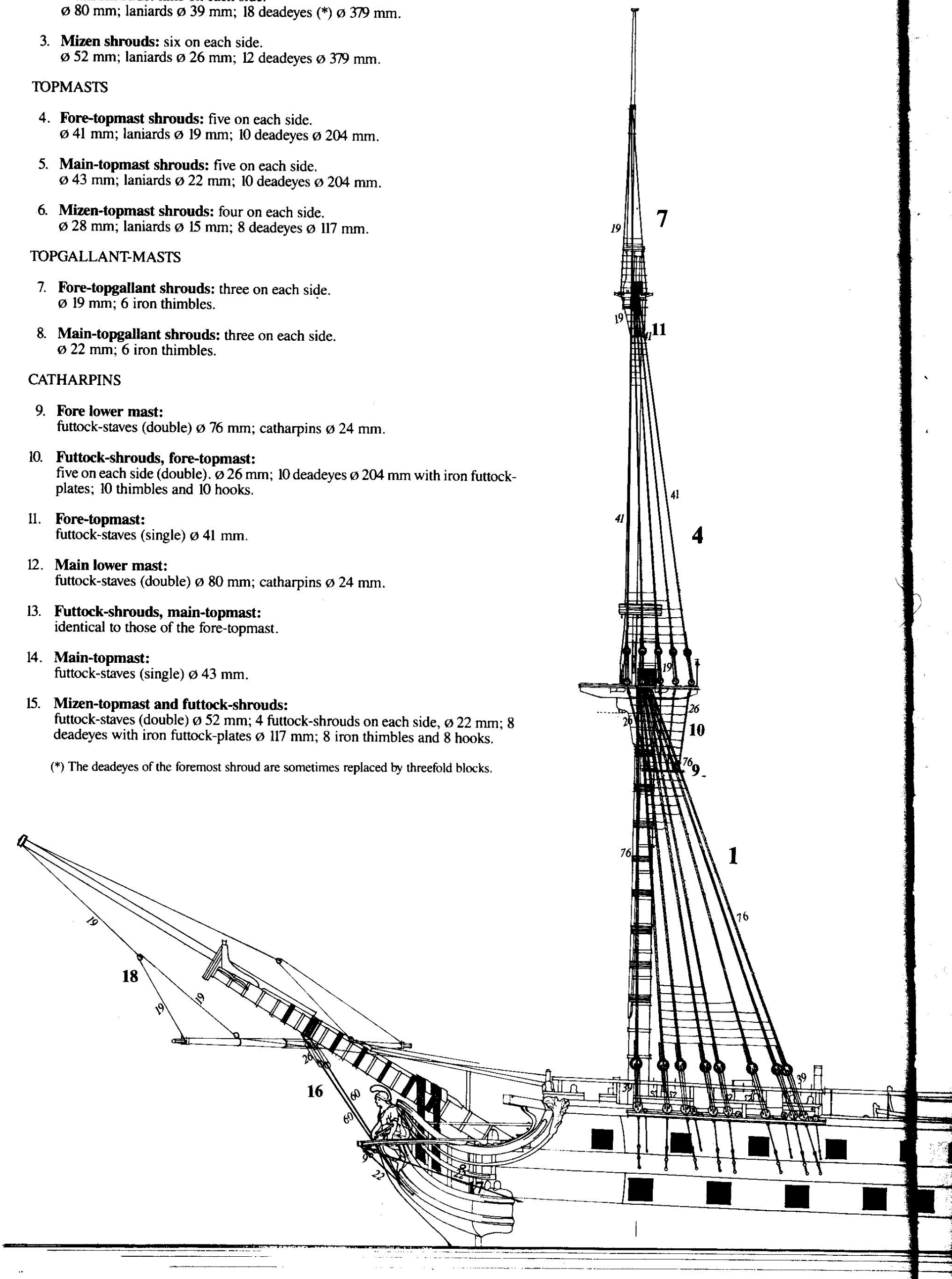
12. **Main lower mast:**
    futtock-staves (double) ø 80 mm; catharpins ø 24 mm.

13. **Futtock-shrouds, main-topmast:**
    identical to those of the fore-topmast.

14. **Main-topmast:**
    futtock-staves (single) ø 43 mm.

15. **Mizen-topmast and futtock-shrouds:**
    futtock-staves (double) ø 52 mm; 4 futtock-shrouds on each side, ø 22 mm; 8 deadeyes with iron futtock-plates ø 117 mm; 8 iron thimbles and 8 hooks.

(*) The deadeyes of the foremost shroud are sometimes replaced by threefold blocks.



OTHER ITEMS

16. **Bobstays:** (double) ø 60 mm; laniards ø 26 mm; collars ø 60 mm; 4 deadeyes ø 258 mm.

17. **Bumpkin-stays:** (double) ø 22 mm; laniards ø 9 mm; 8 deadeyes ø 156 mm.

18. **Guy-pendants and falls:** 1 pair ø 19 mm; 4 single blocks (length 163 mm). The eye of the pair of pendants is placed over the jibboom below the truck, and each leg has a single block turned in it; the fall reeves through this block, with its standing end made fast to the yardarm of the spritsail yard, and its hauling end reeves through a second single block seized to the quarter of the yard and is then belayed at the beakhead bulkhead.

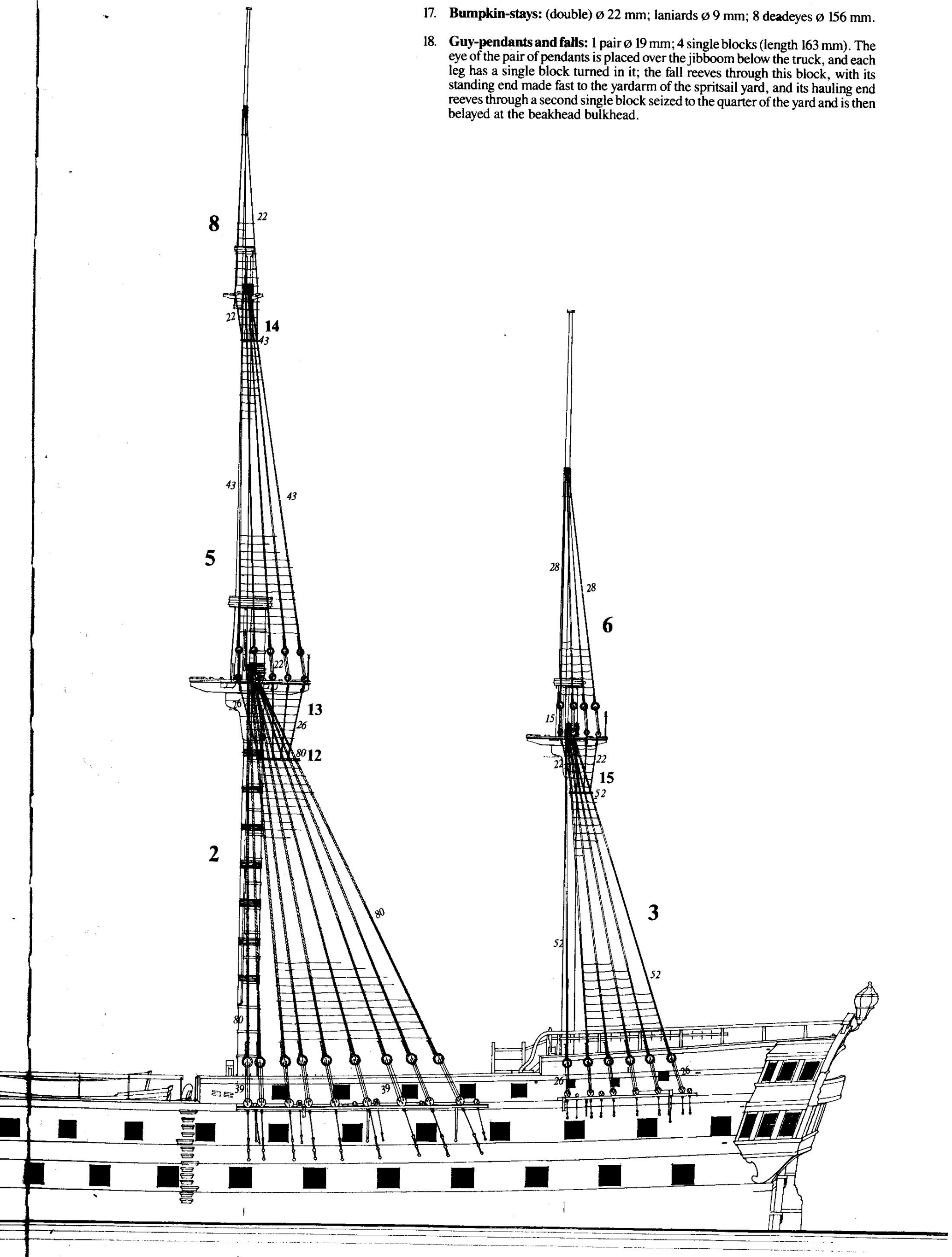


Fig. 288
BACKSTAYS

1. **Fore-topmast shifting backstay:** one on either side. ø 50 mm; laniards ø 24 mm; 2 threefold blocks (length 271 mm).

2. **Fore-topmast standing backstays:** two on either side. ø 50 mm; laniards ø
& 3. 24 mm; 4 deadeyes ø 237 mm.

4. **Main-topmast shifting backstay:** one on either side. ø 54 mm; laniards ø 24 mm; 2 threefold blocks (length 271 mm).

5. **Main-topmast standing backstays:** two on either side. ø 54 mm; laniards
& 6. ø 24 mm; 4 deadeyes ø 237 mm.

7. **Mizen-topmast backstays:** two on either side. ø 30 mm; laniards ø 17 mm;
& 8. 4 deadeyes ø 177 mm.

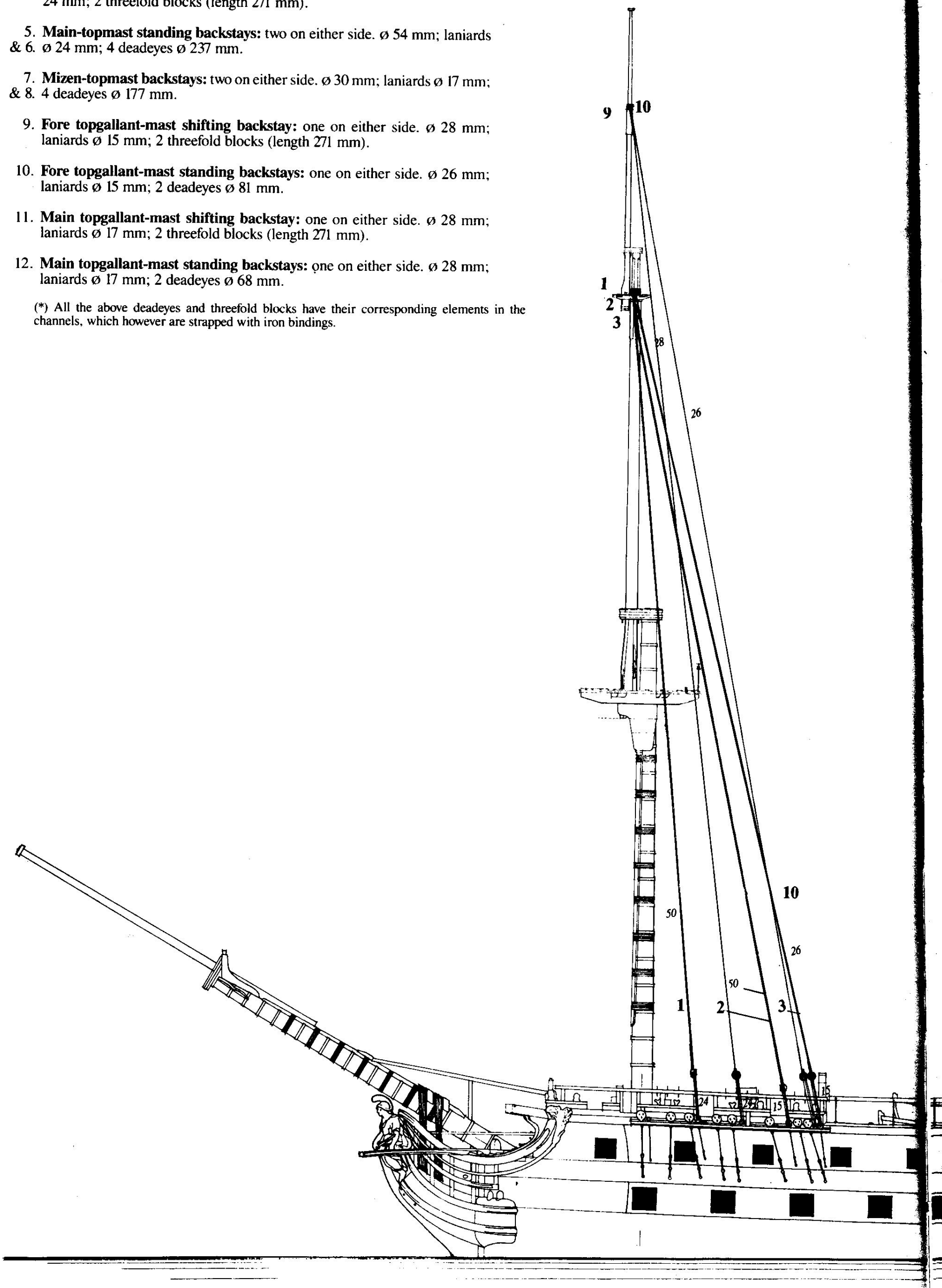
9. **Fore topgallant-mast shifting backstay:** one on either side. ø 28 mm; laniards ø 15 mm; 2 threefold blocks (length 271 mm).

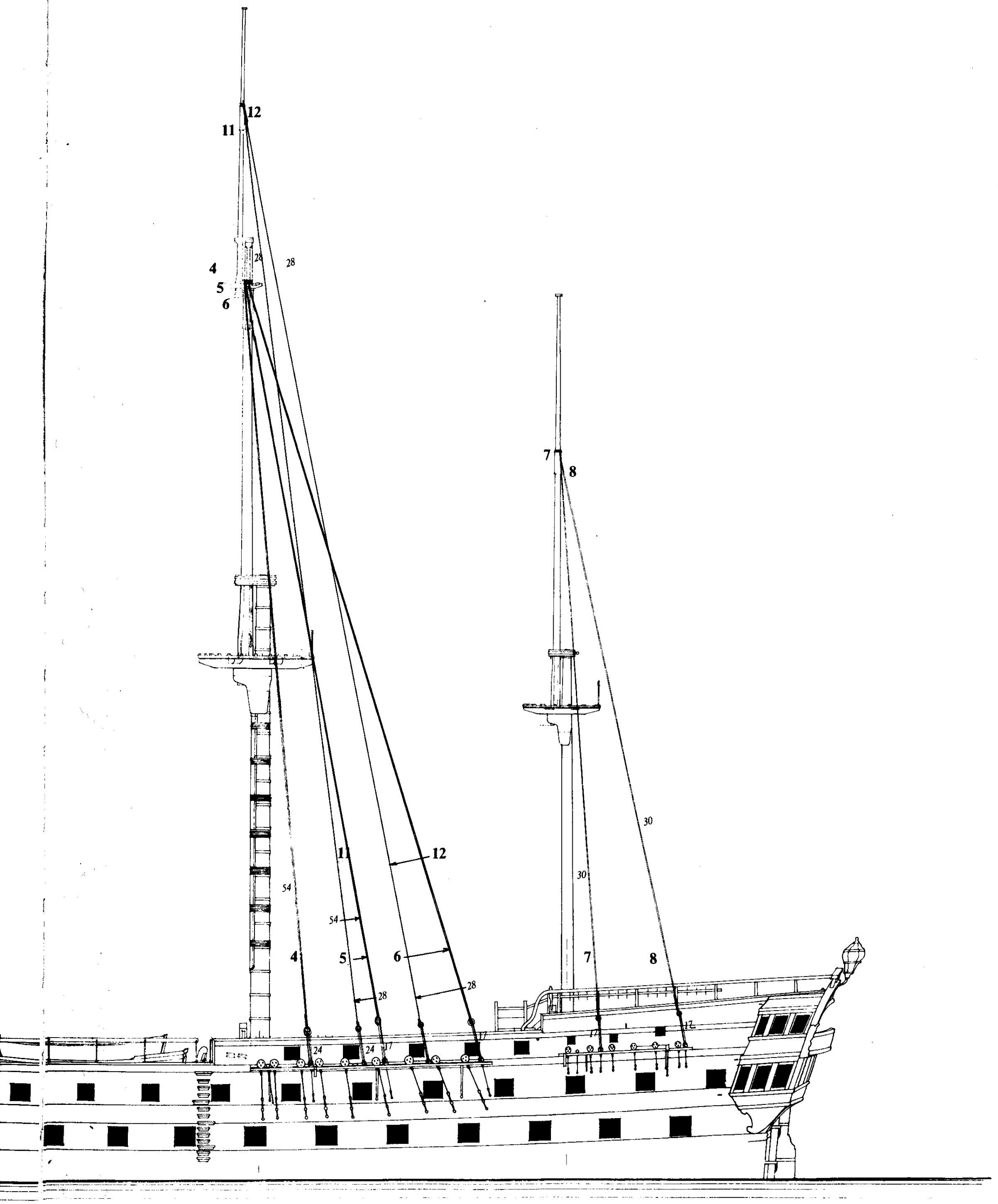
10. **Fore topgallant-mast standing backstays:** one on either side. ø 26 mm; laniards ø 15 mm; 2 deadeyes ø 81 mm.

11. **Main topgallant-mast shifting backstay:** one on either side. ø 28 mm; laniards ø 17 mm; 2 threefold blocks (length 271 mm).

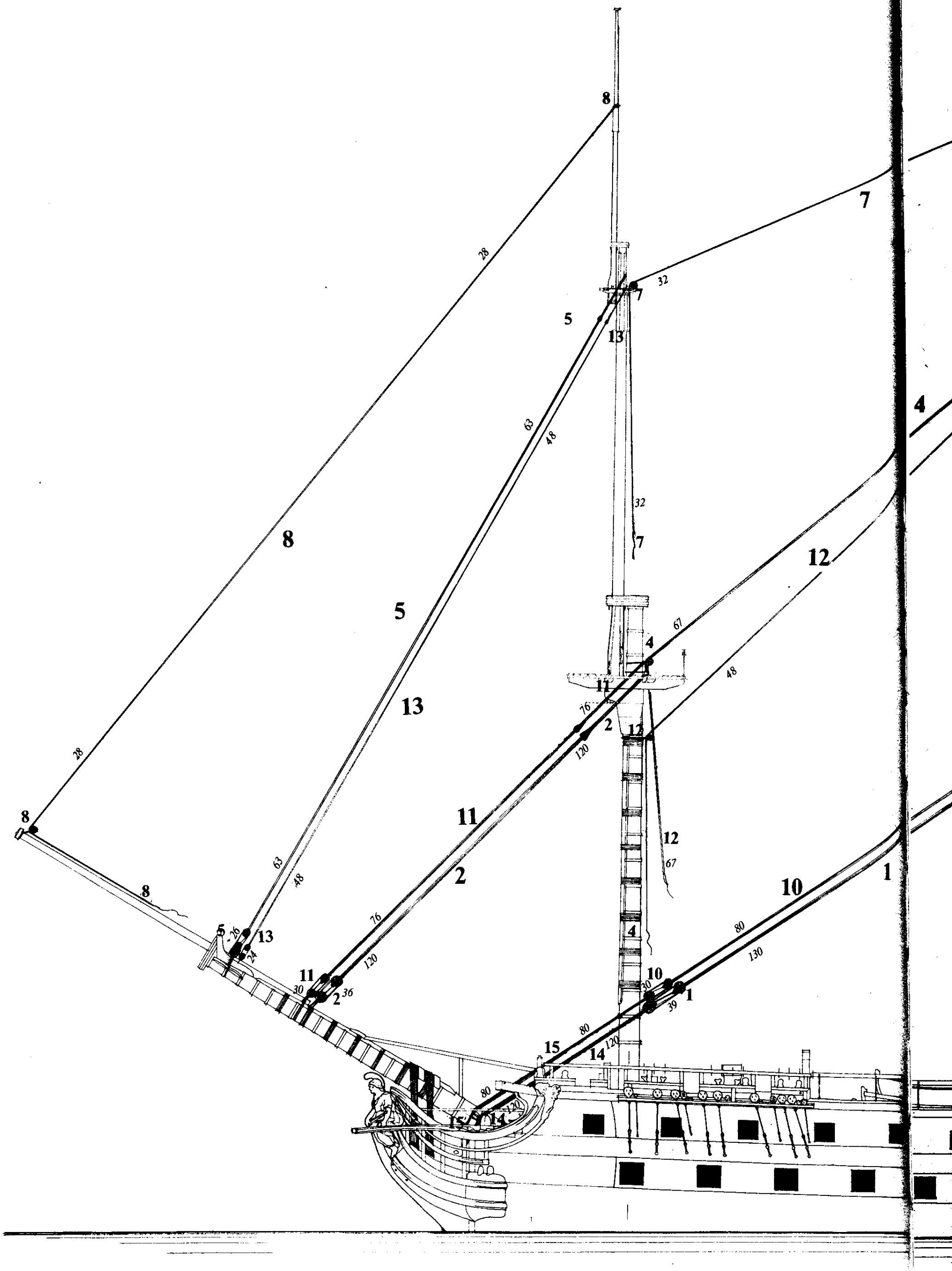
12. **Main topgallant-mast standing backstays:** one on either side. ø 28 mm; laniards ø 17 mm; 2 deadeyes ø 68 mm.

(*) All the above deadeyes and threefold blocks have their corresponding elements in the channels, which however are strapped with iron bindings.




12
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54
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24
24
17
17
17

IGGING


8
28
8
8
63
48
5
13
5
26
24
11
30
2
36
76
120
11
2
13
63
48
28
7
32
7
5
13
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11
76
2
12
120
4
67
48
12
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80
15
14
120

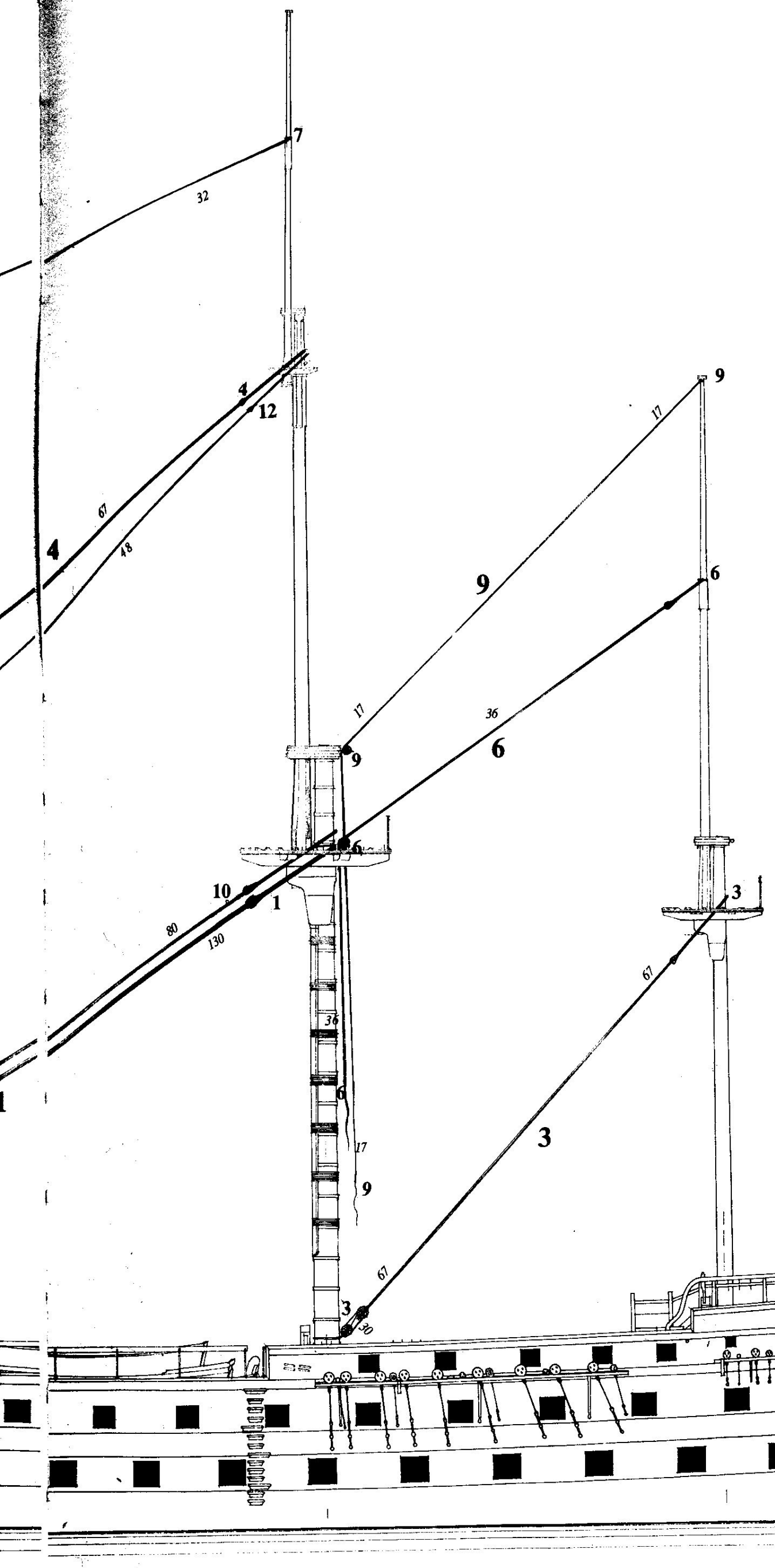


Fig. 289
STAYS AND PREVENTER-STAYS

1. **Mainstay:** Mouse to starboard.
   ø 130 mm (apart from the anchor cables, this is the heaviest rope used on board); laniard ø 39 mm; 1 heart single-strapped (length 520 mm).

2. **Forestay:** Mouse to port.
   ø 120 mm; laniard ø 36 mm; 1 double-strapped heart (length 480 mm) seized round the bowsprit.

3. **Mizen-stay:** Mouse to starboard.
   ø 67 mm; laniard ø 30 mm; 2 single-strapped hearts (length 268 mm), the lower one seized round the mainmast.

4. **Main-topmast stay:** Mouse to starboard.
   ø 67 mm; tackle falls ø 28 mm; 1 single block (length 352 mm); 1 long-tackle block (length 434 mm); 1 hook-block (length 217 mm).

5. **Fore-topmast stay:** Mouse to port.
   ø 63 mm; falls ø 26 mm; 1 single block (length 217 mm) turned in the lower end of the stay; 1 long-tackle block (length 379 mm) seized round the bowsprit.

6. **Mizen-topmast stay:** Mouse to starboard.
   ø 36 mm; 1 single block (length 271 mm) seized round the mizen-mast head over the rigging; 1 single hook-block (length 271 mm).

7. **Main-topgallant stay:** The collar is spliced.
   ø 32 mm; 1 single block (length 244 mm) seized round the main-topmast head over the rigging.

8. **Fore-topgallant stay:** The collar is spliced.
   ø 28 mm; middle sheave of 1 threefold block (length 325 mm) seized below the truck of the jibboom.

9. **Mizen-topgallant stay:** The collar is spliced.
   ø 17 mm; 1 single block (length 136 mm) made fast to the main-cap; 1 single hook-block (length 136 mm).

10. **Main preventer-stay:** Mouse to port.
    ø 80 mm; laniard ø 30 mm; 1 single-strapped heart (length 320 mm).

11. **Fore preventer-stay:** Mouse to starboard.
    ø 76 mm; laniard ø 30 mm; 1 single-strapped heart (length 304 mm) seized round the bowsprit.

12. **Main-topmast preventer-stay:** Mouse to port.
    ø 48 mm; tackle falls ø 26 mm; 1 single block (length 298 mm); 1 long-tackle block (length 379 mm); 1 single hook-block (length 217 mm).

13. **Fore-topmast preventer-stay:** Mouse to starboard.
    ø 48 mm; laniard ø 24 mm; 1 deadeye turned in to the stay; 1 deadeye made fast to a bolt in the jackstaff-standard.

14. **Mainstay collar:** ø 120 mm; 1 single-strapped heart (length 480 mm).

15. **Main preventer-stay collar:** ø 80 mm; 1 single-strapped heart (length 320 mm).

4. RUNNING RIGGING – YARDS

Halliards – Jeers – Slings – Parrels – Lifts – Braces.

The yards must first be hoisted by means of *halliards* or *jeers*, and once in place they are supported by *slings*; the wind tends to force them away from the masts, so they are secured by *parrels*. The yards should be more or less horizontal*, which is achieved by the use of *lifts*, and furthermore they must be angled to the most favourable angle in relation to the wind, and this is done by means of the *braces*. Thus there are five items of running rigging needed for most of the yards on our 74.

* Only relative, since in fact, particularly when sailing close-hauled, the yards are noticeably higher on the lee side.

I should also add at this point that the effort exerted by the braces on the ends of the yards needs to be as square to the yards as possible, and for this reason the standing end of the braces is made fast as far aft as possible, except in the case of the mizen-mast which is already so far aft that the braces are led forward instead.

Bowsprit

SPRIT-TOPSAIL YARD (see in particular Fig. 290).

Halliards: The halliards of the sprit-topsail yard are composed of a small tackle, the lower block of which is made fast to the centre of the yard and the upper block round the rigging of the jibboom below the truck; the fall is belayed to one of the stanchions of the forecastle breastwork, after first reeving through a thimble or small block made fast to the collar of the forestay.

Slings: A length of rope is middled and passed round the yard, then through itself in the bight thus formed; it is then passed twice round the jibboom in opposite directions and lashed underneath by means of a small eye formed at each of the ends.

Parrel: The sprit-topsail yard has no parrel.

Lifts: These have their standing end made fast at the yardarm by means of an eye slipped over the end; they then reeve through a single block or alternatively a thimble fastened to the jibboom rigging, and are belayed to one of the stanchions of the beakhead bulkhead.

Braces: These have their standing end made fast by means of a toggle to a becket passed over the yardarm; they pass then aft and upwards to the collar of the forestay where they reeve through a single block or a thimble fastened above the mouse, and pass downwards again to be belayed to one of the stanchions of the beakhead bulkhead.

Horses – Footropes. Stirrups.

Horses and Stirrups: A rope is suspended below each half of the yard, ending at either end in a small eye or becket; at the outboard end the eye is fitted over the arm of the yard, while inboard the eyes of the two ropes are seized together about the slings. These ropes, called *horses* or *footropes*, are suspended from four *stirrups*, which are formed of short lengths of rope passed two or three times round the yard and nailed on the after side.

The part of the stirrups which passes round the yard is plaited, while at the lower end there is a spliced eye, through which the horses reeve before the seizing-eyes are spliced in their ends.

SPRITSAIL YARD (see in particular Fig. 290).

Halliards: The spritsail halliards take the form of a small tackle, with its lower block fastened to the slings (see below), and its upper block seized to an eyebolt in the bowsprit cap. When the upper block is a double block the falls are made fast at their standing end to the strap of the single block and are belayed to it by means of several turns taken round above the standing end. In order to lighten the rigging, this tackle is often omitted, and replaced by a short length of rope served overall with spun-yarn and with a hook at either end, the two ends being hooked together beneath the forward end of the bowsprit. It should however be remembered that once the spritsail yard has been rigged and is held in place by the slings, the halliards can be unrove.

overall with spun-yarn and with a hook at either end, the two ends being hooked together beneath the forward end of the bowsprit. It should however be remembered that once the spritsail yard has been rigged and is held in place by the slings, the halliards can be unrove.

Slings: As with the sprit-topsail yard, the slings and the parrels are essentially the same thing. A length of rope is spliced together at its ends, passes round the mid-point of the yard, and turns in a thimble on top of the yard by means of a thimble-seizing. A similar strap is passed round the bowsprit just above the fore preventer-stay collar. The two thimbles are then seized together.

Lifts: While the sprit-topsail yard only has single lifts, those of the spritsail yard are double; in other words, they are made fast at their standing end to a sprig-bolt on either side of the cap of the bowsprit, reeve through a block at the outboard end of the yard, and then return inboard again to reeve through a second block fastened to the same sprig-bolt in the cap; from there they pass down along the bowsprit, through the rack-blocks, and are belayed at the beakhead bulkhead.

The spritsail-yard lifts sometimes act as sheets for the sprit-topsail: see what I have to say on the subject in the section on the sprit-topsail (page 178).

Running lifts. Standing lifts.

Braces: Normally double, the braces are made fast at their standing end to the collar of the forestay close to the mouse, then reeve through a block made fast over the arm of the yard, pass back to reeve through a second block fastened underneath the forward end of the fore-topmast trestletrees, and from there run down to the forecastle breastwork where they are belayed to one of the stanchions, after first reeving through a lead-block.

Standing lifts: Apart from the *running lifts* described above, the spritsail-yard is also rigged with *standing lifts*; approximately one third of the way out from the slings is a deadeye, and a second deadeye is turned in to a strap made fast to one of the sprig-bolts under the cap. The two deadeyes are bowsed together by means of a laniard. There are of course two symmetrical lifts.

Horses and stirrups: Exactly the same as for the sprit-topsail yard, save that there are six stirrups.

Fig. 290
Rigging to the Spritsail and Sprit-Topsail Yards

1. Sprit-topsail yard halliard (the fall is belayed at the forestay collar).
2. Slings of the sprit-topsail yard.
3. Lifts of the sprit-topsail yard (belayed round a stanchion of the beakhead bulkhead).
4. Sprit-topsail yard braces (run up to the forestay collar and then back down again to be belayed round a stanchion of the beakhead bulkhead).
5. Horses and stirrups, sprit-topsail yard.
6. Spritsail-yard halliard or tackle.
7. Spritsail-yard slings.
8. Spritsail-yard running lifts (reeve through the rack-blocks and are belayed round one of the beakhead bulkhead stanchions).
9. Spritsail-yard braces (standing part made fast to the forestay collar and hauling end belayed round forecastle breastwork stanchion).
10. Spritsail-yard standing lifts.
11. Horses and stirrups, spritsail-yard.
12. Horse of the jibboom.

Foremast

FOREYARD

Jeers.

Jeers: The halliards which we have seen on the sprit yards are replaced on the foreyard by a heavy tackle called the *jeers*. For the lower yards, two such tackles are necessary in order to hoist them. Two threefold blocks are fastened on either side of the trestletrees below the foretop; the strap has a long tail into which a thimble is turned (see Fig. 292), and the two thimbles are fastened round the head of the foremast over the rigging by a lashing. The length of these straps is calculated to allow the yard to be hoisted as far as the catharpins, and the straps are served overall with spun-yarn. The two lower blocks of the jeers are attached to the foreyard about 4 feet [1.30 m] apart. The lower blocks are double-strapped (see Fig. 267), and are placed over the yard so that the sheaves run fore-and-aft. The strap of each of these blocks is composed of two single straps each with a long and a short leg which are laid alongside each other in the scores of the block, seized together with a throat-seizing at the arse; the two legs pass round the yard and are seized together on the fore side, leaving the block on top of the yard (see Fig. 292).

*And sometimes leathered as well.

These straps are served with spun-yarn*, and a throat-seizing towards the end of each leg forms a small seizing-eye.

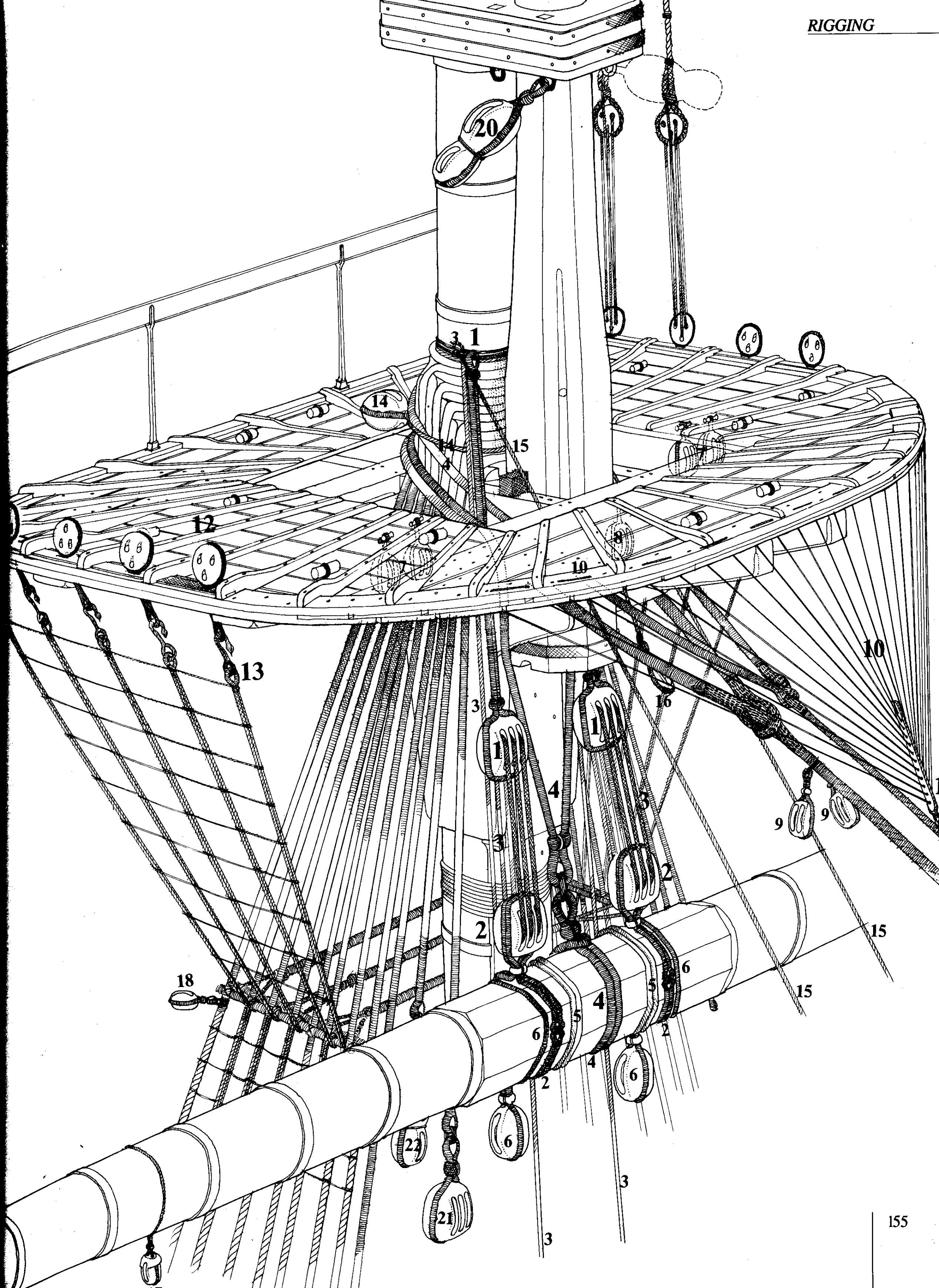
The jeer-falls have their standing end made fast round the head of the mast by means of an eye spliced in the end and sometimes enclosing a thimble. The falls run down the mast and are belayed to cleats nailed to the lower mast. The jeer-falls are rigged to the capstan when the yard is to be hoisted or lowered.*

*It is rare for the lower yards to be lowered, save perhaps when at anchor in very heavy weather, or also on occasions as a means of boarding an adversary, the lower yards forming gangways for the boarding party.

Fig. 291
Mainyard and Maintop

1. Upper jeer-blocks; the single long leg of the pendant has a thimble by means of which it is lashed round the masthead.
2. Lower jeer-blocks; double-strapped, with therefore two scores in the shell; the ends of the legs of the straps are spliced in an eye to enable a seizing to be clapped on, on the forward side of the yard.
3. Jeer-falls; the standing end has a thimble turned in to allow it to be made fast round the head of the foremast above the lashing securing the upper jeer-blocks.
4. Slings; the strap forms a noose round the yard and the slings themselves fit round the masthead. The thimbles in the slings and in the strap allow the two parts to be seized together. The slings pass inside the collar of the mainstay. Some people prefer to pass it over the forward crosstrees, modifying the maintop accordingly, but while this brings the yard further forward and makes it easier to brace up, it has the disadvantage of chafing the slings and the crosstrees.
5. Truss passed round the yard.
6. Topsail-sheet blocks (quarter-blocks).
7. Double blocks for the maincourse buntlines and leech-lines*.
8. Double block for the buntlines.
9. Forebrace and fore-topsail brace blocks.
10. Crow's-foot passed in and out alternately through the rim of the top.
11. Euphroe; the thimble by which it is seized to the stay is sometimes replaced by a small tackle or two deadeyes so that the crow's-foot can be set up more easily.
12. Topmast shroud deadeye and futtock-plate.
13. Thimble and hook for futtock-shrouds.
14. Block for mizen topmast-stay strapped round the masthead.
15. Garnet-pendants made fast round the masthead rigging.
16. Main-staysail halliard block.
17. Buntline block.
18. Block for port mizen-topsail brace.
19. Mizen topgallant-stay block seized to an eyebolt on the after side of the maincap.
20. Long-tackle block for mainyard lifts.
21. Main winding-tackle block.
22. Main-tackle block.

*One of the double blocks fastened under the maintop is for the leech-lines (see the marginal note regarding their run on page 184).


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Slings: The jeers are only used to hoist and lower the yards, and their weight is borne by the slings (see Figs. 291 and 292). The slings are formed in two parts: the slings proper, which are formed from a piece of rope spliced together at its ends and passed over the masthead rigging and the trestletrees, and turning in a thimble with a thimble-seizing at its lower end; and a strap, fashioned in the same way but doubled round the yard at its middle and then through itself to form a noose over the top of the yard. The two thimbles are seized together. Both strap and slings are served overall with spun-yarn.

Alternatively, the strap round the yard may have two legs rigged like the straps of the lower jeer-blocks, in which case the groove round the thimble must be wide enough to take the doubled strap.

Trusses: The trusses are similar in purpose to the parrels, and formerly all the yards (except those of the bowsprit) were provided with parrels (see below). However, in order to lighten the rigging trusses have taken their place for the lower yards.

There are two trusses, each consisting of a length of rope with a thimble spliced in at one end, the other end being left unchanged since it reeves through the block of a tackle. They are leathered from the thimble to the point where they no longer surround the mast. They are fixed to the yard (see Fig. 293) on either side of the strap of the slings by means of a round turn at the end with the thimble, and the turn is then stopped with a seizing. Each truss passes behind the mast, reeves through the thimble of the other, runs down the mast and ends at a tackle, of which the lower block is made fast to the deck. This tackle, called the *truss-tackle*, can be bowsed taut to bring the yard up against the mast or slacked off to allow the yard to be braced up*.

Truss-tackle.

*Adjusting the truss can be made easier by means of two lines called the *uphauler* and *downhauler*, made fast to the middle of the trusses. Working either from the top or from the deck these lines help the truss to be moved up and down in the event that it should jam against the mast-hoops of the lower mast.

Lifts: A block is clapped on over the arm of the yard, and this block has a peculiar shape which gives it the name of a "shoe-block"; it was described earlier (see Fig. 278). The lifts are doubled, and are made fast at their standing end by means of an eye; passing up to the cap, they reeve through one of two fiddle-blocks seized to sprig-bolts on the under side of the cap on either side; from the smaller of the two sheaves in the fiddle-blocks they pass outboard and reeve through the upper sheave of the shoe-block, then inboard again to the larger sheave of the fiddle-block, and finally pass down through the lubber's hole to be belayed at the forecastle pin-rail, passing first through a lead-block.

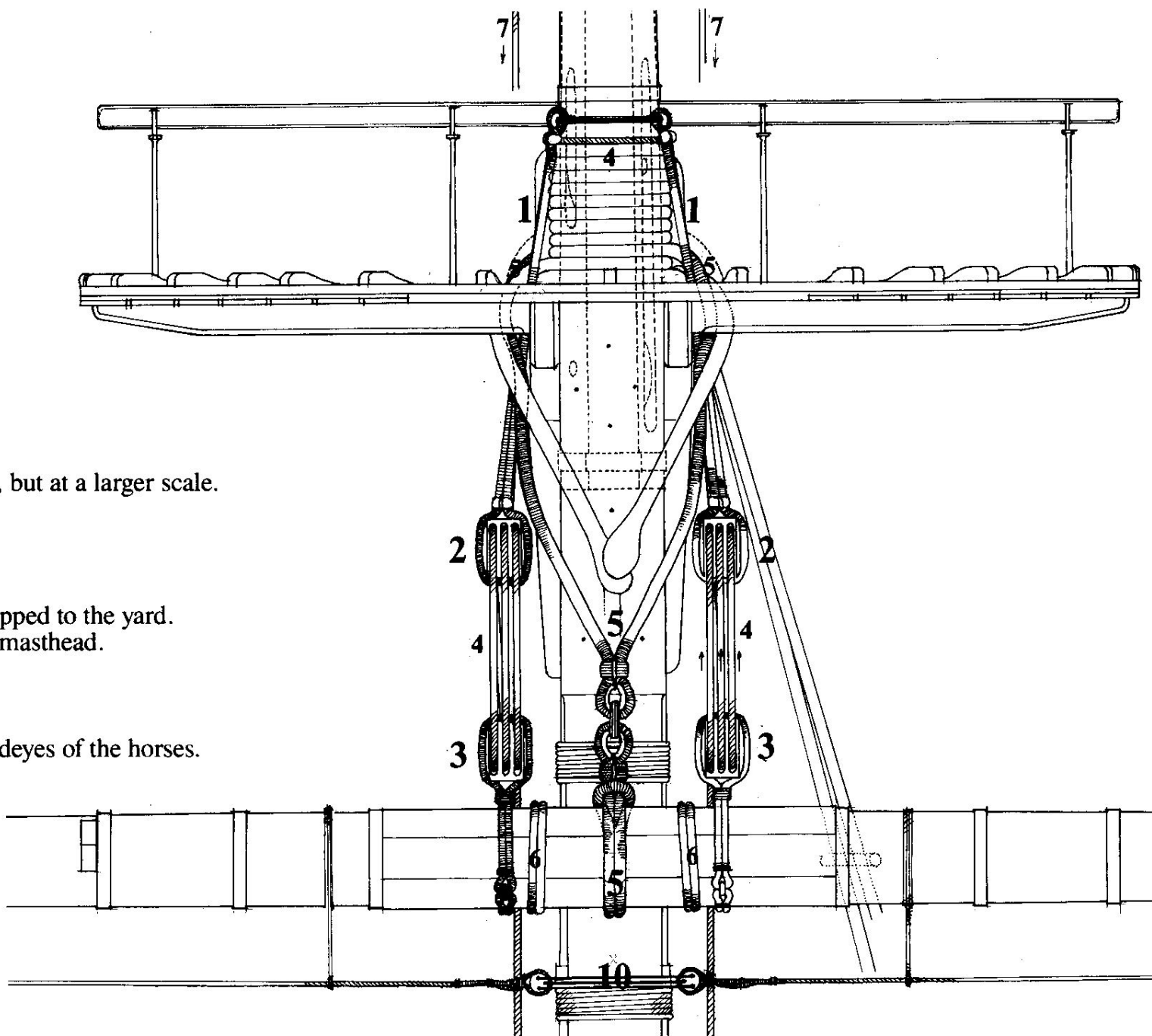


Fig. 292
Close-up View of a Lower Yard
(looking aft)

This is a small area from Fig. 298, but at a larger scale.

1. Pendants of the jeers.
2. Upper jeer-blocks.
3. Lower jeer-blocks double-strapped to the yard.
4. Jeer-falls made fast round the masthead.
5. Slings.
6. Truss-parrel.
7. Lower yard lifts.
10. Laniards rove through the deadeyes of the horses.

Braces: The braces are double and they are made fast at their standing end to the mainstay below the collar*; from there they lead to a single block made fast at each yardarm, return to a single block seized to the mainstay close to their standing end (sometimes this block is left off), reeve through a double block seized to the side of the bibbs of the mainmast, and run down the mast to the ninepin-bitts where they reeve through one of the sheaves in the pins; they are belayed there, or round a cleat nailed close by.

*or alternatively to the bibbs of the mainmast.

Horses and stirrups: The horses are formed by two ropes made fast at their outboard ends by means of an eye slipped over the yardarm; they are bowsed taut by means of small deadeyes and a laniard, each horse having one deadeye turned in its inboard end (see Fig. 292).

Eight stirrups complete the footropes, and these are rigged in exactly the same way as has already been explained for the stirrups of the sprit-topsail yard.

Yard-tackles: These are only rigged to the lower yards, with their pendants made fast at the yardarm. When used as *rolling-tackles*, the lower block is hooked to a becket with a thimble at the bottom of the bibbs; the tackle-falls reeve through a block seized to the mast a little lower down, and then run down to the deck.

Rolling-tackles: whether used as yard-tackles or rolling-tackles, these are never rigged permanently but used as required, mainly to limit the amount of play in the yards when the vessel is rolling heavily.

We will examine the various uses of the yard-tackles on the lower yards in Volume IV: for swaying the boats in and out, and for hoisting the guns when fitting out the ship or laying her up.

Pudding: I described how the puddings were made at the beginning of this section (p. 107), and the dolphin nailed to the mast below it. The puddings are placed under the yards to prevent them from slipping down if anything should give. I should also mention another kind of *puddening* which is more specific to the lower yards, and of which there may be two on either side. Made in the same way as puddings, these are clapped on round the yard to prevent the sheets of the topsails and topgallants from chafing the robands. The padded part is placed on the after side of the yard. Seamen call such puddings *paunches*, and they may also be fitted round the topsail-yards.

Puddening: synonym for pudding, but also used as a verbal noun to describe other forms of padded protection.

Paunches.

Fig. 293
Close-up View of a Lower Yard and Truss (from the side)

This Figure completes the previous one. At 13 note the mizen topmast-stay block. The way the trusses are rigged at 6 is I hope perfectly clear.

FORE TOPSAIL-YARD

Ties and Halliards: When we looked at the standing rigging of the masts we saw how, before the burton-pendants were got over the masthead, the tie-block straps had first to be rigged, these being the first pair of eyes to be got over.

Upper tie-block or ***tye-block.***

These straps (see Fig. 296) are spliced, with the eye formed by a throat-seizing which serves at the same time to turn in a thimble below. A single block called the *upper tie-block*, which has the peculiarity of having one cheek of the shell flat rather than rounded* (see Fig. 268), is double-strapped, the two legs of the strap turning in an iron thimble at the head. The thimble in the strap over the masthead (which effectively performs the role of a pendant) is seized to the thimble in the strap of the tie-block.

*The flat cheek faces inwards and thus bears more easily on the hounds of the topmast.

Bollock-block: the term is easier to understand when the blocks are double (see below); this sort of term tended to be bowdlerised by the Victorian lexicologists, and the word does not appear for example in Admiral Smyth's *Sailor's Word Book* of 1867. They are listed however in the 1815 (Burney) edition of Falconer. [Trans.].

At the slings of the yard is fastened a double-strapped single block (called the *bollock-block*) with its sheave running athwartships, or parallel to the yard. The double strap (which is a single length of rope doubled) is made fast over the yard and turns in the block at the same time (see Fig. 294). A throat-seizing is clapped on between the block and the yard, and two seizings below the doubled ends of the strap form two eyes which are lashed together on the forward side of the yard.

Generally all these straps are served overall with spun-yarn.

Tie: The tie (or ***tye***) is effectively a ***runner*** [q.v.], while the halliards form the tackle.

A rope called the *tie* reeves through the bollock-block at the slings of the yard, then through the two upper tie-blocks, and runs down on either side of the mast, the middle of the tie being thus at the bollock-block. The tie is served overall with spun-yarn. The two lower ends of the tie turn in a double block, or else reeve through a thimble seized in the strap of the block*. This double block (the *fly-block*) has a corresponding single block below fitted with a swivel-hook (the hook is shown in Fig. 275). The falls* of this tackle are made fast at their standing end to the lower block which is hooked to an eyebolt in the ship's side abaft the channels. It is thus simple to understand how by tailing on these two tackles, one to port and the other to starboard, the topsail-yard can be swayed up or lowered.

*After passing through the thimble they are fastened to the strap with a sheet bend.

Fly-block.

*In this case the falls take the name of ***halliards*** (or ***halyards***, from ***haul-yards***), since it is by hauling on these ropes that the yards are swayed up.

*Save the fore-topsail halliards.

Topsail-halliard traveller.

All the topsail-halliards on our 74* pass through *travellers* placed one or two feet [32 – 65 cms] above the fly-block; these are iron guides (see Fig. 295) in the form of a strap pierced by a series of holes; one end finishes in a ring, through which is rove the aftermost topmast backstay, while the other end has a small jaw of the same diameter as the tie.

The traveller is fastened to the tie at the jaws by means of a small lashing, and it is held horizontal by a series of thin lines which reeve through the holes in the traveller (where they are stopped by knots), and are then seized at regular intervals to the tie, so that the lines are parallel.

*The swivel of the hook-block should in principle prevent any twisting of the halliard, and thus the traveller is somewhat pointless.

The purpose of the traveller is to prevent the tie from unlaying and thereby twisting the halliard*.

In Figure 298 I have also shown an alternative way of rigging the topsail-yard ties; instead of being single, as I have just described, the ties can be double, each one being made fast at its standing end to the forward side of the mast at the hounds by means of eyebolts to which they are seized. Each tie then reeves separately through one of two bollock-blocks lashed next to each other at the slings of the yard, pass up through the tie-blocks and then down again like the single ties, with the same tackle composed of fly-blocks and halliards.

I should add that the falls of this tackle (the halliards), after reeving through the sheaves of the two blocks then reeve through a lead-block made fast in the spirketting and are then belayed to a cleat nailed inside the bulwarks.

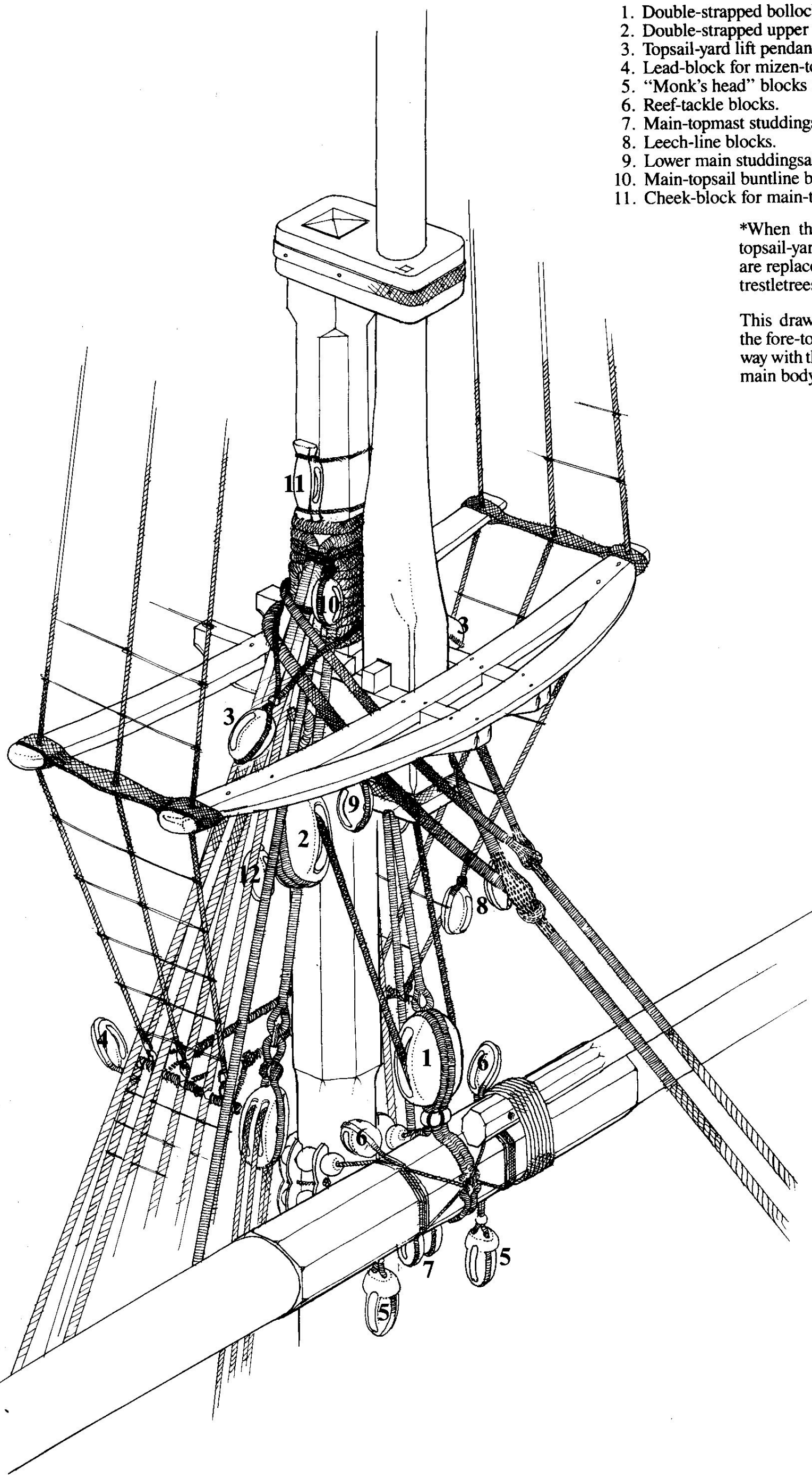


Fig. 294
Close-up View of the Main-Topmast Head and Topsail-Yard

1. Double-strapped bollock-block on the yard.
2. Double-strapped upper tie-block.
3. Topsail-yard lift pendant-blocks.
4. Lead-block for mizen-topsail brace.
5. "Monk's head" blocks for the topgallant sheets*.
6. Reef-tackle blocks.
7. Main-topmast studdingsail halliard blocks.
8. Leech-line blocks.
9. Lower main studdingsail halliard block.
10. Main-topsail buntline block.
11. Cheek-block for main-topmast staysail halliard.

*When the topgallant sheets also serve as topsail-yard lifts, these blocks are left off, and are replaced by the single blocks beneath the trestletrees marked 3.

This drawing shows the main-topmast, but the fore-topmast is rigged in exactly the same way with the exception of a few blocks (see the main body of the text).

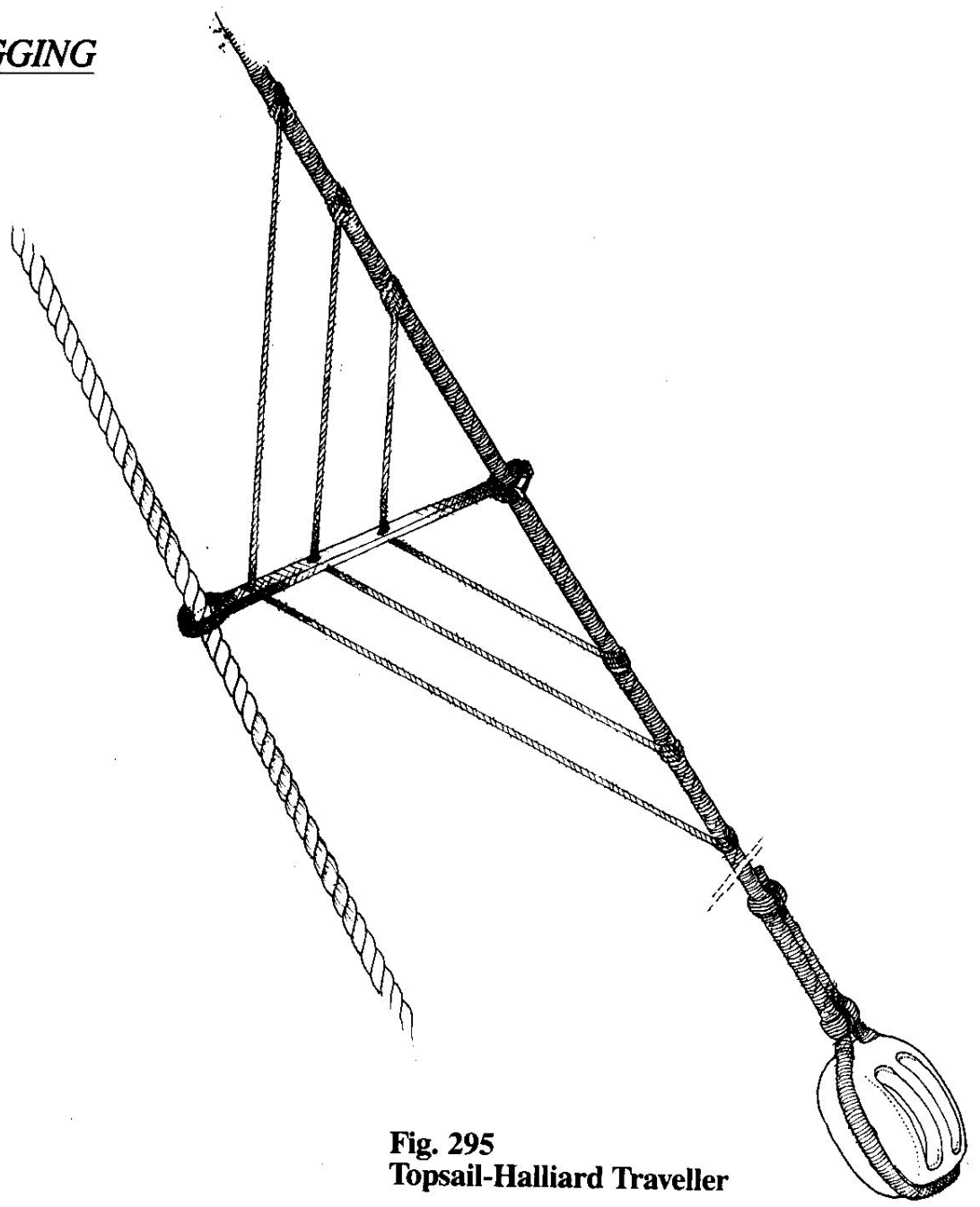


Fig. 295
Topsail-Halliard Traveller

The traveller may also be made of wood with the ring and jaws of metal. As a rule the traveller is served overall with spun-yarn to preserve the rigging from chafe.

Parrels: In the case of the topsail-yards the parrels are composed of three rows of trucks, each truck being separated from the next by a rib; having described these in detail on page 116 I will not go over them again here, save to repeat that a parrel-rope runs through each row of trucks and through the ribs; the upper and lower parrel-ropes have an eye formed at one end (see Fig. 297), the eyes being placed at opposite ends, one on the port side and one to starboard. The parrel is placed round the mast behind the yard. The two ends of the parrel-ropes are made fast round the yard on the forward side of the mast by passing each end round the yard two or three times, one over and the other underneath, each end being passed through the eye or thimble seized in the end of the opposing rope. Then the two ends are lashed together and the two eyes are seized (Fig. 297). A certain amount of play is left when the parrel is clapped on, and then the topmasts are payed with tallow to allow the yards to be hoisted and lowered more easily.

Lifts: Sometimes the lifts are double, in which case they are made fast at their standing end to an eyebolt in the topmast cap, while the running end reeves through the sheave of a single block fitted over the arm of the topsail-yard; passing inboard again to reeve through a second single block strapped round the rigging at the topmast head, the falls lead down to the deck where they are belayed to a pin in the forecastle pin-rail.

To furl a sail: to gather the canvas over the top of the yard, by means of ***gaskets*** [q.v.].

This arrangement of double lifts is only used when the topgallants are *furled*; when these sails are set, the lifts become single since they also serve as the topgallant sheets; there is a toggle fitted to one end which fastens to the clue of the sail (see Fig. 298).

Braces: The braces are always double, and they have their standing ends made fast either to the mainstay collar or to the main-topmast stay collar, or alternatively to the foremost topmast-shroud, between the catharpins and the masthead. The hauling part reeves through the pendant-block at the yardarm (strapped with a long strap – see Fig. 296), passes back to the mainstay collar where it reeves through a block seized a little below the mouse, then through one of the sheaves of a sister-block (that already used for the foreyard braces – see above), and down the mainmast to the ninepin-bitts on the quarterdeck; reeving through one of the sheaves in the bitt-pins it is belayed to the pin or to a cleat nearby.

Horses and stirrups: These are similar to those of the sprit yards, save that the eyes formed at the inboard ends of each horse are replaced by thimbles, and there are six stirrups.

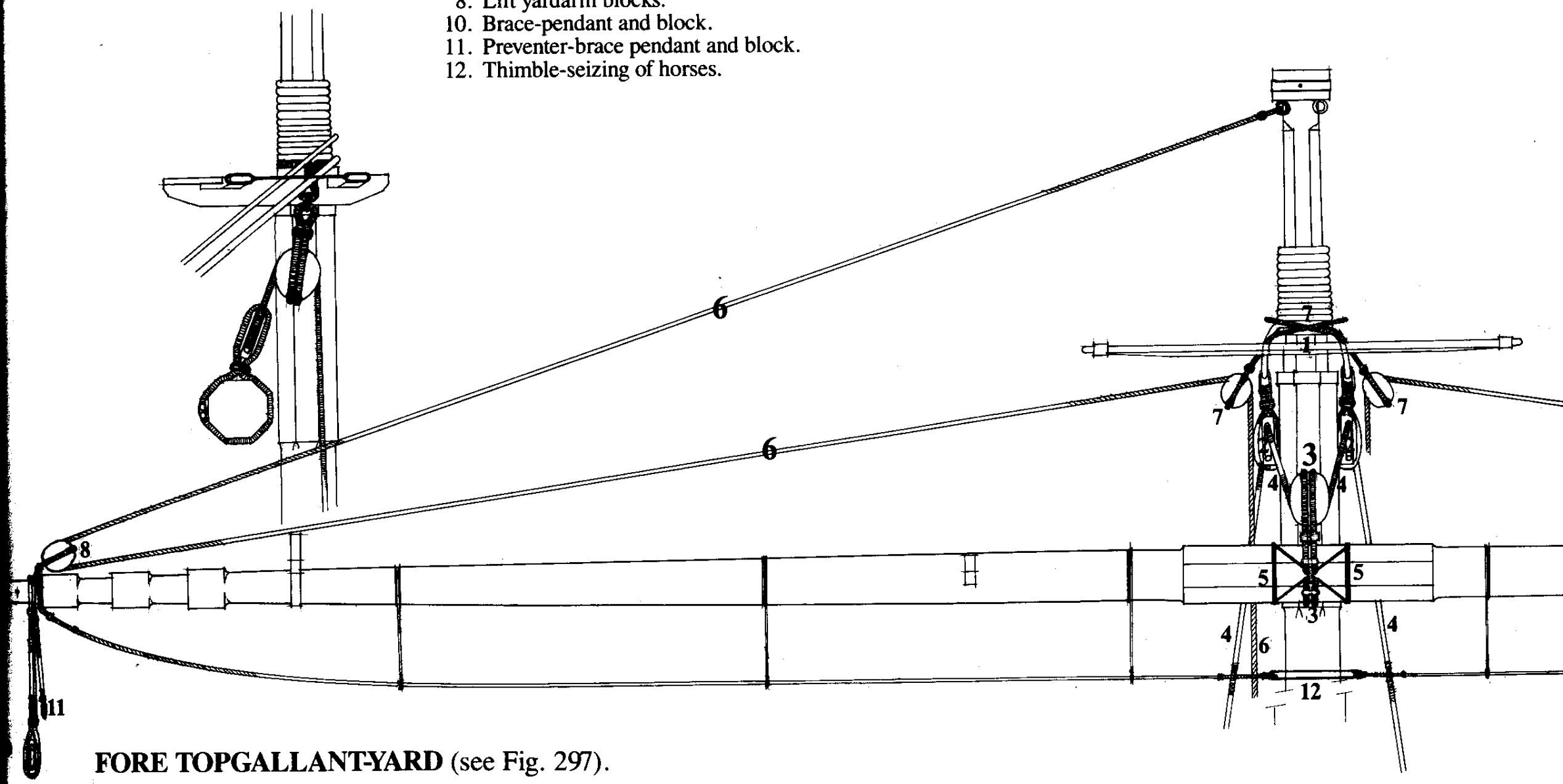
Preventer-braces.
Topsail-yard rolling-tackles.

*I should perhaps mention in passing a couple of further items of rigging which are rigged before going into action or when heavy weather is expected: these are *preventer-braces*, fitted to the yards by means of brace-pendants at the yardarms, and *topsail-yard rolling-tackles*, similar to those already briefly described for the lower yards. I may come back to the preventer-braces in Volume IV, rather than add still more here to a section which is already long enough, and perhaps even boring.

Fig. 296
Close-up of Main Topsail-Yard

This and the next drawing are merely taken from Figure 298, but enlarged.

1. First eye fitted over the masthead: the tie-block straps.
2. Double-strapped upper tie-blocks.
3. Bollock-block lashed to topsail-yard.
4. Tie; one leg runs down on either side.
5. Parrel-ropes (see Fig. 297).
6. Topsail-yard lifts.
7. Lift pendant-blocks round masthead.
8. Lift yardarm blocks.
10. Brace-pendant and block.
11. Preventer-brace pendant and block.
12. Thimble-seizing of horses.



FORE TOPGALLANT-YARD (see Fig. 297).

Ties and halliards: A strap which is served overall with spun-yarn is passed round the yard at the slings and a throat-seizing is clapped on over the yard so as to turn in a thimble. At the hounds of the topgallant-mast there is a swallow, and the tie reeves through this sheave; the tie is also served overall, and has a hook at its upper end which is passed through the thimble just mentioned. The other end of the tie turns in a thimble, and this is seized to a second thimble turned in the strap of a single block; alternatively, the tie itself serves as a strap for the block. The halliard reeves through the single block, and each leg is belayed on the port or starboard side to the forecastle pin-rail, after passing through a lead-block. Another arrangement is for one leg to be made fast at its standing end to a sprig-bolt in the bulwarks near the topsail-yard halliards. Alternatively, the halliards may be single and be made fast directly to the thimble of the tie, reeve through the sheave in the topgallant-mast, run down to the deck just aft of the topsail-yard halliard, and be belayed to a cleat on the bulwarks or to a pin in the pin-rail.

Parrels: These are usually exactly the same as those of the topsail-yards, save that there are only two parrel-ropes.

Truss-parrel.

A variant (shown in Fig. 297) is for the parrels to take the form of a *truss-parrel* – a length of rope served and leathered and middled so as to form two unequal legs. The bight is put round the yard at the slings and fastened by means of a throat-seizing like a collar or eye, and the two legs, which end in eyes, are seized together with a round seizing above the eye of the shorter leg; the two ends are then passed together round the mast, the longer end is passed round the yard a second time, and the two eyes are then seized together.

Lifts: These are single; they are clapped over the end of the yard at their standing end, reeve through a thimble in a pendant passed round the topgallant rigging at the hounds and are belayed at the trestletrees; alternatively they reeve through a sister-block made fast at the hounds in the topgallant shrouds, pass down the mast through the lubber's hole of the top and are belayed to a pin in the forecastle pin-rail; sometimes they reeve through a lead-block or a shroud-truck in the lower shrouds on the way.

Braces: These are single and are fastened directly to the yardarm (fitting over the end) by means of an eye spliced in the standing part. The running part passes up to the main-topmast stay and reeves through a single block seized below the mouse, passes forward to reeve through a single block made fast abaft the foremast trestletrees, then almost vertically downwards to a block seized to the mainstay, and is belayed at one of the stanchions of the forecastle breastwork.

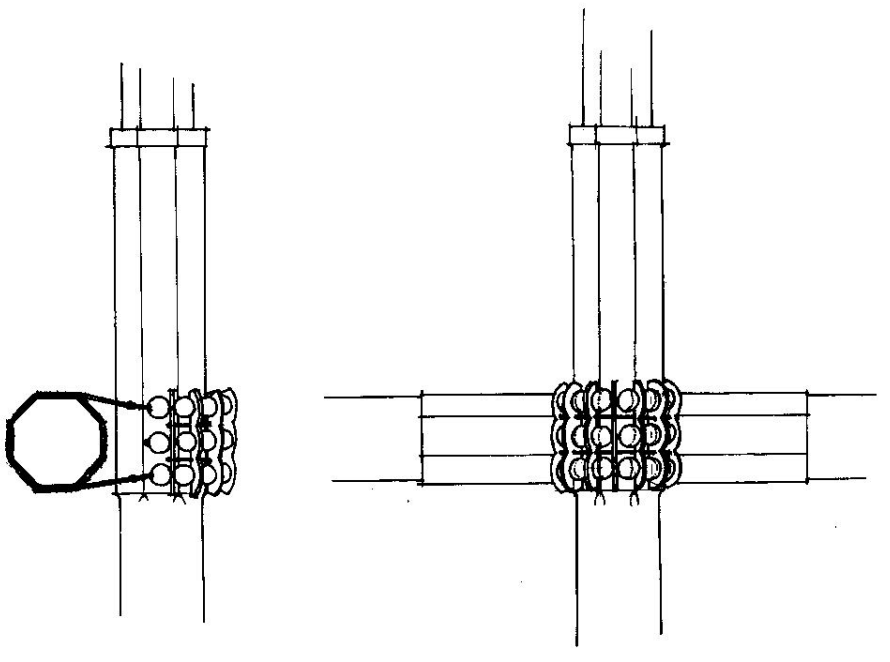
Alternatively, the braces reeve on either side through a block seized to the foremost main-topmast shroud near the masthead; from there they pass down through the lubber's hole in the maintop, follow the foremost main lower shroud and are belayed to a pin in the quarterdeck pin-rail.

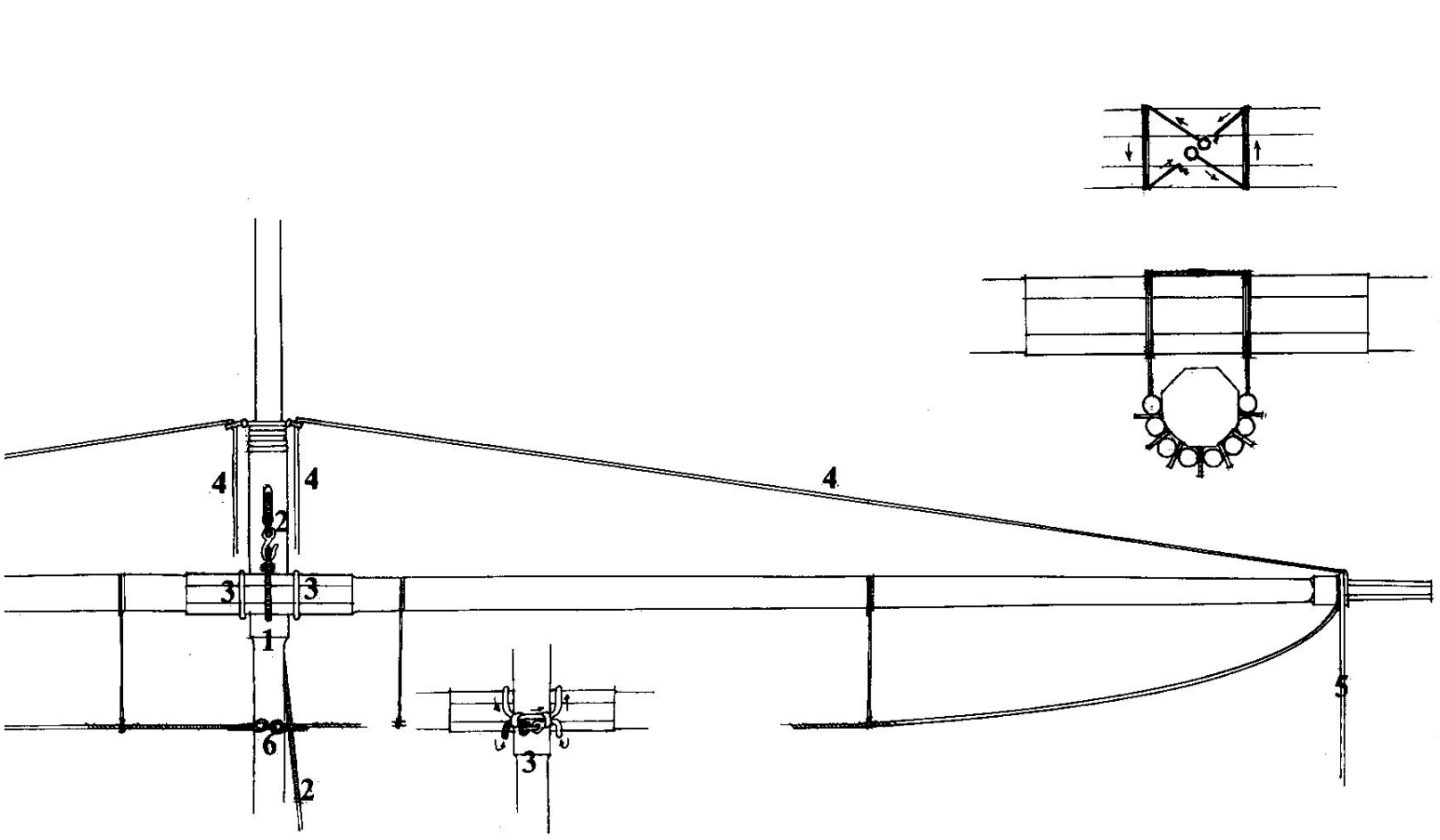
Footropes – stirrups: Like those of the sprit-topsail yard.

Fig. 297
Topsail-Yard Parrels and Topgallant-Yard

The way the parrel is rigged is shown in a series of drawings illustrating the description given in the main body of the text.

The drawing of the topgallant-yard shows: at (1), the strap passing round the slings of the yard and fitted with a thimble to receive the hook at the lower end of the tie (2), which reeves through a sheave in the hounds of the mast. (3) shows the truss-parrel, (4) the lifts, which reeve through thimbles seized to the rigging at the hounds; (6) shows the way the two footropes or horses are seized together.





Mainmast

MAINYARD (see Fig. 298).

Ties and halliards: Exactly the same as for the foreyard.

Slings: Also the same as for the foreyard.

Trusses: As for the foreyard.

Lifts: These are rigged as on the foreyard, save that they are belayed to a cleat* lashed to one of the main lower shrouds; sometimes they reeve first through a lead-block or shroud-truck seized to the same shroud.

*There is a drawing of a shroud-cleat on page 122; sometimes they are accompanied by a lead-block or shroud-truck.

Braces: Rigged like those of the foreyard, save that they are made fast at their standing end to an eyebolt in the side of the ship placed outboard and forward of the upper finishing of the quarter-galleries. They return by means of a block seized to a sprig-bolt in the poop planksheer near the taffarel, and the hauling part is belayed to a range-cleat on the poop.

Footropes, stirrups, yard-tackles, puddings: Exactly like those of the foreyard.

MAIN TOPSAIL-YARD (see Fig. 298).

Ties and halliards: These are rigged in the same way as has already been described for the fore topsail-yard; the lower block has a long strap and a swivel-hook turned into it, which is hooked to a sprig-bolt in the ship's side at the same height as and somewhat abaft the main-channels. A traveller is fitted between the tie and the aftermost main-topmast backstay.

Parrels: Rigged like those of the fore topsail-yard.

Lifts: Rigged like those of the fore topsail-yard described above; they are belayed to a shroud-cleat seized to one of the lower main shrouds.

Braces: Made fast at their standing end to brace-pendants slipped over the mizen-mast head above the other rigging; the pendants turn in a single block on either side. Each brace reeves through the brace-block at the yardarm, passes back to reeve through the pendant-block, and from there down to a block seized to the foremost mizen-shroud about a third of the way up; after passing through a lead-block seized to a sprig-bolt in the spirketting in the way of the poop breastwork, it is belayed to a range-cleat fastened nearby*.

*Alternatively the main topsail-yard braces may be made fast at their standing end either to the mizen-topmast head (above the head rigging), or to the collar of the mizen-stay.

Footropes, stirrups: Rigged like those of the fore topsail-yard.

MAIN TOPGALLANT-YARD (see Fig. 298).

Ties and halliards: Rigged like those of the fore topgallant-yard; the legs of the halliards reeve through a lead-block fastened to the inside of the bulwarks in the spirketting abaft the main-topsail-yard halliards; they are belayed to a cleat nearby.

Parrels: Like those of the fore topgallant-yard.

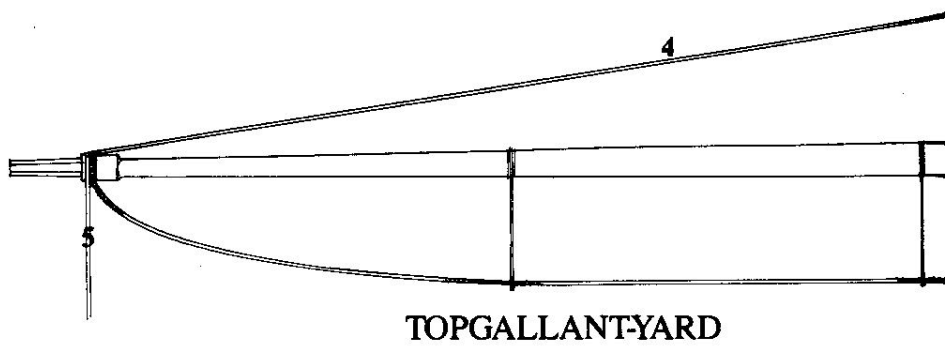
Lifts: The general principal is unchanged; the main topgallant-yard lifts are belayed at the topmast trestletrees, or alternatively as already explained to a pin in the quarterdeck pin-rail.

Braces: Like those of the fore topgallant-yard, save that they reeve through a single block seized to the rigging at the mizen-topmast head and are belayed at the poop pin-rail.

Footropes, stirrups: Rigged like those of the sprit-topsail yard.

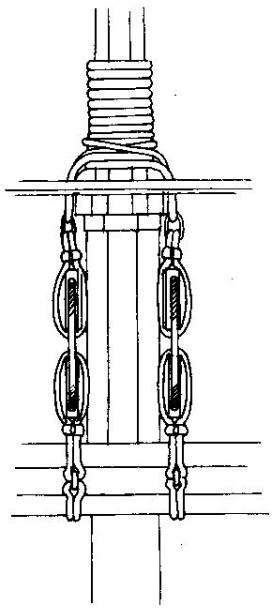
Fig. 298
Rigging to the Yards (Mainmast)

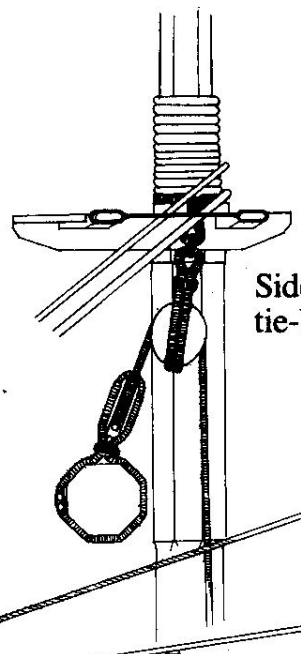
There is no need I believe to repeat the same drawings for the foremast since the general arrangements are exactly the same.



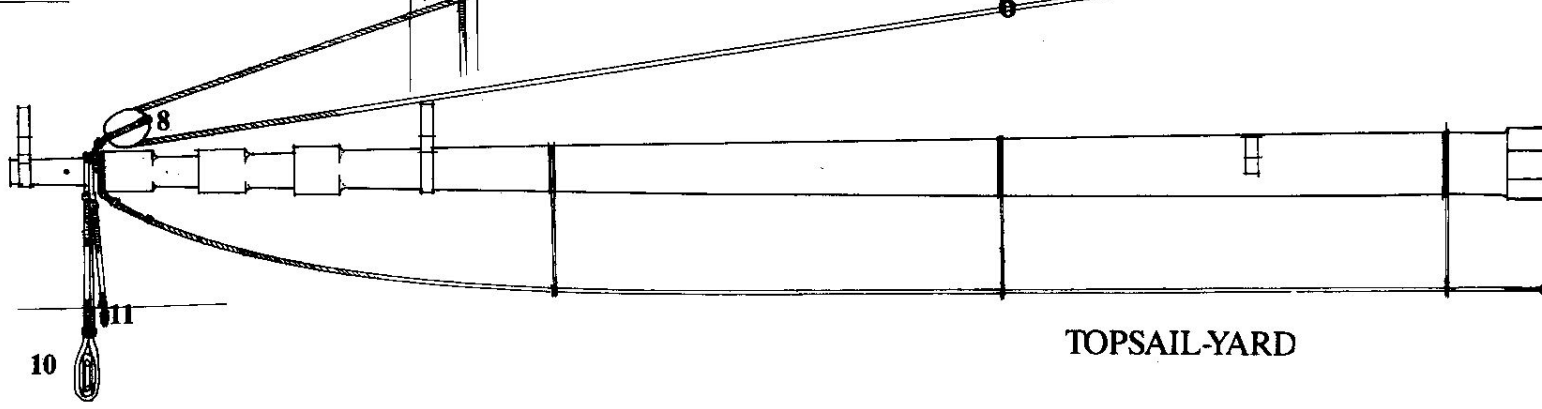
TOPGALLANT-YARD

Alternative rigging of tie-blocks





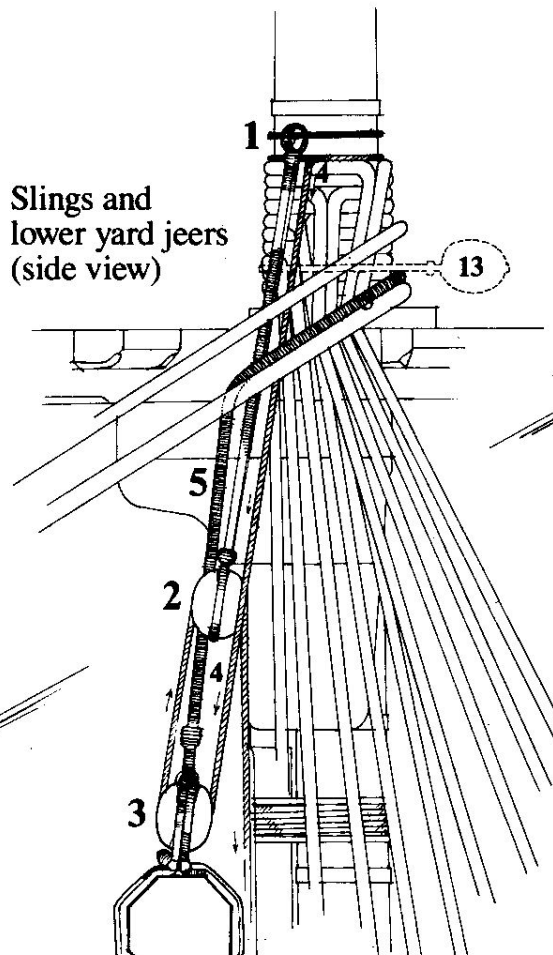
Side view of tie-blocks



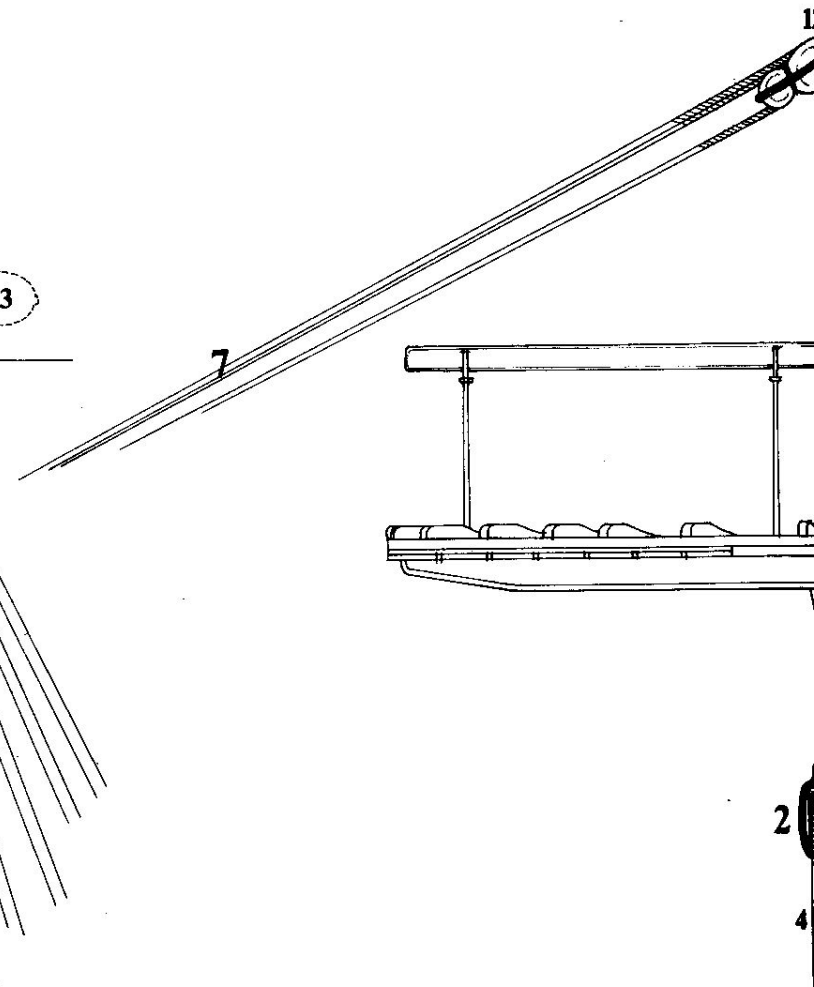
TOPSAIL-YARD

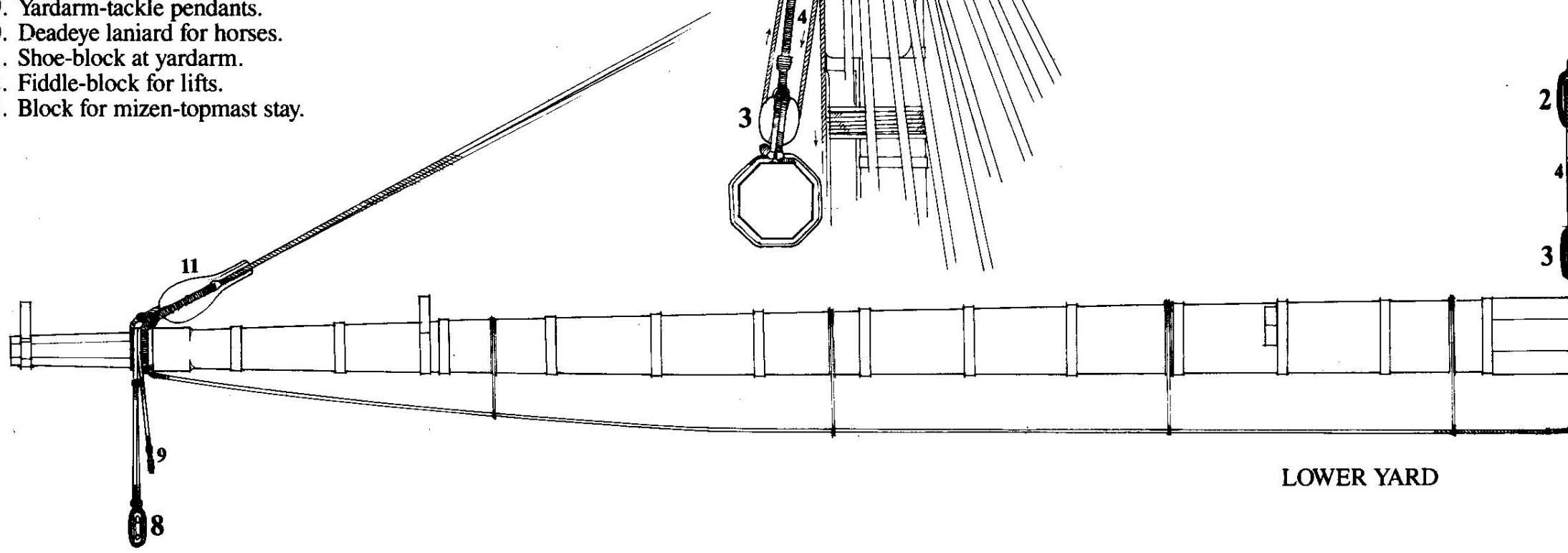
Mainyard

1. Jeer-block pendants.
2. Upper jeer-blocks.
3. Lower jeer-blocks.
4. Jeer-falls.
5. Slings.
6. Truss.
7. Lifts.
8. Brace-pendants and blocks.
9. Yardarm-tackle pendants.
10. Deadeye laniard for horses.
11. Shoe-block at yardarm.
12. Fiddle-block for lifts.
13. Block for mizen-topmast stay.

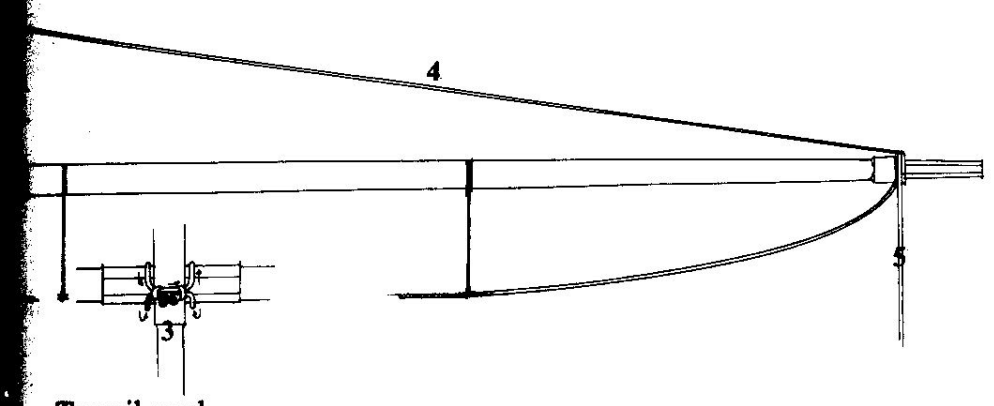


Slings and lower yard jeers (side view)





LOWER YARD



Topsail-yard parrels

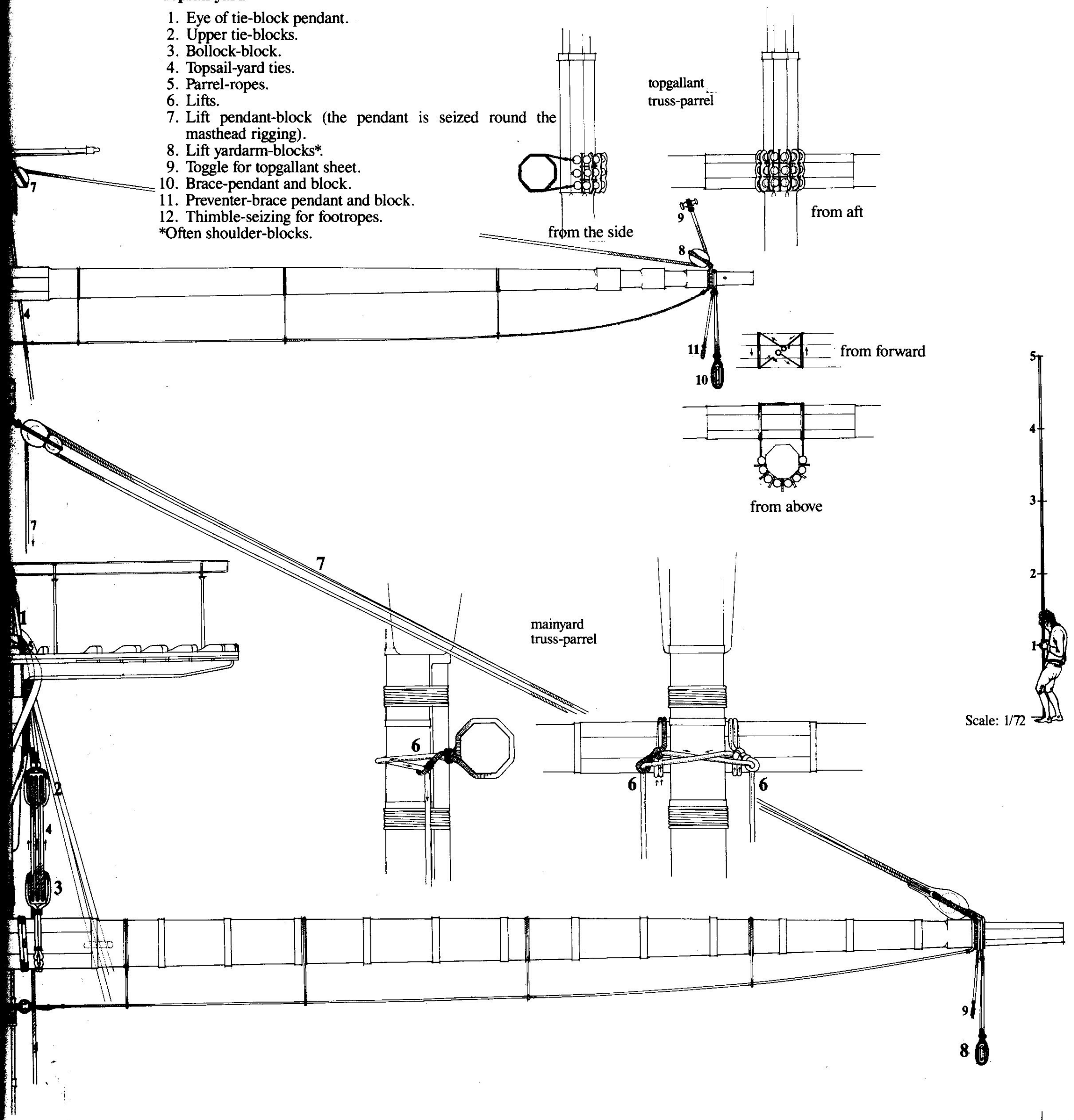
Topgallant-yard

1. Strop.
2. Tie and hook.
3. Truss.
4. Lifts.
5. Braces.
6. Seizing through the footrope eyes.

Topsail-yard

1. Eye of tie-block pendant.
2. Upper tie-blocks.
3. Bollock-block.
4. Topsail-yard ties.
5. Parrel-ropes.
6. Lifts.
7. Lift pendant-block (the pendant is seized round the masthead rigging).
8. Lift yardarm-blocks*.
9. Toggle for topgallant sheet.
10. Brace-pendant and block.
11. Preventer-brace pendant and block.
12. Thimble-seizing for footropes.

*Often shoulder-blocks.



Mizen-mast

CROSS-JACK YARD (see Fig. 299).

It will be remembered that no sail is bent to the cross-jack yard, which serves only to spread the foot of the mizen-topsail.

Jeers: As a rule there are no jeers rigged to the cross-jack yard, which is hoisted or sent down by means of a small tackle rigged for the purpose when required.

Standing lifts: As with the spritsail-yard, *standing lifts* are used to help support the yard. The standing lifts are formed by a single rope which is middled and an eye, formed at the bight by means of a throat-seizing, fits over the masthead.

Standing lifts: according to Lees [op.cit.], standing lifts appear to have been used for the cross-jack yard on English ships-of-war only between about 1670 and 1719. After that they were replaced by running lifts.

A deadeye is turned in at each end, and corresponding deadeyes have their straps seized round the yard at the quarters.

Slings: A collar is made fast round the masthead rigging as on the other lower masts; it is formed of a single length of rope served overall and with an eye spliced at each end; the two eyes are seized together abaft the masthead. The collar may reeve through a double-strapped single block which is rigged at the slings* of the yard exactly like the bollock-blocks of the topsail-yards.

*The ***slings of the yard*** is the central part round which the slings (ropes) pass. This may give rise to confusion. [Trans.]

Running lifts: The running lifts are made fast at their standing end to an eyebolt in the mizen cap; the running part reeves through the upper sheave of the yardarm shoe-block (the other sheave takes the mizen-topsail sheet), passes up again to reeve through a single block seized to an eyebolt at the standing end and then runs down to the poop where it is belayed to a pin in the poop pin-rail.

Braces: It will be remembered that these have to be rigged in a rather strange manner, since the position of the mizen means that the braces have to be led forward because there is no room for them to lead aft. In order to simplify sail-handling, when the mizen yards have to be braced up at the same time as the yards of the other masts, the mizen-braces are crossed over. The brace-blocks are not rigged at the yardarms but about six feet [1.94 m] inboard to improve the angle, but this minor detail is not obligatory. The cross-jack yard braces are made fast at their standing end to the aftermost shroud of the main lower mast about two-thirds of the way up (or sometimes at the level of the catharpins); from there they reeve through the brace-block on the yard, return forward and reeve through a single block seized to the same shroud a little way below the standing end; running down the shroud, they are belayed at the quarterdeck pin-rail.

Footropes, stirrups: Similar to those of the topsail-yards.

The cross-jack yard has no parrels or truss*.

*Occasionally a truss may be fitted.

MIZEN TOPSAIL-YARD (see Fig. 299).

Ties and halliards: A double-strapped single block is made fast at the slings of the yard exactly as on the other topsail-yards.

The tie is made fast at its standing end by means of an eye passed over the masthead rigging; the running part reeves through the bollock-block, and thence through the sheave in the hounds of the mizen-topmast. The tie, which is served overall, turns in a double fly-block; the fly-block forms the upper part of a tackle, of which the lower block is made fast on the port side to a sprig-bolt in the ship's side above and abaft the mizen-channels; the lower block has a long strap turning in a swivel-hook.

Parrels: The parrels are like those of the other topsail-yards, save that there are only two parrel-ropes and rows of trucks, and these are rigged somewhat differently.

Lifts: The lifts are single and also serve as sheets for the mizen-topgallant; for that reason they have a toggle at their ends; the hauling part reeves through a single block at the yardarm, passes up to reeve through a second single block seized round the rigging at the hounds and then runs down again to the poop where it is belayed to a pin in the poop pin-rail.

Braces: As with the cross-jack yard braces, these are crossed over: in other words the brace which for example has its standing part made fast to port is led to the starboard brace-block, and vice versa*. The mizen topsail-yard braces are made fast at their standing end to the aftermost shroud of the main lower mast at the catharpins; the running part reeves through the brace-block, leads forward to reeve through a second single block made fast close to the standing end, and runs down to the quarterdeck where after passing through a lead-block seized to a sprig-bolt in the spirketting it is belayed at the quarterdeck pin-rail.

*This arrangement is not always adopted.

Footropes, stirrups: Rigged like those of the fore and main topgallant-yards.

MIZEN TOPGALLANT-YARD (see Fig. 299).

Ties and halliards: As with the other topgallant-yards, one of the legs is made fast at its standing end on the port side, while the other is belayed in the quarterdeck pin-rail on the starboard side.

Parrels: Rigged like those of the other topgallant-yards.

Braces: Made fast at their standing end at the yardarm, the hauling end reeves through a single block seized to the upper part of the aftermost topmast shroud, and runs down to the quarterdeck where it is belayed in the pin-rail. The braces are crossed.

Lifts: The lifts are single, reeve through thimbles clapped on below the truck of the pole topmast, and run down to the poop where they are belayed in the pin-rail.

Footropes, stirrups: Rigged like those of the sprit topsail-yard, but with only two stirrups.

MIZEN-YARD (see Fig. 299).

The mizen-yard is rigged somewhat peculiarly since it is the only yard which is placed longitudinally to the ship's axis, rather than transversely, and furthermore it is raked between 45° and 50° as opposed to being horizontal.

Jeers: The yard is carried on the starboard side of the mast. A threefold block with a long strap and a thimble seized in the end is clapped on over the masthead rigging, the strap passing round behind the crosstrees. A double-strapped double block is made fast to the yard.

The sheaves of these two blocks face fore-and-aft. The jeers are taken round the yard, to which they are made fast at their standing end a little way below the double collar formed by the straps of the double block. The jeer-falls reeve between the sheaves of the two blocks, from there to a lead-block in the poop spirketting on the starboard side, and are belayed at the poop pin-rail.

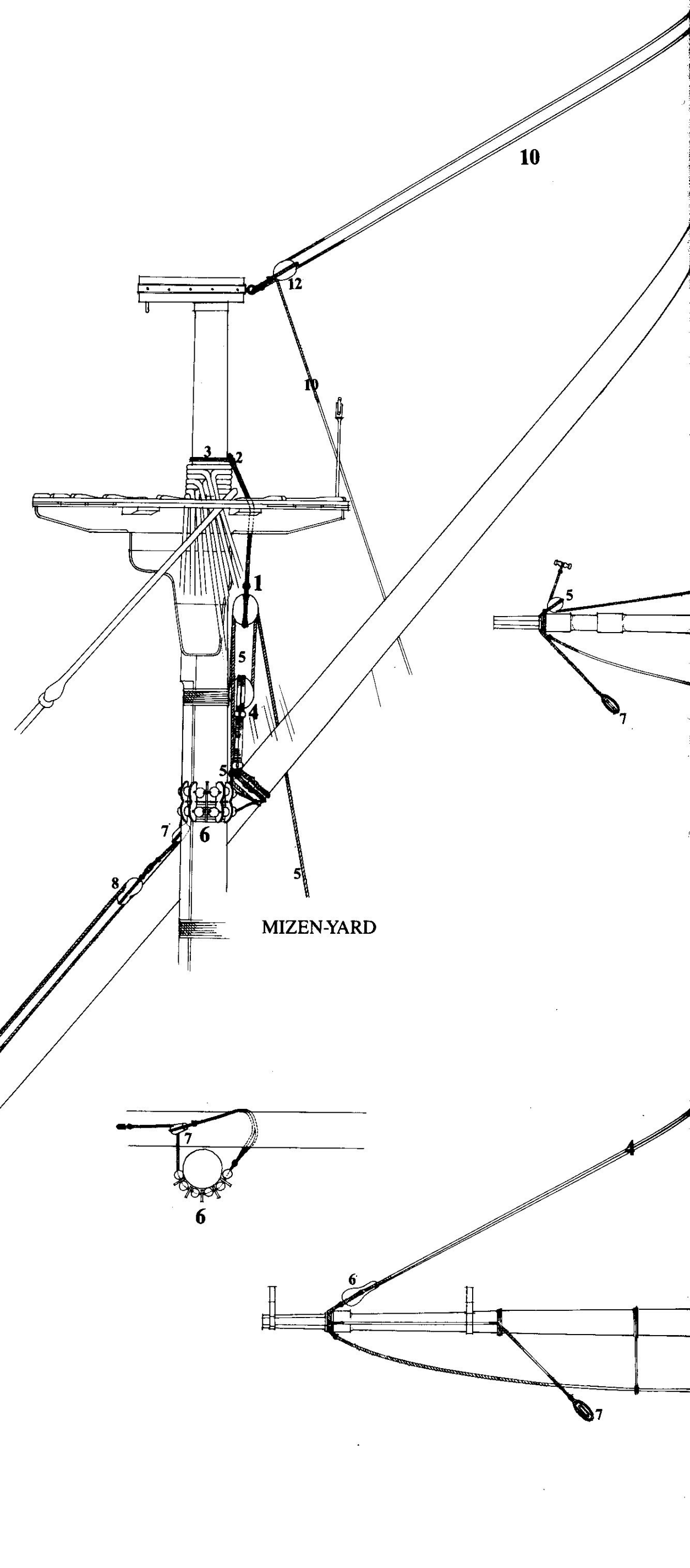
Slings: Slings are only rarely rigged to the mizen-yard, but if used they follow the same principles as for the slings of the foreyard or mainyard.

Parrels: The parrel is rigged on the port side of the mast and is composed of only two rows of ribs and trucks. The parrel-ropes are seized together abaft the mast and then taken double beneath the mizen-yard, up over the top and turn in a two-hole deadeye (see Fig. 300). Each of the two forward ends of the parrel-ropes pass through one of the holes in the deadeye and are then spliced together round a thimble. The parrel-ropes are served with spun-yarn. The parrel is tightened over the yard by hauling on the falls of a truss-tackle: a fiddle-block with a thimble turned in its strap is seized to the thimble in the parrel-ropes; the lower block of the tackle is a single block which is fastened to the foot of the mizen-yard.

Fig. 299
Rigging to the Yards of the Mizen-Mast

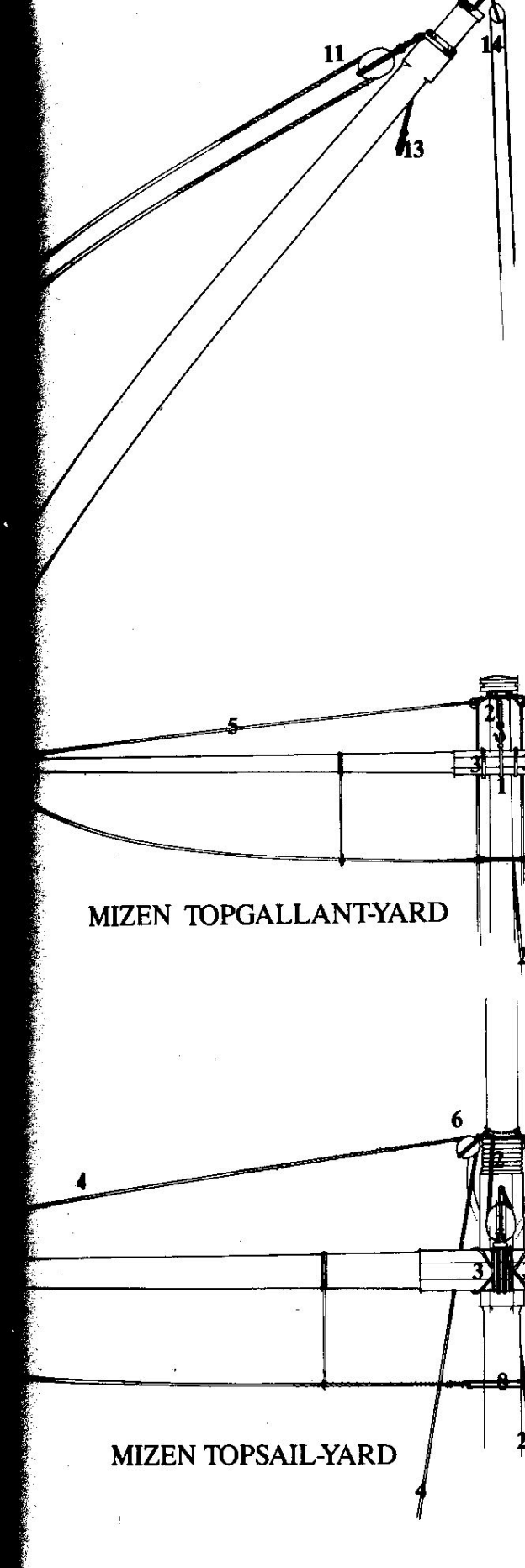


Scale: 1/72



Mizen-yard

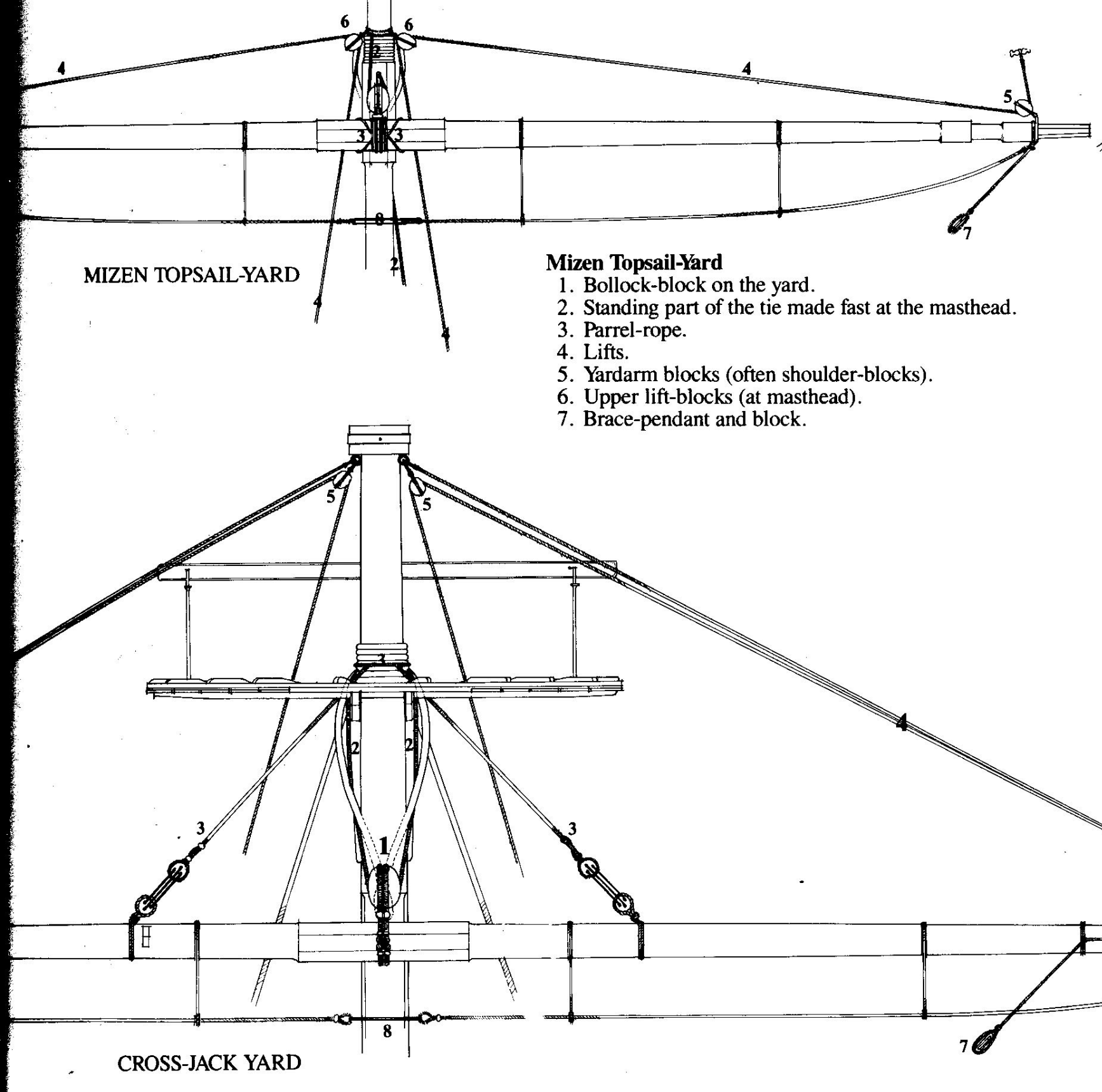
1. Threefold upper jeer-block.
2. Jeer-pendant.
3. Pendant seized round masthead.
4. Double-strapped double jeer-block.
5. Jeer-falls made fast at their standing end to the yard.
6. Parrels (2 rows).
7. Two-hole parrel deadeye.
8. Truss fiddle-block.
9. Truss single block.
10. Mizen lifts.
11. Single lift block.
12. Single lift block.
13. Pendant and thimble.
14. Flag halliard block.
15. Starboard mizen-bowline block.
16. Port mizen-bowline block.



MIZEN TOPGALLANT-YARD

Mizen Topgallant-Yard

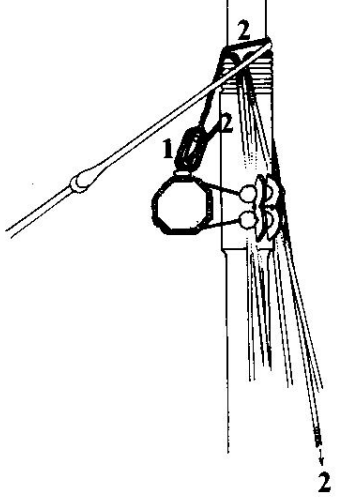
1. Strop.
2. Tie with hook.
3. Truss-parrels.
4. Braces.
5. Lifts.

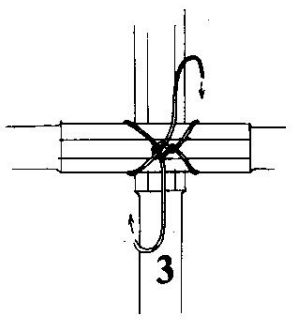


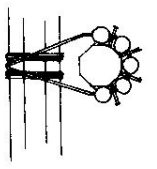
MIZEN TOPSAIL-YARD

Mizen Topsail-Yard

1. Bollock-block on the yard.
2. Standing part of the tie made fast at the masthead.
3. Parrel-rope.
4. Lifts.
5. Yardarm blocks (often shoulder-blocks).
6. Upper lift-blocks (at masthead).
7. Brace-pendant and block.







CROSS-JACK YARD

Cross-jack Yard

1. Sling-block.
2. Collar seized behind the masthead.
3. Standing lifts.
4. Running lifts.
5. Lift-blocks.
6. Shoe-block at yardarm.
7. Brace-block and pendant.
8. Thimble-seizing of the footropes.

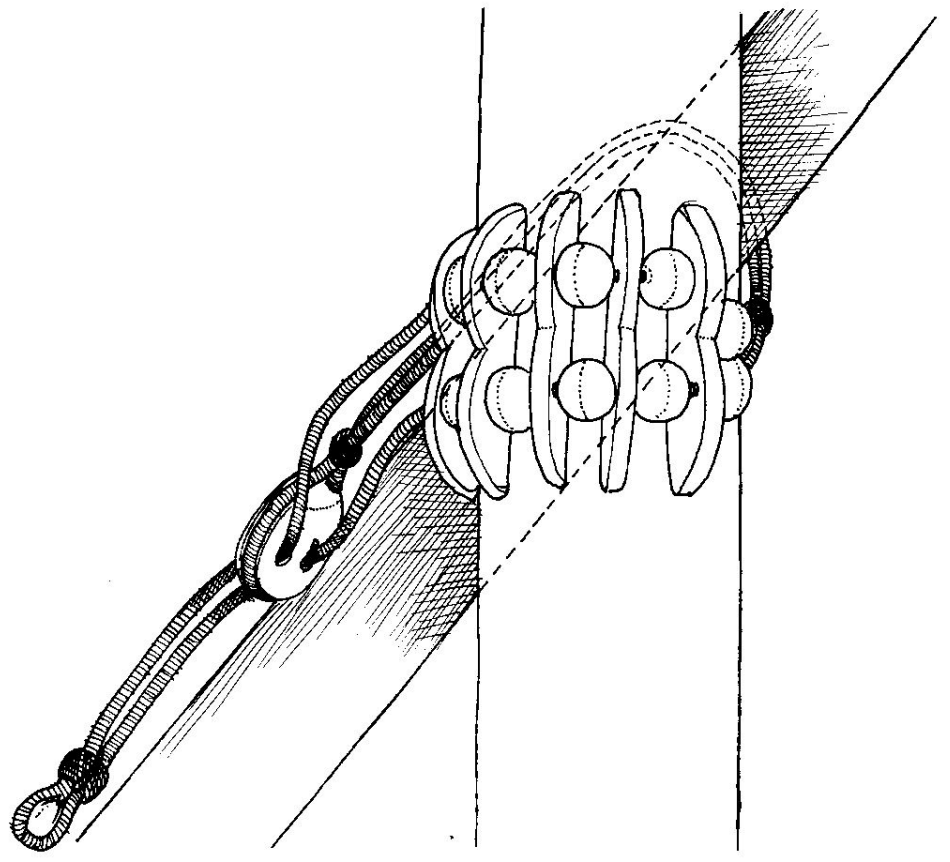


Fig. 300
Mizen-Yard Parrel

With the parrel on the starboard side, the parrel-ropes are brought together by a round seizing behind the mast; they then pass under the yard and turn in the parrel deadeye. On the forward side the parrel-ropes each reeve through one of the two holes of the deadeye; they are then spliced together, turning in a thimble by means of a thimble-seizing.

Mizen-lifts: The mizen-lifts serve the same purpose as the running lifts of the other yards, namely to maintain the yard at the correct angle.

The falls are made fast at their standing end either to an eyebolt in the after side of the mizen cap, or to the hounds of the mizen-topmast. The running part reeves through a single block seized to the cleats at the upper end of the yard. It will be recalled that this upper end (the smaller diameter) is called the peak, while the greater diameter is the foot or heel. The falls of the lifts are led back to the mizen-mast, reeve through a single block seized to the sprig-bolt in the cap (or to the mizen-topmast rigging), and then run down to the poop where they are belayed at the pin-rail on the port side.

Mizen-bowlines: These lines are peculiar to the mizen-yard and serve the same purpose as the braces of the other yards. Each of the bowlines is made fast at its standing end at the bottom of the aftermost lower main shroud, one on the starboard side and the other to port; from there they reeve through single blocks seized to the heel of the yard, forward again to reeve through a second single block made fast to the shroud beside and below their standing part, and they are then belayed to a neighbouring cleat.

———*———

I will conclude this section on the rigging to the yards with a few lines on the subject of royal-yards; these are designed to spread a fourth tier of sails, and their use is not officially recognised in the regulations for ships. They are called by the name of their respective masts, and only differ from the topgallants in that they are smaller and are more rarely used.

They are provided like the topgallants with a halliard, two braces, two lifts and a parrel, but they are only hoisted in very fine weather. In rough weather they are stowed in the lower shrouds like the topgallant-yards, but on the other side.

The royal-yard halliard consists of a single rope which reeves through a sheave at the topgallant polehead and is then led down and belayed abaft the shrouds close to the standing part of the topgallant halliards. The main-royal braces reeve through a thimble or small block lashed to the rigging where it is placed over the head of the fore topgallant-mast, and are belayed in the foretop.

The fore-royal braces run down to the forward end of the jibboom, reeve through a thimble seized there, and are belayed near the heel of the bowsprit.

The mizen-royal braces (the presence of a mizen-royal implies the existence of a mizen topgallant-mast) reeve through a thimble seized on the after side of the main-topgallant crosstrees or the main-topgallant cap and are belayed in the maintop.

The lifts reeve through thimbles fastened below the mast-trucks and run down into the tops.

The parrels are similar to those of the topgallant-yards. The dimensions of the royal-yards are given in the table on page 60.

Rigging to the Yards

Item	Sprit-Topsail Yard			Spritsail-Yard			Foreyard			Mainyard		
	1	2	3	1	2	3	1	2	3	1	2	3
Halliards/Jeers	34	2 1/4	19	39	3	26	140	4 3/4	41	150	5	43
Trusses							10	7	60	24	7 1/4	63
Truss-tackle falls							68	2 1/4	19	70	2 1/4	19
Running lifts	52	1 3/4	15	76	2 1/4	19	130	3 1/4	28	140	3 1/2	30
Braces	68	1 3/4	15	98	2 1/4	19	114	3 1/2	30	114	3 1/2	30
Footropes				11	3	26	24	3 1/4	28	28	3 1/4	28
Standing lifts				10	3	26						

	Cross-jack Yard			Fore Topsail-Yard			Main Topsail-Yard			Mizen Topsail-Yard		
Ties	48	4 3/4	41	50	5	43	16	3 1/2	30			
Halliards				160	3	26	170	3 1/4	28	55	2	17
Parrel-rope				14	3	26	14	2 3/4	24			
Running lifts	88	2 1/4	19	100	3	26	110	3 1/4	28	82	2	17
Braces	88	2 1/4	19	114	3	26	114	3 1/4	28	82	2	17
Footropes	12	3	26	12	3	26	12	3	26			
Standing lifts	10	3 1/4	28									

	Fore Top-gallant Yard			Main Top-gallant Yard			Mizen Top-gallant Yard			Mizen-Yard		
Ties	9	3 1/2	30	10	3 1/2	30						
Halliards	61	3	26	64	3	26				70	4 1/4	36
Parrel-ropes	5	2	17	4	2	17				11	2 1/2	22
Running lifts	44	1 3/4	15	54	1 3/4	15	58	1 1/2	13			
Braces	110	1 3/4	15	110	1 3/4	15	54	2	17			
Footropes	6	2 1/2	22	6	2 3/4	24						
Mizen-lifts (double)										50	3	26
Mizen-bowlines										36	3	26
Truss-tackle										30	2 1/2	22

For each item of rigging the first column indicates the length in fathoms [1.62 m]. The second column shows the circumference in inches [27.1 mm]. The third column shows the diameter in millimetres.

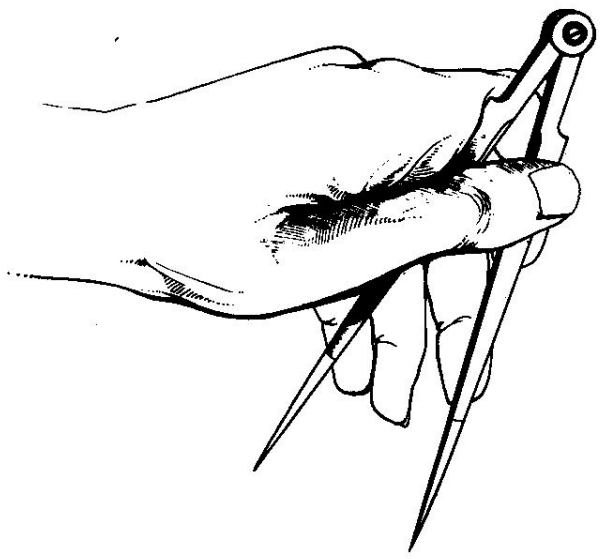


Fig. 301
JEERS, TIES, HALLIARDS AND SLINGS

Where there are two parts to a line, the second is indicated by a ′; however, only the first part is illustrated.

SPRIT TOPSAIL-YARD

STH1 Sprit topsail-yard halliards (at slings).
STH2 Sprit topsail-yard halliards (hauling part).
STS Sprit topsail-yard slings.
ø Slings 26 mm; ø halliards 19 mm; 2 single blocks L163 mm; 1 thimble or additional single block L163 mm.

SPRITSAIL-YARD

SH1 Spritsail-yard halliards, block seized to slings.
SH2 Spritsail-yard halliards, double block at eyebolt in cap.
SS Spritsail-yard slings.
ø Slings 34 mm; ø halliards 26 mm; 1 single block L217 mm; 1 double block L352 mm.

FOREYARD

FJ1 Jeers: treble block on yard.
FJ2 Jeers made fast at masthead.
FJ3 Jeer-falls.
FS1 Slings.
FS2 Strap of slings round masthead.
ø Jeers 41 mm; 2 treble lower jeer-blocks L434 mm, double-strapped and seized to the yard; 2 treble upper jeer-blocks L434 mm, single-strapped and seized to the masthead rigging; 2 iron thimbles.
ø slings 67 mm; 2 iron thimbles (1 wide).

FORE TOPSAIL-YARD

FTT1, 1′ Double-strapped single block (bollock-block) on the yard.
FTT2, 2′ Single blocks (upper tie-blocks) fastened at the masthead.
FTT3,3′ Tie reeving between upper and lower tie-blocks, and with a double fly-block turned in at each end.
FTH4, 4′ Fore-topsail halliards.
ø Tie 41 mm; ø halliard 26 mm; 1 double-strapped bollock-block L298 mm; 2 single upper tie-blocks L298 mm; 2 double fly-blocks L271 mm; 2 single swivel-blocks L217 mm; 4 thimbles.

FORE TOPGALLANT-YARD

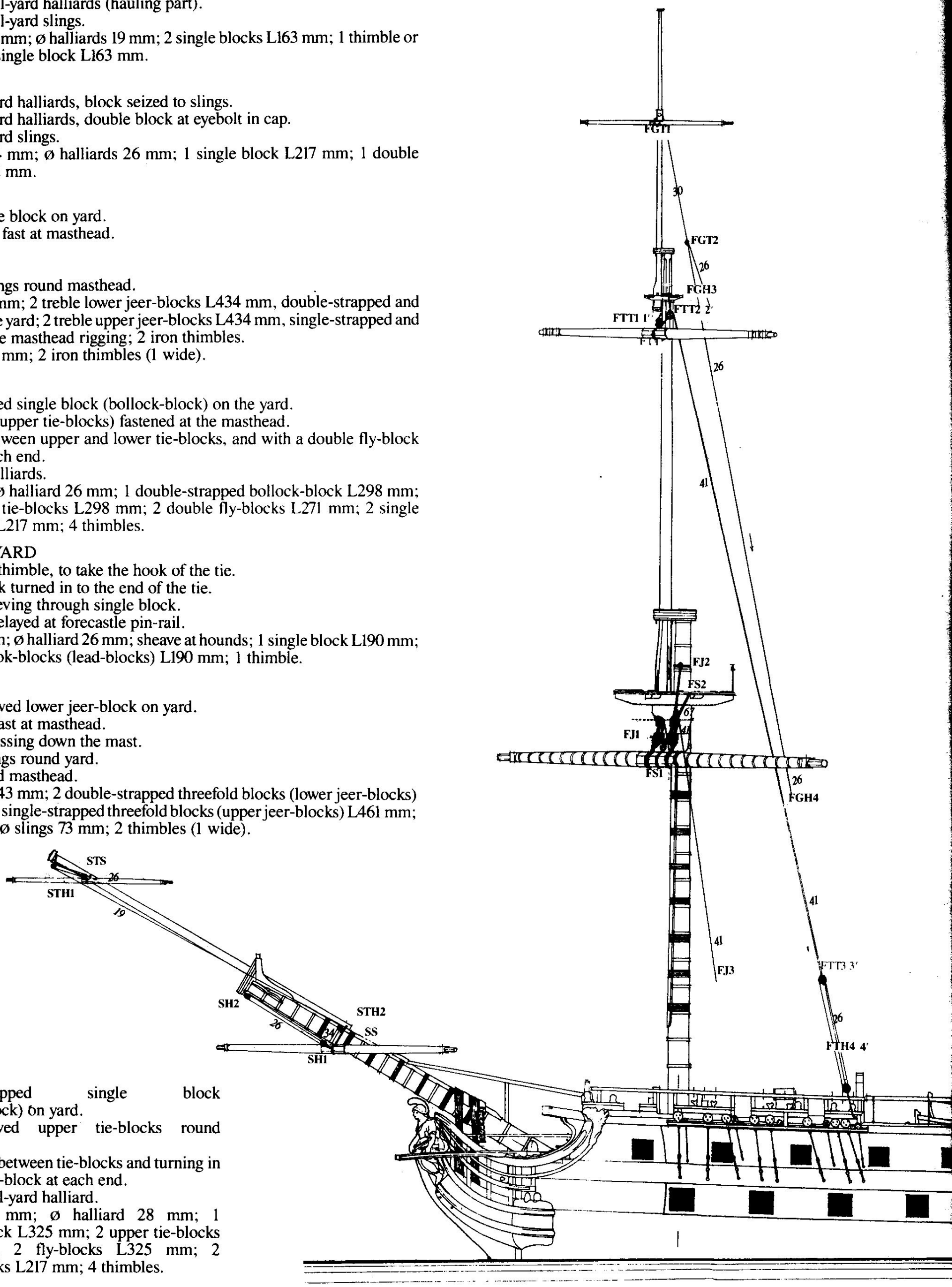
FGT1 Strop with thimble, to take the hook of the tie.
FGT2 Single block turned in to the end of the tie.
FGH3 Halliard reeving through single block.
FGH4 Halliards belayed at forecastle pin-rail.
ø Tie 30 mm; ø halliard 26 mm; sheave at hounds; 1 single block L190 mm; 2 single hook-blocks (lead-blocks) L190 mm; 1 thimble.

MAINYARD

MJ1 Treble-sheaved lower jeer-block on yard.
MJ2 Jeer made fast at masthead.
MJ3 Jeer-falls passing down the mast.
MS1 Strap of slings round yard.
MS2 Slings round masthead.
ø Jeer-falls 43 mm; 2 double-strapped threefold blocks (lower jeer-blocks) L461 mm; 2 single-strapped threefold blocks (upper jeer-blocks) L461 mm; 2 thimbles; ø slings 73 mm; 2 thimbles (1 wide).

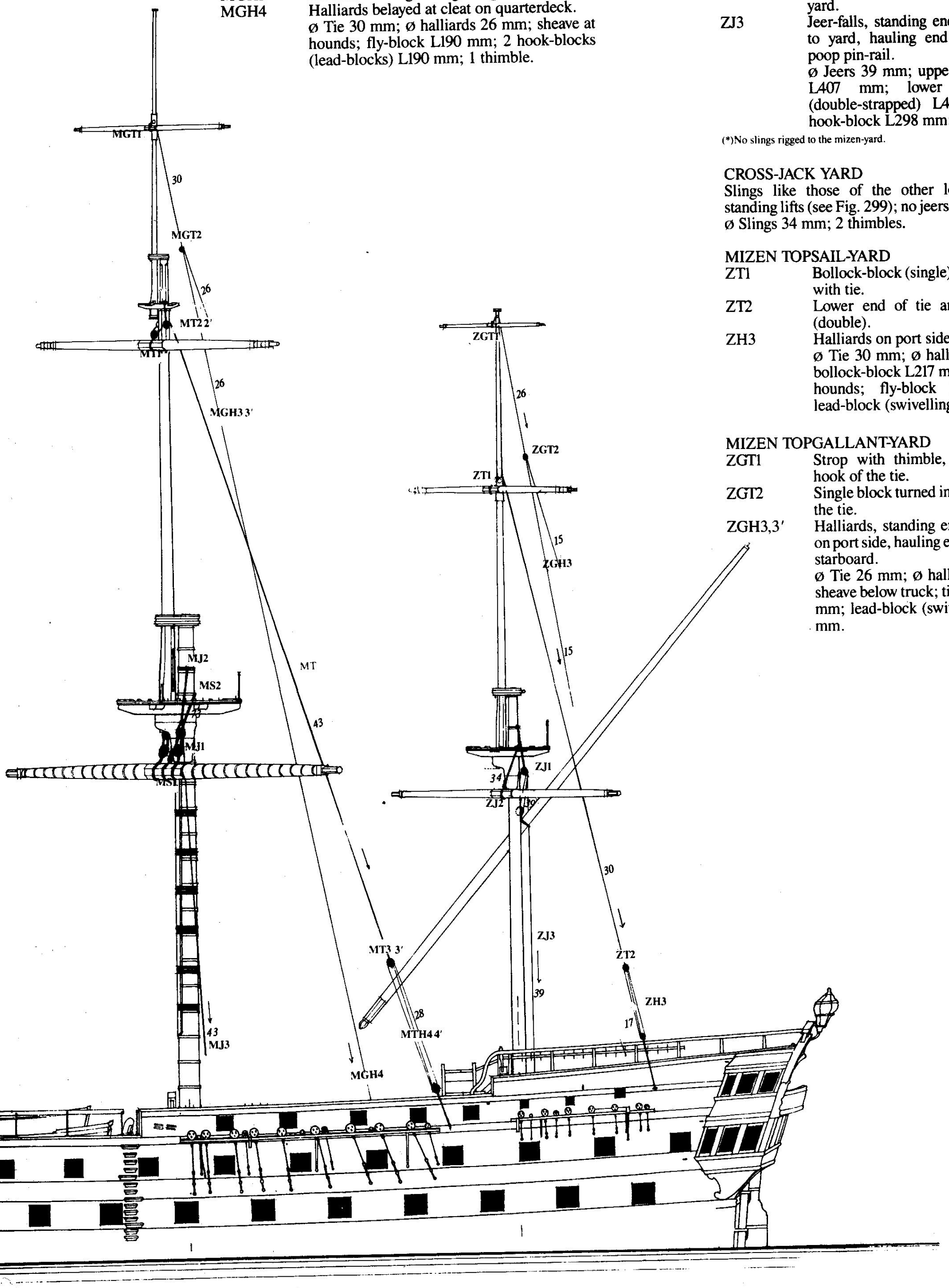
MAIN TOPSAIL-YARD

MT1 Double-strapped single block (bollock-block) on yard.
MT2, 2′ Single-sheaved upper tie-blocks round masthead.
MT3, 3′ Tie reeving between tie-blocks and turning in a double fly-block at each end.
MTH4, 4′ Main topsail-yard halliard.
ø Tie 43 mm; ø halliard 28 mm; 1 bollock-block L325 mm; 2 upper tie-blocks L325 mm; 2 fly-blocks L325 mm; 2 swivel-blocks L217 mm; 4 thimbles.



MAIN TOPGALLANT-YARD

MGT1 Strop with thimble, to take the hook of the tie.
MGT2 Single block turned in to the end of the tie.
MGH3 Halliard reeving through single block.
MGH4 Halliards belayed at cleat on quarterdeck.
ø Tie 30 mm; ø halliards 26 mm; sheave at hounds; fly-block L190 mm; 2 hook-blocks (lead-blocks) L190 mm; 1 thimble.



MIZEN-YARD

ZJ1 Threefold upper jeer-block round masthead.
ZJ2 Double lower jeer-block round yard.
ZJ3 Jeer-falls, standing end made fast to yard, hauling end belayed at poop pin-rail.
ø Jeers 39 mm; upper jeer-block L407 mm; lower jeer-block (double-strapped) L407 mm; 1 hook-block L298 mm; 1 thimble.

(*)No slings rigged to the mizen-yard.

CROSS-JACK YARD

Slings like those of the other lower yards; standing lifts (see Fig. 299); no jeers or halliards.
ø Slings 34 mm; 2 thimbles.

MIZEN TOPSAIL-YARD

ZT1 Bollock-block (single) round yard, with tie.
ZT2 Lower end of tie and fly-block (double).
ZH3 Halliards on port side.
ø Tie 30 mm; ø halliard 17 mm; bollock-block L217 mm; sheave in hounds; fly-block L352 mm; lead-block (swivelling) L136 mm.

MIZEN TOPGALLANT-YARD

ZGT1 Strop with thimble, to take the hook of the tie.
ZGT2 Single block turned in to the end of the tie.
ZGH3,3′ Halliards, standing end made fast on port side, hauling end belayed to starboard.
ø Tie 26 mm; ø halliard 15 mm; sheave below truck; tie-block L136 mm; lead-block (swivelling) L136 mm.

Fig. 302
Rigging to the Yards of the Bowsprit and Foremast

SPRIT TOPSAIL-YARD

Braces

STB1 Standing end made fast to yardarm.
STB2 Single block seized to forestay.
STB3 Belayed at beakhead bulkhead.
ø Braces 15 mm; 2 single blocks L136 mm, or 2 thimbles.

Lifts

STL1 Standing end made fast to yardarm.
STL2 Single block or thimble and thence to beakhead bulkhead.
ø Lifts 15 mm; 2 single blocks L136 mm, or 2 thimbles.

SPRITSAIL-YARD

Braces

SB1 Standing end at collar of forestay.
SB2 Single brace-block at yardarm.
SB3 Single block under foretop.
SB4 Hauling end through lead-block and belayed at forecastle breastwork.
ø Braces 19 mm; 6 single blocks L163 mm.

Standing Lifts

Not drawn in to avoid overloading the drawing.
ø laniards 26 mm; 4 deadeyes ø 163 mm.

Running Lifts

SL1 Standing end made fast to cap and reeving through yardarm block.
SL2 Single block at cap close to standing end.
SL3 Running part passes down through rack-blocks to beakhead bulkhead.
ø Lifts 19 mm; 4 single blocks L163 mm; sheave of rack-blocks.

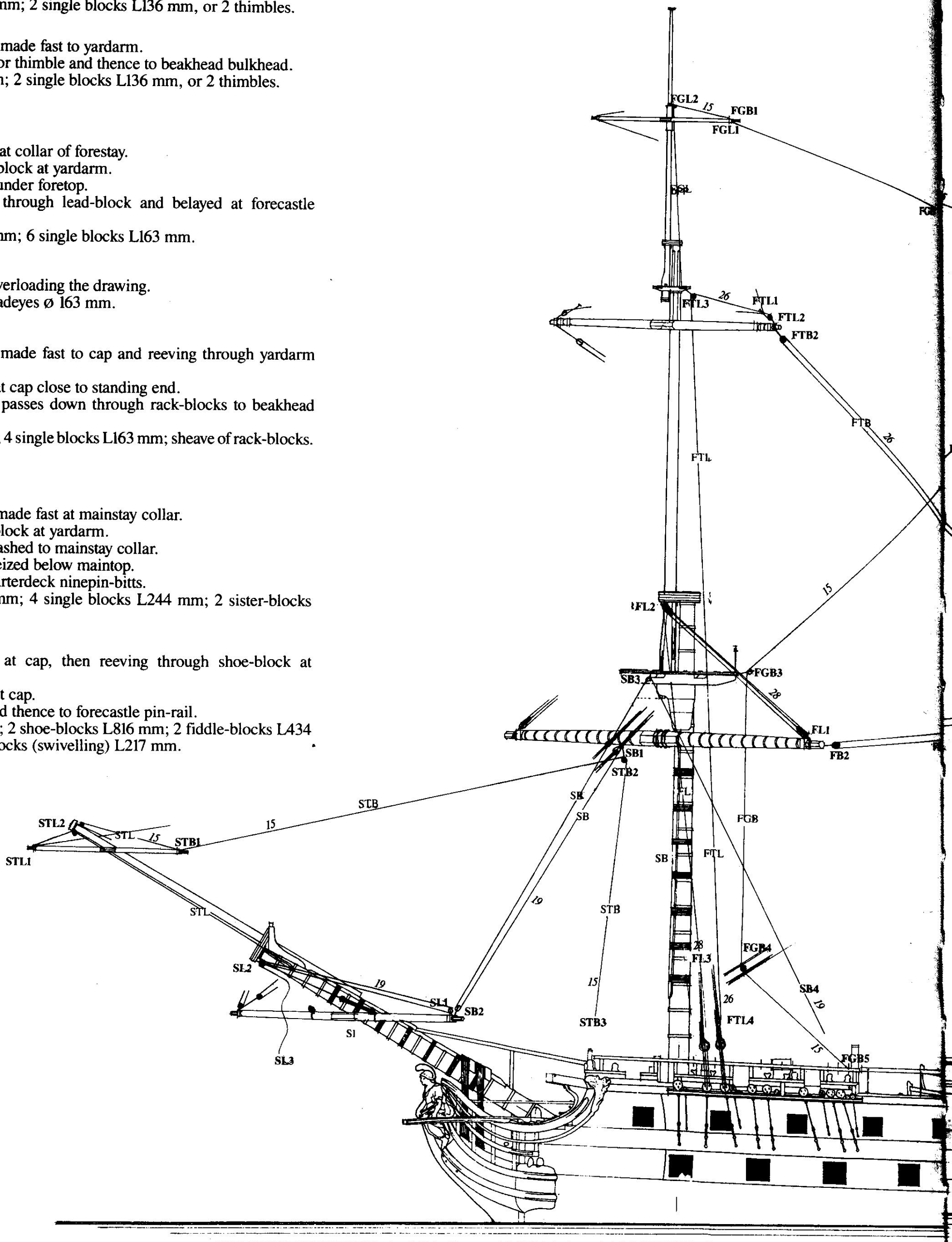
FOREYARD

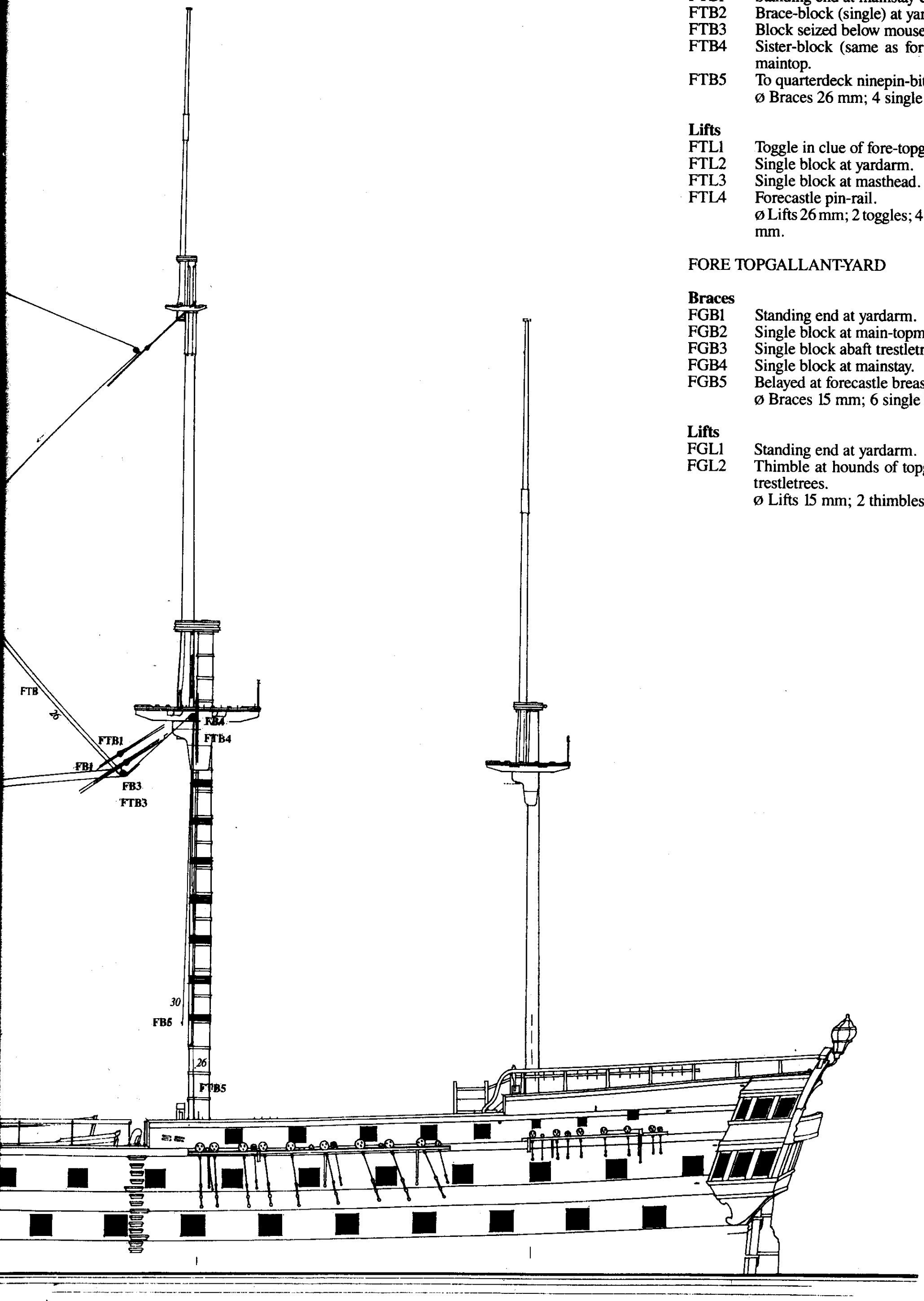
Braces

FB1 Standing end made fast at mainstay collar.
FB2 Single brace-block at yardarm.
FB3 Single block lashed to mainstay collar.
FB4 Sister-block seized below maintop.
FB5 Belayed at quarterdeck ninepin-bitts.
ø Braces 30 mm; 4 single blocks L244 mm; 2 sister-blocks L352 mm.

Lifts

FL1 Standing end at cap, then reeving through shoe-block at yardarm.
FL2 Fiddle-block at cap.
FL3 Lead-block and thence to forecastle pin-rail.
ø Lifts 28 mm; 2 shoe-blocks L816 mm; 2 fiddle-blocks L434 mm; 2 lead-blocks (swivelling) L217 mm.





FORE TOPSAIL-YARD

Braces

FTB1 Standing end at mainstay collar.
FTB2 Brace-block (single) at yardarm.
FTB3 Block seized below mouse of mainstay.
FTB4 Sister-block (same as for forebrace) below maintop.
FTB5 To quarterdeck ninepin-bitts.
ø Braces 26 mm; 4 single blocks L217 mm.

Lifts

FTL1 Toggle in clue of fore-topgallant.
FTL2 Single block at yardarm.
FTL3 Single block at masthead.
FTL4 Forecastle pin-rail.
ø Lifts 26 mm; 2 toggles; 4 single blocks L217 mm.

FORE TOPGALLANT-YARD

Braces

FGB1 Standing end at yardarm.
FGB2 Single block at main-topmast stay.
FGB3 Single block abaft trestletrees of foretop.
FGB4 Single block at mainstay.
FGB5 Belayed at forecastle breastwork.
ø Braces 15 mm; 6 single blocks L136 mm.

Lifts

FGL1 Standing end at yardarm.
FGL2 Thimble at hounds of topgallant; belayed at trestletrees.
ø Lifts 15 mm; 2 thimbles.

Fig. 303
RIGGING TO THE YARDS OF THE MAINMAST

MAINYARD

Braces
MB1 Standing end at the upper finishing of the galleries.
MB2 Brace-block (single) at yardarm.
MB3 Block at poop planksheer.
MB4 Belayed to range-cleat on poop.
ø Braces 28 mm; 4 single blocks L217 mm.

Lifts
ML1 Standing end at maincap, then reeving through shoe-block at yardarm.
ML2 Fiddle-block at cap; belayed in lower shrouds.
ø Lifts 30 mm; 2 fiddle-blocks L515 mm; 2 shoe-blocks L924 mm; 1 single block L217 mm, or shroud-truck.

MAIN TOPSAIL-YARD

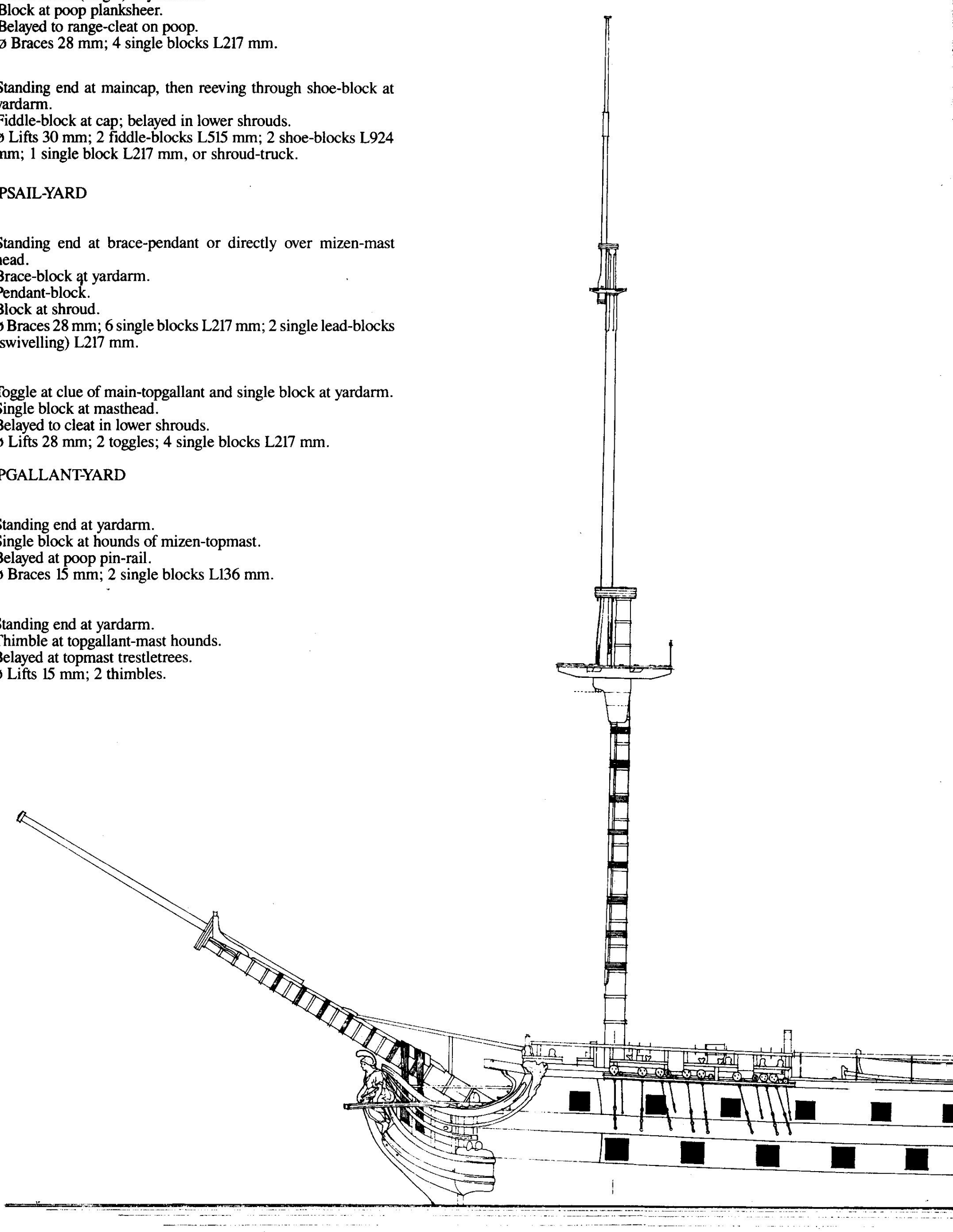
Braces
MTB1 Standing end at brace-pendant or directly over mizen-mast head.
MTB2 Brace-block at yardarm.
MTB3 Pendant-block.
MTB4 Block at shroud.
ø Braces 28 mm; 6 single blocks L217 mm; 2 single lead-blocks (swivelling) L217 mm.

Lifts
MTL1 Toggle at clue of main-topgallant and single block at yardarm.
MTL2 Single block at masthead.
MTL3 Belayed to cleat in lower shrouds.
ø Lifts 28 mm; 2 toggles; 4 single blocks L217 mm.

MAIN TOPGALLANT-YARD

Braces
MGB1 Standing end at yardarm.
MGB2 Single block at hounds of mizen-topmast.
MGB3 Belayed at poop pin-rail.
ø Braces 15 mm; 2 single blocks L136 mm.

Lifts
MGL1 Standing end at yardarm.
MGL2 Thimble at topgallant-mast hounds.
MGL3 Belayed at topmast trestletrees.
ø Lifts 15 mm; 2 thimbles.



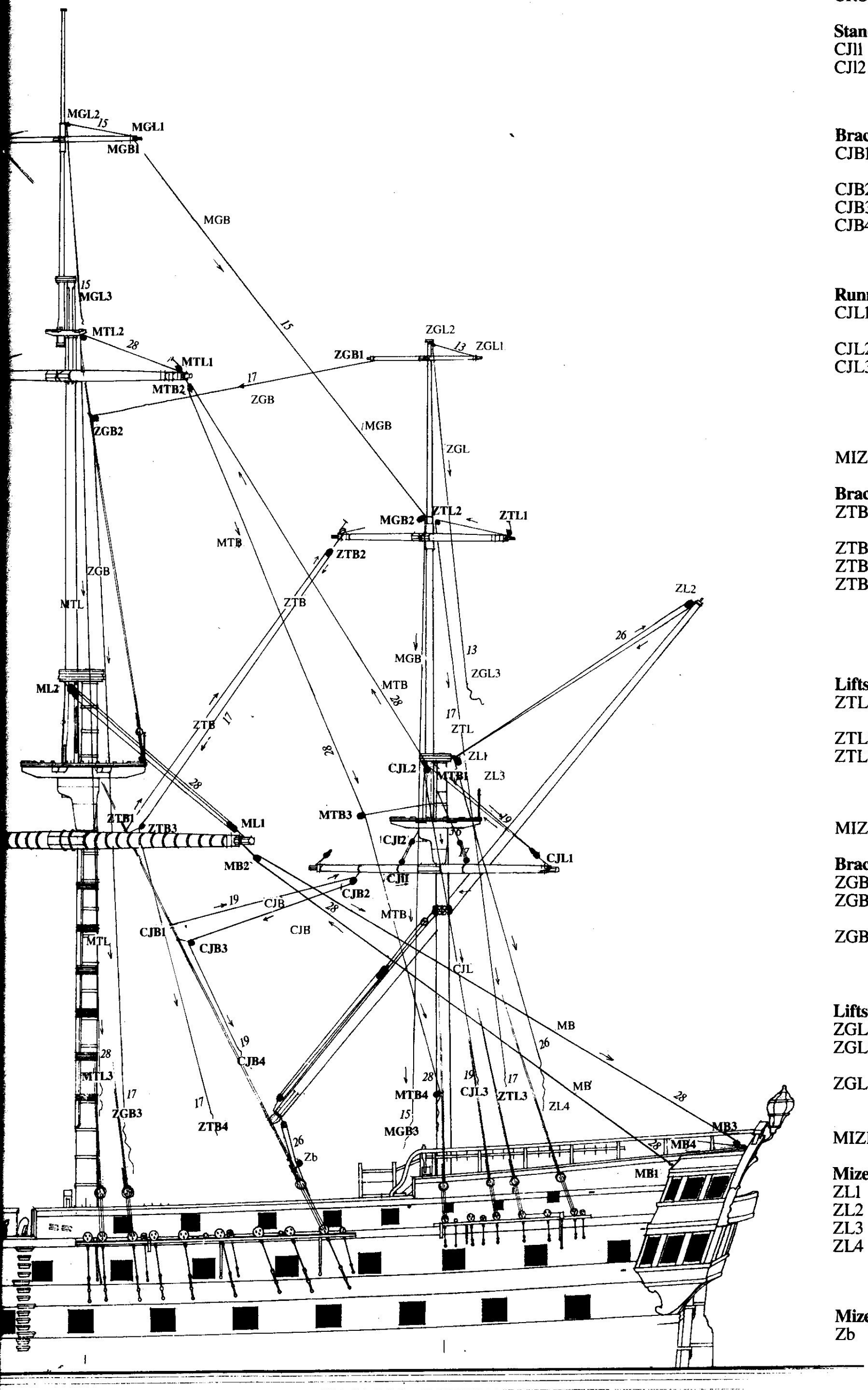


Fig. 304
RIGGING TO THE YARDS OF THE MIZEN-MAST

CROSS-JACK YARD

Standing Lifts

CJl1 Lower deadeye at yard.
CJl2 Upper deadeye at end of lift.
ø Standing lifts 36 mm; ø laniards 17 mm; 4 deadeyes ø 190 mm.

Braces

CJB1 Standing end at aftermost mainmast shroud.
CJB2 Quarter-block on yard.
CJB3 Single block below standing end.
CJB4 Belayed at quarterdeck pin-rail.
ø Braces 19 mm; 4 single blocks L163 mm.

Running Lifts

CJL1 Standing end at mastcap and thence to shoe-block at yardarm.
CJL2 Single block at mastcap.
CJL3 Belayed at poop pin-rail.
ø Running lifts 19 mm; 2 shoe-blocks L408 mm; 2 single blocks L163 mm.

MIZEN TOPSAIL-YARD

Braces

ZTB1 Standing end at aftermost mainmast shroud.
ZTB2 Brace-block (single) at yardarm.
ZTB3 Block next to standing end.
ZTB4 Down to lead-block and quarterdeck pin-rail.
ø Braces 17 mm; 4 single blocks L136 mm; 2 lead-blocks (swivelling) L136 mm.

Lifts

ZTL1 Toggle at clue of mizen-topgallant and single block at yardarm.
ZTL2 Single block in topmast rigging.
ZTL3 Belayed at poop pin-rail.
ø Lifts 17 mm; 2 toggles; 4 single blocks L136 mm.

MIZEN-TOPGALLANT

Braces

ZGB1 Standing end at yardarm.
ZGB2 Single block at aftermost main-topmast shroud.
ZGB3 Belayed at quarterdeck pin-rail.
ø Braces 17 mm; 2 single blocks L136 mm.

Lifts

ZGL1 Standing end at yardarm.
ZGL2 Thimble below mizen-topmast truck.
ZGL3 Belayed at poop pin-rail.
ø Lifts 13 mm; 2 thimbles.

MIZEN-YARD

Mizen-lifts

ZL1 Standing end at ringbolt in cap.
ZL2 Single block at peak.
ZL3 Single block at cap.
ZL4 Belayed at poop port-side pin-rail.
ø Lifts 26 mm; 2 single blocks L217 mm.

Mizen-bowline

Zb ø 26 mm; 4 single blocks L217 mm.

5. RUNNING RIGGING - SAILS

I shall follow the same order as in the last section of this Chapter, since I prefer to cover all the running rigging for each sail in turn.

Square Sails

Sheet: rope attached to the clue of the sail on the lee side.
Tack: rope attached to the clue on the weather side.

*This was referred to as having the yards ***braced sharp up*** or sailing ***close-hauled***, both expressions clearly indicating the attempt to reduce the angle between the sails and the wind as much as possible.

As we have seen, these sails are bent to yards, which allows them to be angled as required by means of the braces. They are hauled or spread at their lower corners or clues by *sheets* and *tacks*. The sheet is to leeward and the tack to windward, so that the closer to the wind the ship is sailing the further forward the tack is compared to the sheet*. However, only the forecourse and maincourse have sheets and tacks at their clues; all the other square sails only require sheets to secure the clues, which serve the same purpose as the tacks. The sheets are qualified by the words weather and lee. In the case of the studdingsails, their inboard clue takes the sheet and the outboard clue the tack.

Steady out: to haul forward on the weather side.
Bowlines: sailing close-hauled was also called ***sailing on a bowline***.
Bowline bridle: a number of lines fastened to the leech of the sail and resembling a crow's-foot. See Fig. 307.

When sailing close-hauled it is also necessary to *steady out* the leech of the square sails on the weather or windward side by means of *bowlines*, which distribute the strain on the sail by means of a *bridle*. Obviously bowlines are only rigged on the windward side, since their purpose is to hold the sail open to the wind. The sail is thus spread to receive the wind by means of the yard to which it is bent, the sheets and tacks at its clues, and the bowlines.

Reefs.
Reef-points.
Reef-tackles.

If it is necessary to reduce the area of the sail, this can be done in one of a number of ways; one or more *reefs* can be taken in, gathering some of the canvas up on top of the yard by means of thin lines called *reef-points* attached to the reef-bands. This operation is made considerably easier by a *reef-tackle*, which allows the leech of the sail at the reef-band to be hoisted up towards the yard. Alternatively, the topsails and topgallants can be lowered so that they form a bag, thereby reducing the effect of the wind on their surface; or the tack of the courses can be eased off so as to spill some of the wind (reefs are almost never taken in the courses).

Clue or ***clew up:*** "to haul up the clews of a sail to its yard". [Falconer: op. cit.].

Furl: "to wrap or roll a sail close up to its yard . . . and wind a gasket or cord about it to fasten it thereto". [Falconer: op. cit.].

If it is decided to *clue up* a sail so as to gather all its canvas on top of the yard where it is *furled*, this is done by means of a variety of lines: the *buntlines* raise the foot of the sail, the *clue-lines* fold back the clues, and the *leech-lines* raise the leeches. All of these lines taken together are called the *brails*, and depending on the size of the sail, some or all may be fitted.

Buntlines: but the ***bunt*** of a sail is its middle part.

clue-lines: on the courses these are called the ***clue-garnets***.

Leech-lines.

This describes therefore very summarily how a sail is spread, reduced partially in area, or taken in.

Brails: hence to ***brail up*** a sail means the same as to clue up, but for four-sided fore-and-aft sails.

BOWSPRIT (see Figs. 305 and 306).

*Sometimes the sprit-topsail sheets are independent of the spritsail-yard lifts, in which case they simply reeve through a block strapped to the spritsail yardarms and are belayed round one of the stanchions of the beakhead bulkhead.

Sprit-topsail: The sheets are formed by the lifts of the spritsail-yard, which are passed round a toggle at the clues of the topsail; from there they reeve through a single block at the spritsail yardarm, then through a second single block strapped round the head of the bowsprit; passing down the bowsprit, they reeve through the rack-blocks and are belayed at the beakhead bulkhead*.

The clue-lines reeve through a quarter-block seized a third of the way out from the slings and hanging down underneath the yard, run down to a block at the head of the bowsprit*, thence through the rack-blocks, and are belayed at the beakhead bulkhead.

*Often this block is omitted, and I have not shown it in my detailed drawing of the bowsprit sails (Fig. 306).

The sprit-topsail has no buntlines.

Spritsail: Two *strapped blocks* hang on short pendants passed through the clue-cringles of the sail and are finished with a wall-knot; the sheets are made fast at their standing end to an iron shackle in the ship's side slightly abaft the beakhead bulkhead and level with the first wale*. The hauling end reeves through the strap-bound block and is then belayed at one of the beakhead bulkhead stanchions.

The reef-tackles are merely single lines.

The buntlines are made fast at their standing end to the cringle near the clue, then reeve through a bull's-eye seized to a cringle at the middle of the footrope, pass up inside the sail to a double block seized to the slings of the yard, reeve through one of the sheaves of the rack-blocks, and are belayed at the beakhead bulkhead.

The clue-lines are single and are made fast at the clue of the sail, run up to a quarter-block placed one third of the way out from the slings, thence to the rack-blocks on the bowsprit, and are belayed at one of the stanchions of the beakhead bulkhead.

Strapped blocks: like ***buntline-blocks*** [q.v.]. These are the blocks which resemble the tonsured head of a monk. Sometimes the only way to haul the clues down is to hang a few shot from them, despite the weight on the rigging.

*The lead of the spritsail sheets is sometimes simplified by making fast the standing end to the same beakhead bulkhead stanchion to which the hauling end is belayed.

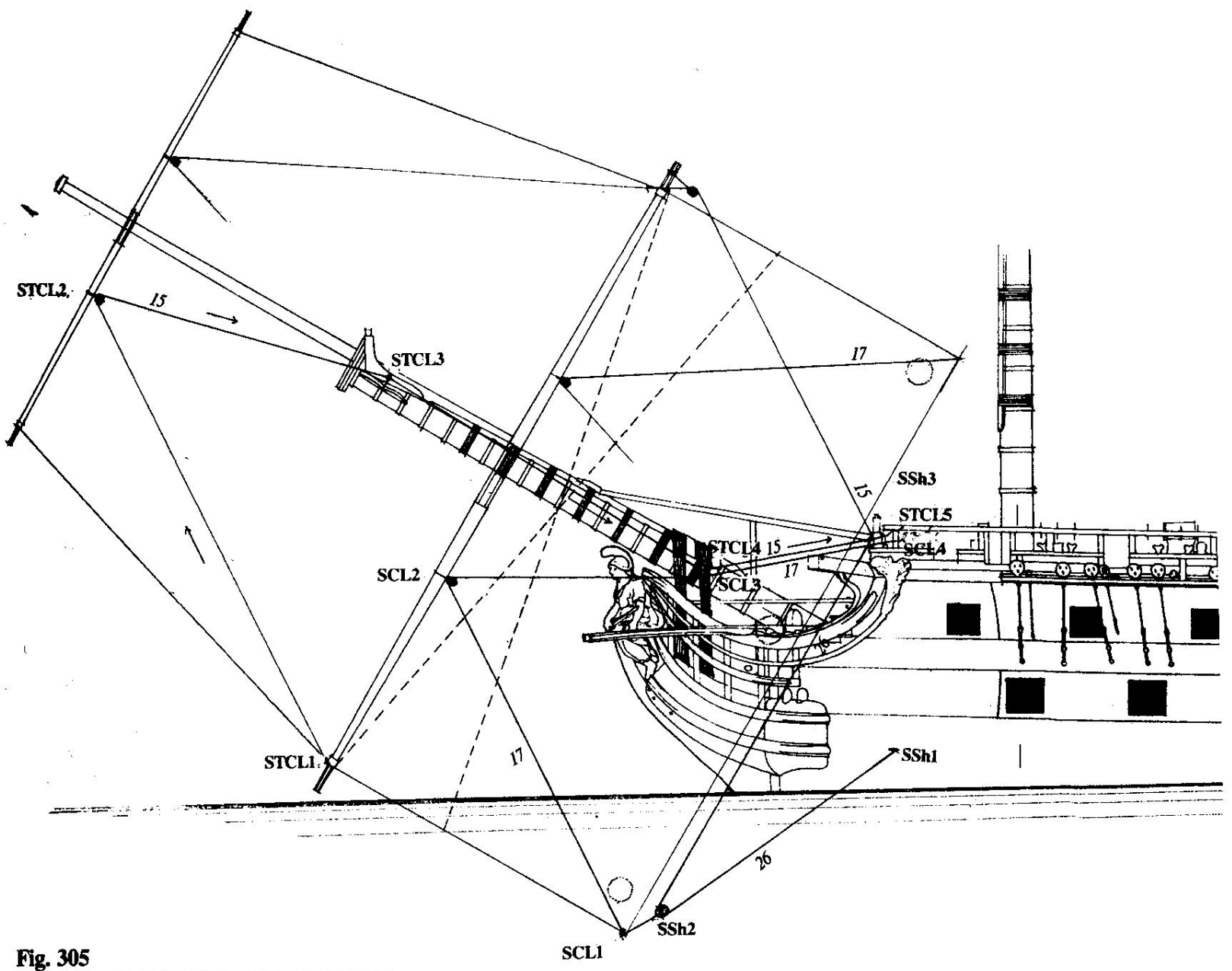


Fig. 305
SQUARE SAILS ON THE BOWSPRIT

SPRIT-TOPSAIL

Sheets: formed by the spritsail-yard lifts. Should they be separate lines, they reeve through a single block at the spritsail yardarm, then through a second single block seized to the bowsprit cap, thence to a sheave of the rack-blocks, and are belayed at the beakhead bulkhead.
ø 15 mm; 4 single blocks L136 mm.

Clue-lines

STCL1	Standing part at clue.
STCL2	Quarter-block 1/3 out from the slings.
STCL3	Block at head of bowsprit.
STCL4	Bowsprit rack-blocks.
STCL5	Beakhead bulkhead.
	ø Clue-lines 17 mm; 4 single blocks L136 mm.

SPRITSAIL

Sheets

SSh1	Standing end to ring in ship's side.
SSh2	Block at clue.
SSh3	Beakhead bulkhead.
	ø Sheets 26 mm; 2 "monk's head" blocks L217 mm.

Buntlines (not shown)

SBL1	Standing end to cringle near clue.
SBL2	Bull's eye at central buntline cringle.
SBL3	Double block at slings.
SBL4	Bowsprit rack-blocks.
SBL5	Beakhead bulkhead.
	ø Buntlines 15 mm; 1 double block L271 mm.

Clue-lines

SCL1	Standing end at clue.
SCL2	Quarter-block 1/3 of the way out from the slings.
SCL3	Bowsprit rack-blocks.
SCL4	Beakhead bulkhead.
	ø Clue-lines 17 mm; 2 single blocks L136 mm.

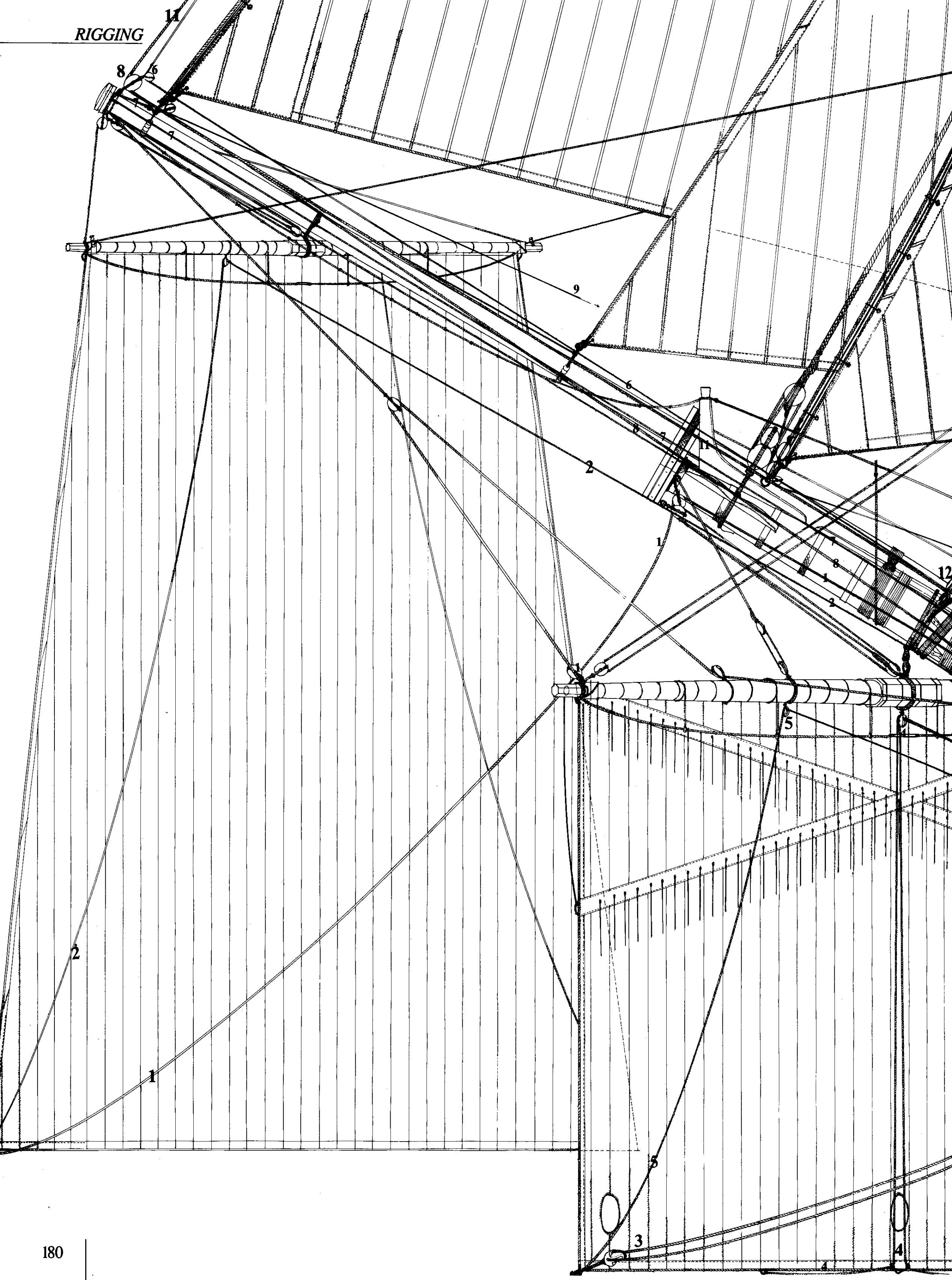

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Fig. 306
Rigging to the Head-Sails

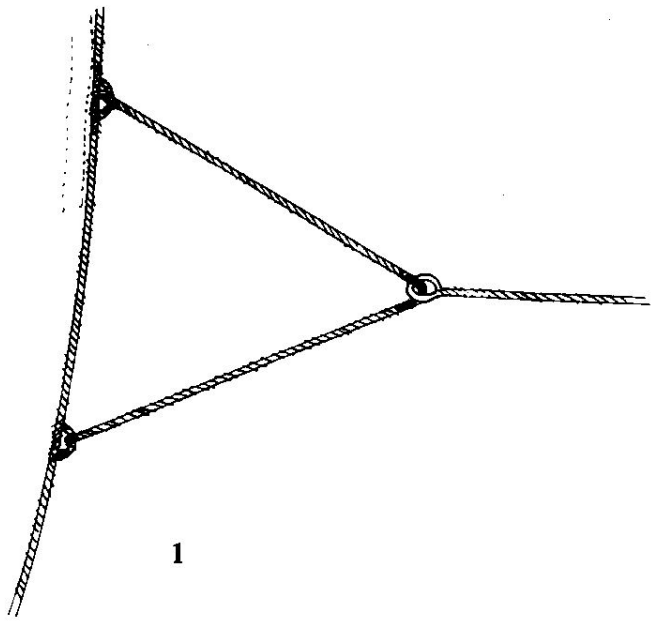
1. Sprit-topsail sheet (reeves through the rack-blocks and forms the running lift of the spritsail-yard).
2. Sprit-topsail clue-line (reeves through rack-blocks).
3. Spritsail sheet (shown here made fast at its standing end at the beakhead bulkhead).
4. Spritsail buntline (reeves through rack-blocks).
5. Spritsail clue-line (reeves through rack-blocks).
6. Fore-topgallant bowline (reeves through rack-blocks).
7. Outhauler of the standing jib traveller (reeves through the port-side rack-blocks; the outhauler of the inner jib reeves through the corresponding sheave of the starboard rack-blocks).
8. Fore-topsail bowline (reeves through one of the outer sheaves of the threefold block seized below the truck of the jibboom, then through a block lashed to a ringbolt in the bumpkin above the main rail).
9. Standing jib downhauler.
10. Inner jib downhauler or downhaul.
11. Fore-topgallant stay (reeves through the central sheave of the threefold block and is made fast to the strop of the lower heart of the forestay).
12. Single block for the port forecourse bowline; the bowline itself (not shown) reeves through this block and thence to the rack-blocks or gammon-lashings; if there is no vacant sheave the bowline reeves instead through the block marked 12' made fast to the beakhead close to that serving the fore-topsail bowline.

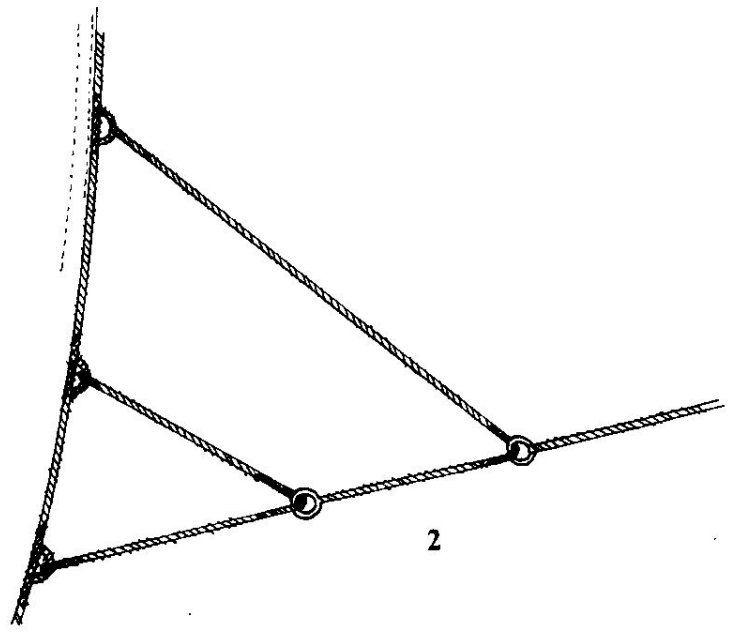
*The yards are shown braced to an angle of 60° which explains why the cloths of the sails appear somewhat narrower than usual.

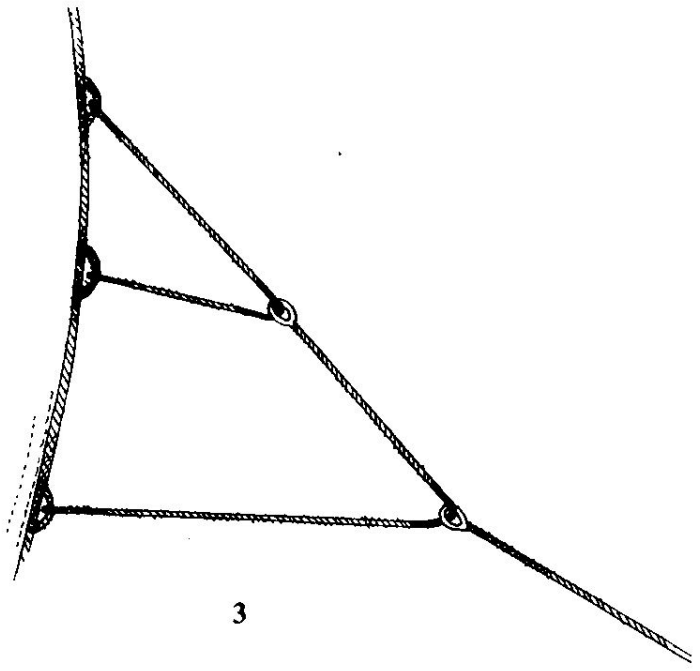
Note: neither this Figure nor Fig. 280 are at the usual scale of 1:72.

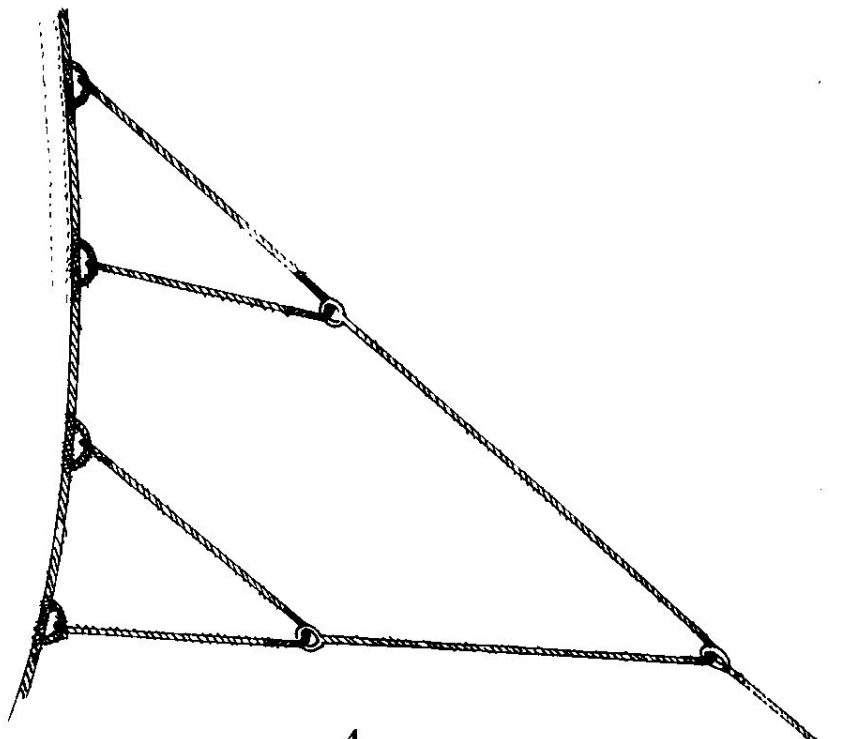
Fig. 307
Various Ways of Rigging Bowline Bridles

1. Forecourse: the bridle takes the form of a single span. Alternatively, it may be rigged like the maincourse (see below).
2. Maincourse - Fore-topsail - Topgallants: two spans.
3. Mizen-topsail: also two spans, but this time the upper span reeves through the thimble of the lower span.
4. Main-topsail: a first span reeves through the thimble of the bowline, and each leg leads to a further span, one for each pair of bowline-cringles.


1


2


3


4

FOREMAST (see Fig. 311).

Forecourse: The sheet is made fast at its standing end to an iron ring at the level of the fourth wale a little way forward of the cleats of the entering ladder; from there it reeves through a block at the clue, then through one of the sheaves of the fixed block let into the upper works athwart the quarterdeck breastwork, and returns forward to the forecastle where it is belayed to a kevel. A common alternative is for the fixed-block to be let into the ship's side at the level of the upper deck ports, and the foresheet is then belayed at a staghorn below the gangway.

The tack is made fast at its standing end at the outboard end of the bumpkin, reeves through a block at the tack of the sail, then through a shoulder-block seized or strapped round the bumpkin inboard of the standing end; from there it lead aft to the forecastle, reeves through a lead-block seized to an eyebolt at the foot of the foremast, and is finally belayed to a cleat nailed to the foremast.

Bowline-bridles: the forecourse has only two bowline-cringles, and thus a single span to the bridle, fastened by means of a bowline knot at either end to the cringles; the bridle reeves through a thimble turned in the end of the bowline (see Fig. 307 above). The purpose of the bridle is to distribute the effort of the bowline more evenly to the bolt-rope and spread the sail better.

Bowlines: as already explained, they act on a bridle formed of a single span. The bowlines reeve through a single block seized to the bowsprit* close to the forestay and fore preventer-stay, lead aft again through the rack-blocks of the bowsprit and are belayed at one of the beakhead bulkhead stanchions. This arrangement is only possible when one of the rack-block sheaves is free (i.e. when the sprit-topsail is not bent); otherwise the bowline reeves through a block made fast to the upper rail of the head, close to the bumpkin, before leading back to be belayed at the beakhead bulkhead.

*Sometimes the two single blocks are replaced by a double block which takes both bowlines.

Reef-lines: these are made fast to the reef-cringles and serve to haul on the reef-bands at the leech, but they are only rarely used, since when a reef is taken in the course (which is not often), it is more usual to clew up the sail (see Vol. IV). The reef-lines are simply lines (as opposed to tackles) made fast at their lower end to the reef-cringle and at the other end to the yardarm.

Buntlines: there are two buntlines for each half of the sail; these lines run up the *forward side of the sail*. The standing ends of the first pair of buntlines are made fast to the outer buntline-cringles in the foot of the sail; the running part then reeves through a thimble or bull's-eye seized to the inner buntline-cringle 2/7ths of the way along the foot. From there the buntline leads up the forward side of the sail through a block known as the *buntline-block* at the yardarm; it will be recalled that these blocks have a sort of brim or "monk's head" over the sheave to protect the buntlines from chafing. The buntline-blocks are seized to the yard directly over the thimble 2/7ths of the way along the foot. The hauling part then reeves through a double block hanging below and seized to the forward crosstree of the foretop, thence down the mast and through one of the ninepin blocks, and is belayed to one of the pins in the ninepin-bitts. The second pair of buntlines are made fast at their standing ends to the two inner buntline-cringles, reeve through two other thimbles made fast at the foot of the sail near the middle, then up the fore side of the sail, and reeve through a block seized to the strap of the lower jeer-block on the yard; from there they reeve through the second sheave of the double block, run down the mast, and through one of the ninepin-blocks.

Buntline-block.

There is another way of rigging the buntlines which I will describe when I come to the maincourse.

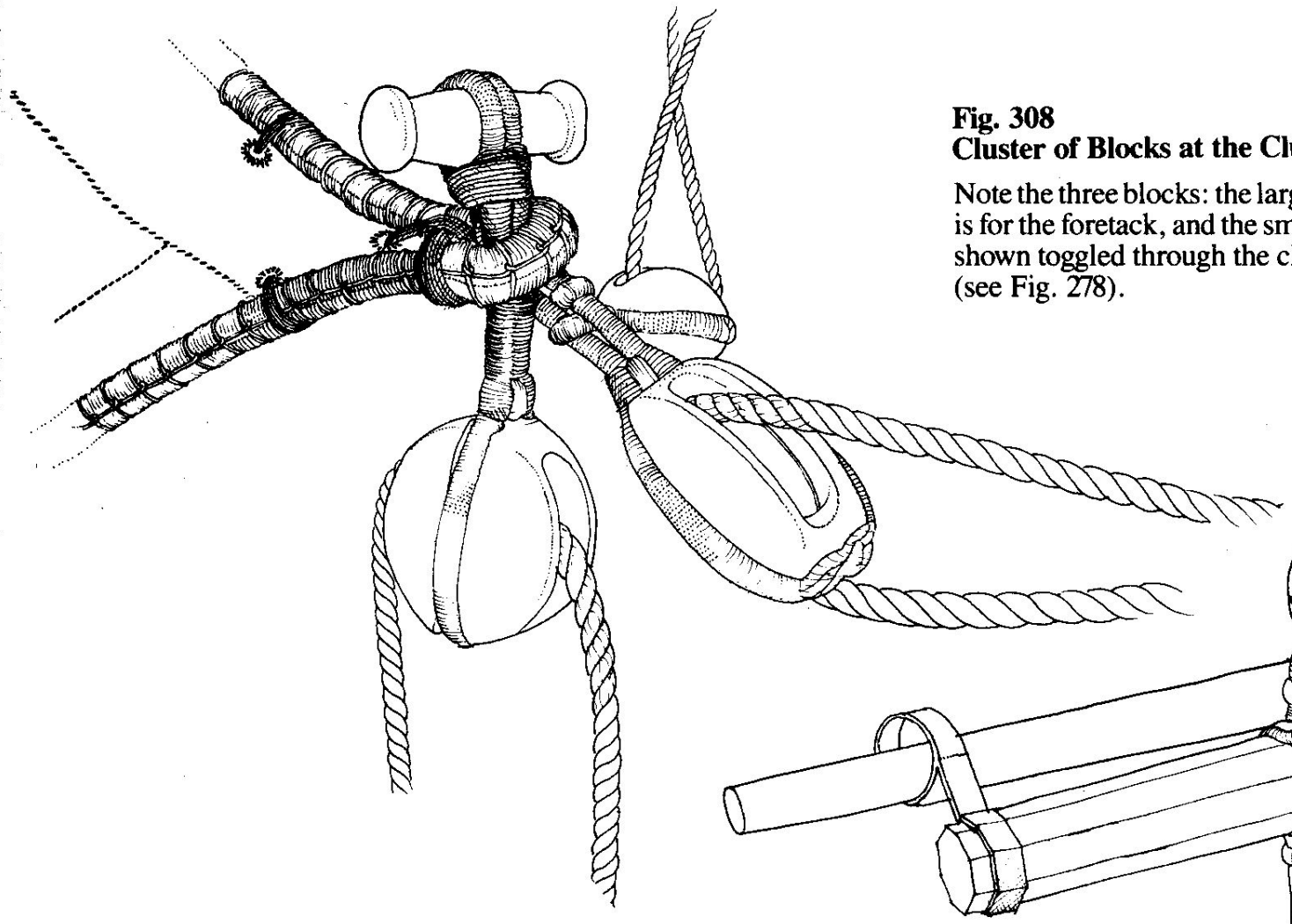


Fig. 308
Cluster of Blocks at the Clue of the Forecourse

Note the three blocks: the largest is for the foresheet; the next, slightly smaller one is for the foretack, and the smallest is the clue-garnet block. The straps, which are shown toggled through the clue of the sail, are sometimes secured by wall-knots (see Fig. 278).

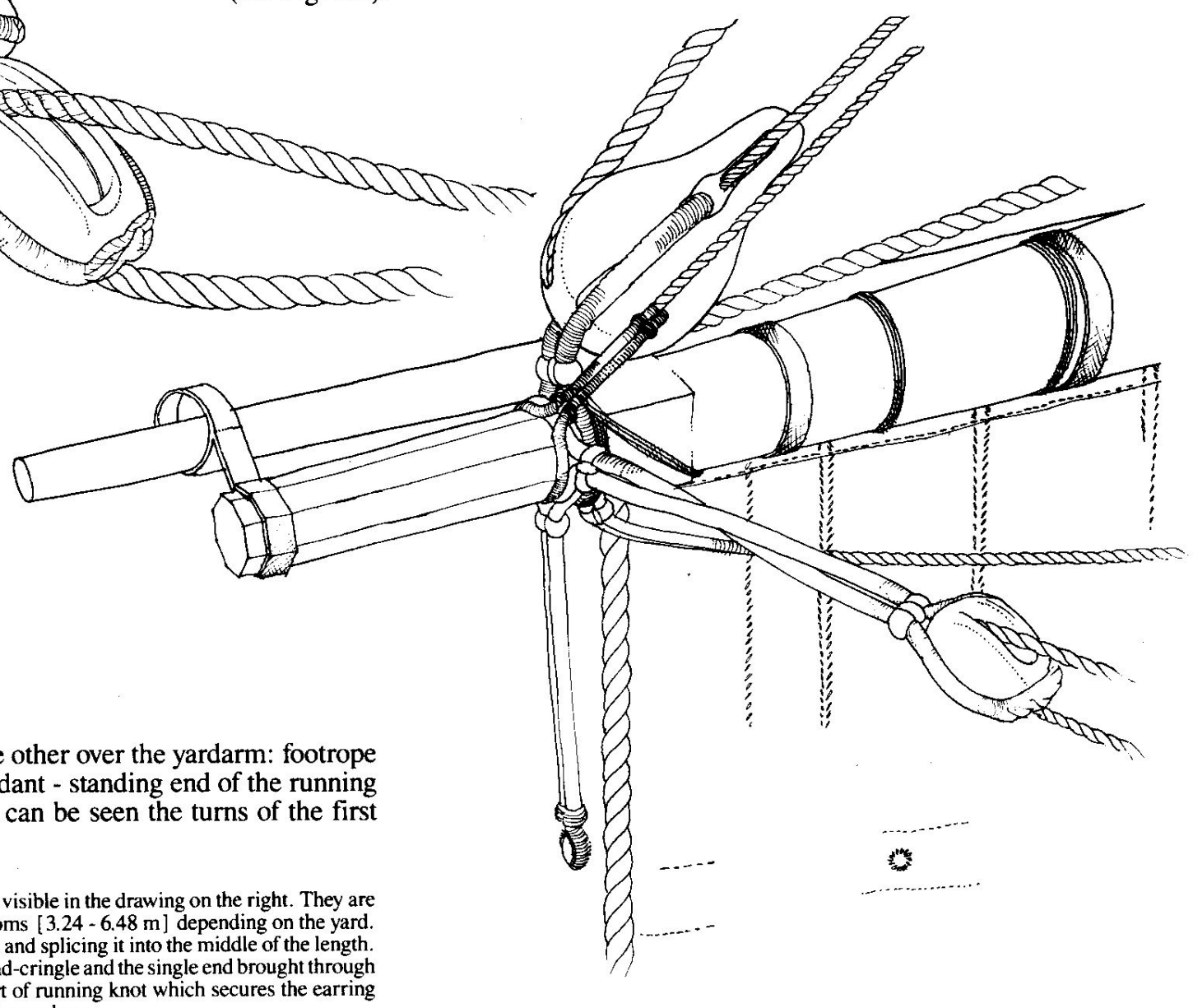


Fig. 309
Lower Yardarm

Various items of rigging are fitted one after the other over the yardarm: footrope - strap of the shoe-block - yardarm-tackle pendant - standing end of the running lift. Up against the stop-cleat of the yardarm can be seen the turns of the first head-earring.

*I should add a few more details regarding the head-earrings visible in the drawing on the right. They are made of ratling and their length varies between 2 and 4 fathoms [3.24 - 6.48 m] depending on the yard. They are first doubled by turning back a quarter of the length and splicing it into the middle of the length. The bight thus formed is passed through the thimble of the head-cringle and the single end brought through the bight from the other side and drawn tight, forming a sort of running knot which secures the earring to the bolt-rope. Three or four turns are then taken round the yardarm.

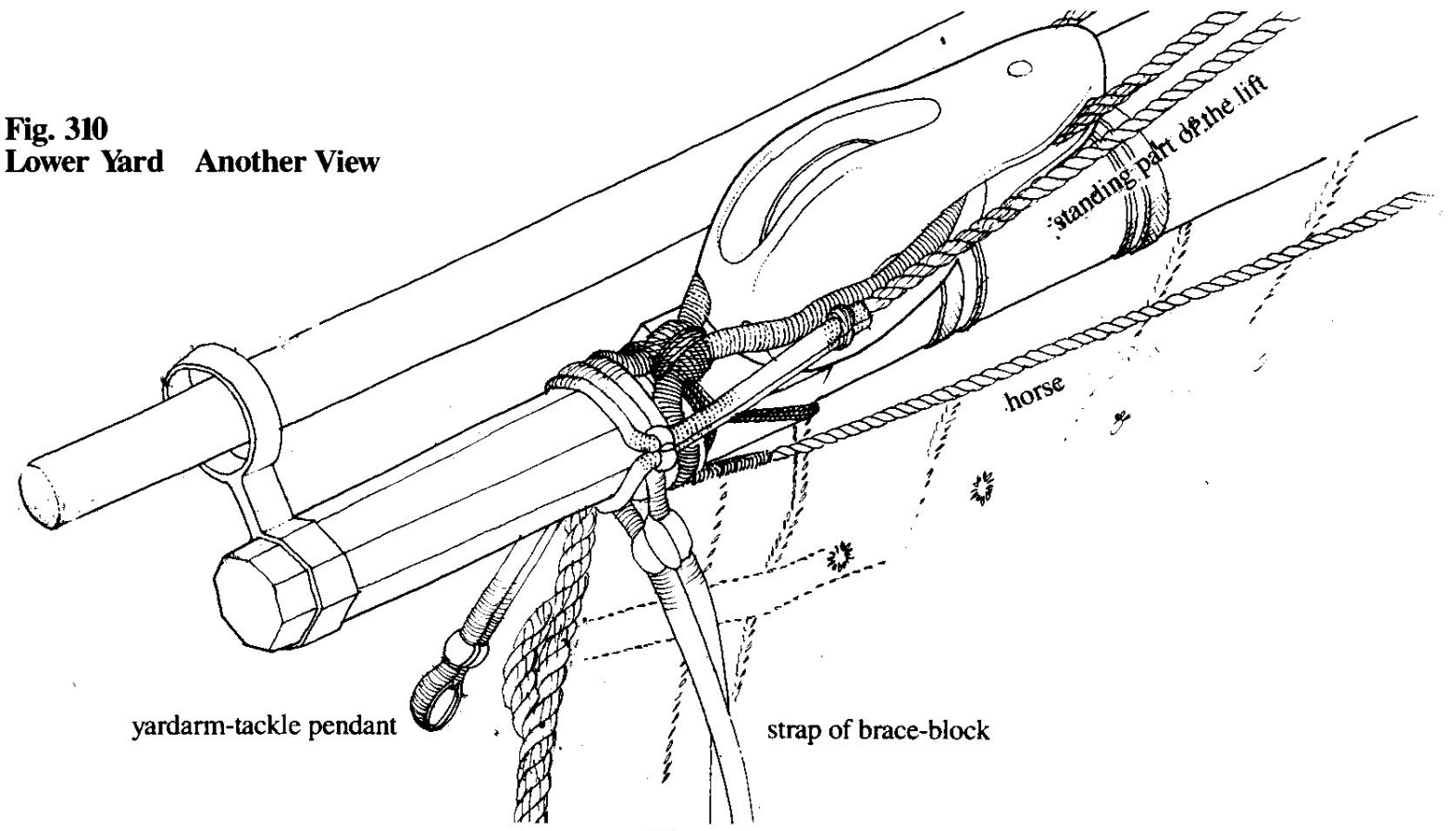
Clue-garnets: Made fast at their standing end to the yards, one third of the way in from the arm, they run down the after side of the sail and reeve through a single block with a long strap fastened at the clue of the sail (which thus has three blocks: sheet, tack and clue-garnet - see Fig. 308); from there they run up the after side of the sail, reeve through a single block seized to the yard close to their standing end, down again to a third block made fast to the foremost lower shroud, and from there reeve through a fourth and final block, this time a lead-block, seized to an eyebolt in the spirketting; finally they are belayed to one of the pins of the forecastle pin-rail.

Leech-lines: Lead up the forward side the sail and are made fast at their standing end to the lower bowline-cringle, then reeve through a thimble or bull's-eye seized to the upper bowline-cringle, and lead up to the yard where they reeve through the sheave of a quarter-block seized towards the outboard end, a third or a quarter of the way in from the arm; from there they reeve through a single block seized below the forward foretop crosstree, run back down the foremast, reeve through a lead-block seized to an eyebolt in the partners, and are belayed to the cleats nailed to the mast*.

*Alternatively, two leech-lines may be rigged (to either side). The lower one is made fast to the middle bowline-cringle and reeves through a thimble seized to the upper cringle. The upper leech-line is made fast at its standing end to the reef-cringle. They then each reeve through their own single block on the fore side of the yard, come together to reeve through the sheaves of a double block fastened beneath the forward crosstree, run down the mast and reeve through the sheaves of a double lead-block fastened to the deck at the foot of the mast, and are belayed to the cleats nailed to the mast.

Robands, earrings: All these were explained in section 1 of the previous Chapter (p. 74), to which I would now refer you. The same applies to the reef-points, although it should be said that these are rarely fitted to the reef-bands of the forecourse.

Fig. 310
Lower Yard Another View



Fore-Topsail: The sheets (for it will be remembered that the topsails have no tacks) are each bent to the clue of the sail by means of a single bend, reeve through the lower, larger sheave of the shoe-block at the fore-yardarm, then inboard along the yard through a quarter-block seized under the yard near the bollock-blocks; from there the sheets run down the mast, reeve through one of the sheaves in the pin of the fore topsail-sheet bitts where they are also belayed.

Bowline-bridles: These are more complicated than those of the forecourse: a span is made fast to the two lower bowline-cringles, passing through a thimble which slides easily along it. A second span is made fast at one end to the upper bowline-cringle, reeves likewise through a thimble, and is made fast at the other end to the thimble of the first span. The bowline itself turns in the thimble of the second span.

Bowlines: The bowlines are made fast to a double bridle and from there they run down to the treble block strapped to the forward end of the jibboom, reeve through the two outer sheaves, then to a single block seized to an eyebolt in the bumpkin (above the upper rail), and then lead aft to the

beakhead bulkhead where they are belayed. Sometimes the bowline reeves through another block on the way aft, fixed to the centre of the bees*.

*Alternatively, the fore-topsail bowlines may lead from the block on the bees to the sheaves of the rack-blocks.

Reef-tackles: Consisting of a single fall, these are made fast at their standing end to the lower reef-cringle, run up from there to the yard where they reeve through a sheave in the yardarm, then inboard along the yard to a block at the slings; they then lead down through the lubber's hole of the foretop, reeve through one of the ninepin-blocks and are belayed to one of the pins in the ninepin-bitts.

Buntlines: The buntlines are bent to the buntline-cringles near the clues of the topsail, reeve through bull's-eyes made fast to the inner buntline-cringles near the middle of the foot, lead up the forward side of the sail, and reeve through a buntline-block seized to the yard beside the bollock-blocks; from there the falls lead to a block made fast at the topmast-head to the second fore-topmast shroud, down through the lubber's hole of the top, reeve through one of the ninepin-blocks, and are belayed to one of the pins in these bitts*.

*An alternative arrangement of the buntlines is that they are made fast at their standing end to the outer buntline-cringle, reeve through two thimbles in the foot of the sail, lead up outside and reeve through the sheaves of a double block fastened to the collar of the fore-topmast stay; from there they run back down abaft the topmast, through a hole in the decking of the top, reeve through a thimble abaft the catharpins below the top, and from there run down to the ninepin-blocks.

Clue-lines: The clue-lines are made fast at their standing end to the yard, a third of the way out from the slings, run down the after side of the sail to reeve through a block made fast at the clue (like the clue-garnet block on the course), run up to a block seized to the yard next to the standing end, and then lead back down to the hounds of the lower mast where they reeve through a block made fast there (or to the rim of the top close to the second shroud); from there they run down to a lead-block seized to an eyebolt in the spirketting, and are belayed to a pin in the forecastle pin-rail*.

Leech-lines: The leech-lines are made fast at their standing end to the middle bowline-cringle; the hauling part reeves through a bull's-eye fastened to the fourth cringle from the clue (i.e. the lower of the pair of cringles at the lowest reef-band - see Plate XLVII), runs up outside the sail and reeves through a quarter-block at the outboard quarter of the yard; from there it leads to a block made fast to the top of the fore-topmast stay-collar, passes down through a hole in the decking of the top, abaft the mast, reeves through a thimble seized to the after catharpins, and from there through one of the ninepin-blocks; it is belayed to one of the pins in the ninepin-bitts*.

*Alternatively, from the block at the rim of the top the fore-topsail clue-lines may lead down outboard of the shrouds, reeving through a block made fast to the third shroud two-thirds of the way down, and then be belayed to a pin in the forecastle pin-rail.

*Alternatively, the leech-lines of the fore-topsail reeve through the sheave in the yard, from there through a block made fast to one of the sheaves of the fore topsail-sheet bitts; they are belayed either at the bitts or to a cleat on the forecastle.

Topsail spilling-lines: Some ships use these lines to supplement the topsail leech-lines. The spilling-line is made fast at its standing end at the slings of the yard, passes down the forward side of the sail, then back round it below the leech-line to the after side of the sail and up again to a block strapped below the yard somewhat beyond the slings; the two spilling-lines thus cross each other in the middle, run down the topmast and the lower mast, and are hauled on from the forecastle.

Topsail spilling-lines or ***hand leech-lines:*** not generally fitted to topsails of English ships.

Earrings, reef-points: As for the forecourse, save that the reef-points are always fitted to the three reef-bands.

Fore-Topgallant

Sheets: As a rule these double as running lifts for the fore topsail-yard, and are seized one on each side round a toggle in the clue; from there they reeve through the single block made fast to the yardarm, then through a second block below the topgallant trestletrees, down through holes in the decking of the top, and are belayed to a shroud-cleat seized to one of the forward shrouds of the lower mast*.

*Alternatively, the topgallant sheets and topsail-yard lifts can be rigged separately; for this a second block is needed at the yardarm for the topgallant sheet, which then reeves through another block lashed to the topsail-yard near the slings, passes down through the lubber's hole of the foretop to a lead-block in the spirketting, and is belayed to a pin in the forecastle pin-rail. The more modern arrangement of combining the sheet with the topsail-yard lift is however generally preferred.
When the topgallant is unbent the sheets must then be freed from the toggle in the clue and made fast below the cap or else to belaying-pins in the topgallant trestletrees, next to their blocks.

Bowline-bridles: Consist of two spans, exactly like those on the fore-topsail.

Bowlines: Lead to the forward end of the jibboom, reeve through a thimble seized to the strap of the threefold block and then lead back to one of the sheaves of the rack-blocks; they are then belayed at the stanchions of the beakhead bulkhead.

Clue-lines: These are rigged singly and end in an eye-splice which fits round the toggle in the clue. The clue-lines lead up to a quarter-block fastened a third of the way out from the slings, and then back down through the lubber's hole to the forecastle where they are belayed to one of the pins of the pin-rail.

Fig. 311
RUNNING RIGGING TO THE SQUARE SAILS OF THE FOREMAST

FORECOURSE

Sheets
FSH1 Eyebolt forward of the entering-ladder.
FSH2 Block in the clue of the forecourse.
FSH3 Fixed-block in the bulwarks at the waist.
FSH4 Kevel on forecastle.
ø Sheets 48 mm; 2 single blocks L298 mm.

Tacks
FTK1 Standing end to outboard end of the bumpkin.
FTK2 Block in tack of forecourse.
FTK3 Block at heel of bumpkin.
FTK4 Block at foot of foremast and belayed to range-cleat.
ø Tacks 39 mm; 4 single blocks L298 mm; 2 shoulder-blocks L298 mm.

Bowlines and Bridles
FBW1 Span of bridle to lower bowline-cringle.
FBW2 Other end to upper bowline-cringle.
FBW3 Thimble of bridle.
FBW4 Block on bowsprit near forestay.
FBW5 Bowsprit rack-block.
FBW6 Beakhead bulkhead.
ø Bowlines & bridles 34 mm; 2 single blocks L244 mm.

Buntlines (forward side of sail)
FBL1 Standing end to buntline-cringle near clue.
FBL2 Bull's-eye in second buntline-cringle.
FBL3 Buntline-block on yard above second cringle.
FBL4 1st sheave of double block below top.
FBL5 Ninepin-block and bitts.
FBL1′ Standing end to third buntline-cringle.
FBL2′ Bull's-eye in foot of sail at middle.
FBL3′ Buntline-block below slings of foreyard.
FBL4′ 2nd sheave of double block below top.
FBL5′ Ninepin-block and bitts.
ø Buntlines 19 mm; 4 buntline-blocks L136 mm; 1 double block L271 mm.

Clue-Garnets
FCG1 Standing end 1/3 in from yardarm.
FCG2 Block in clue of sail.
FCG3 Block below yard near standing end.
FCG4 Block on forward shroud.
FCG5 Lead-block in spirketting, then to forecastle pin-rail.
ø Clue-garnets 28 mm; 8 single blocks L217 mm.

Leech-lines (forward side of sail)
FLL1 Standing end to lower bowline-cringle.
FLL2 Bull's-eye in upper cringle.
FLL3 Quarter-block 1/3 or 1/4 in from yardarm.
FLL4 Block below top.
FLL5 Lead-block at foot of foremast, and to range-cleat.
ø Leech-lines 19 mm; 6 single blocks L163 mm.

FORE-TOPGALLANT

Sheets
FGSH1 Standing end to clue of sail.
FGSH2 Single block at yardarm.
FGSH3 Block below slings.
FGSH4 Lead-block in spirketting, then to pin in forecastle pin-rail.
ø Sheets 26 mm; 6 single blocks L217 mm.

Bowlines & Bridles
FGBW1 Span of 1st bridle to lower cringle.
FGBW2 Other end to middle cringle.
FGBW3 Span of 2nd bridle to upper cringle.
FGBW4 Other end to thimble in 1st bridle; passing through its own thimble to which bowline is made fast.
FGBW5 Thimble seized to strap of threefold block on jibboom.
FGBW6 Bowsprit rack-blocks, then to beakhead bulkhead.
ø Bowlines and bridles 13 mm.

Clue-lines
FGCL1 Clue of sail.
FGCL2 Quarter-block 1/3 in from yardarm.
FGCL3 Pin in forecastle pin-rail.
ø Clue-lines 15 mm; 2 single blocks L136 mm.

FORE-TOPSAIL

Sheets
FTSH1 Clue of sail.
FTSH2 Shoe-block at arm of foreyard.
FTSH3 Block at slings of yard.
FTSH4 Fore topsail-sheet bitts.
ø Sheets 60 mm; 2 shoe-blocks (the second sheave of which takes the foreyard lifts) L816 mm; 2 single blocks L352 mm.

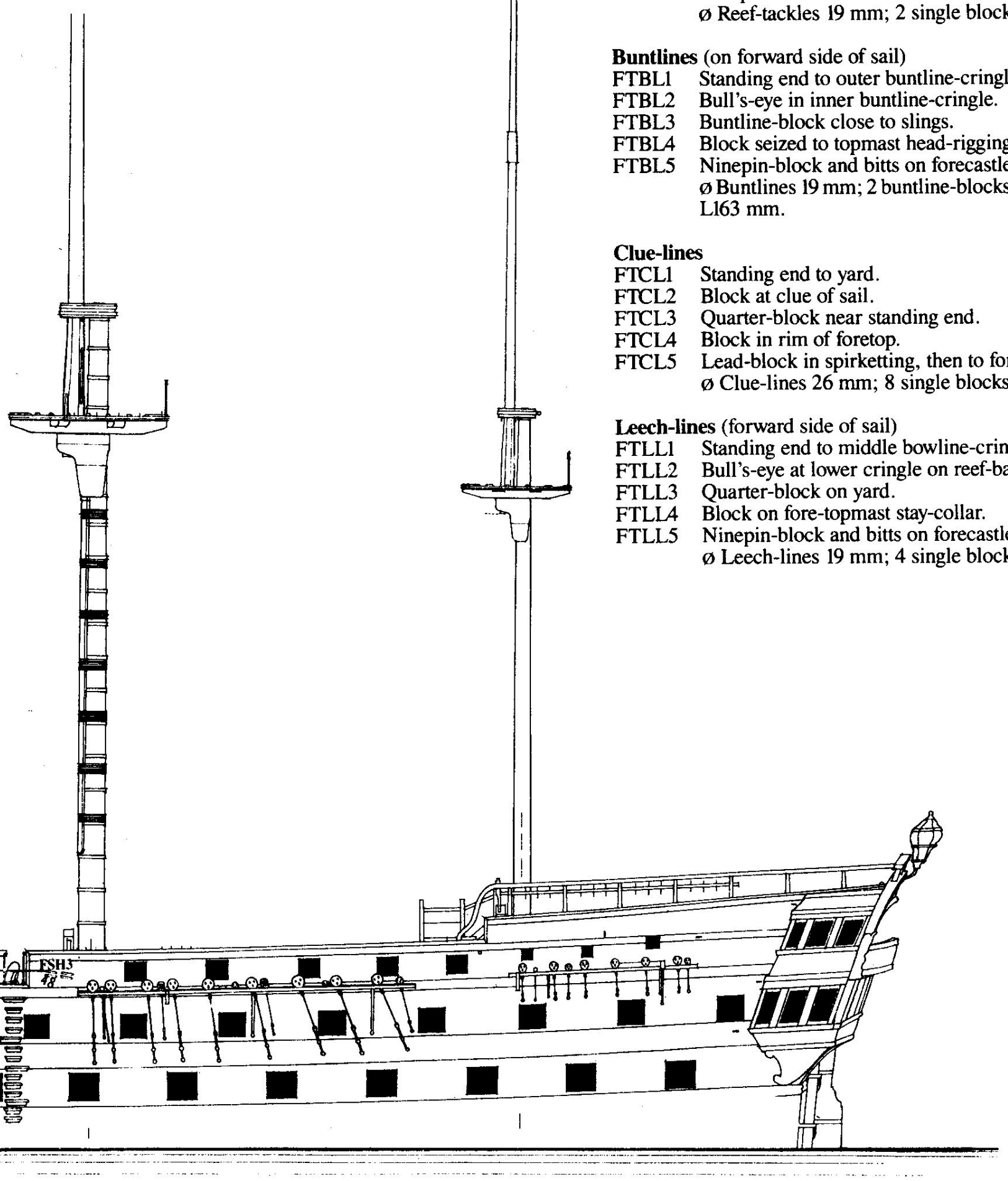
Bowlines & Bridles
FTBW1 Span of 1st bridle to lower bowline-cringle.
FTBW2 Other end to middle cringle.
FTBW3 Span of 2nd bridle to upper cringle.
FTBW4 Other end to thimble of 1st bridle.
FTBW5 Bowline made fast to thimbles of 2nd bridle.
FTBW6 Outer sheaves of threefold block, end of jibboom.
FTBW7 Block on jackstaff-standard (optional).
FTBW8 Block at heel of bumpkin.
FTBW9 Beakhead bulkhead.
ø Bowlines and bridles 28 mm; 1 single block L217 mm; 1 threefold block L325 mm.

Reef-tackles
FTRT1 Standing end to lower reef-cringle.
FTRT2 Sheave in yardarm.
FTRT3 Block at slings.
FTRT4 Ninepin-block and bitts on forecastle.
ø Reef-tackles 19 mm; 2 single blocks L163 mm.

Buntlines (on forward side of sail)
FTBL1 Standing end to outer buntline-cringle.
FTBL2 Bull's-eye in inner buntline-cringle.
FTBL3 Buntline-block close to slings.
FTBL4 Block seized to topmast head-rigging.
FTBL5 Ninepin-block and bitts on forecastle.
ø Buntlines 19 mm; 2 buntline-blocks L163 mm; 2 single blocks L163 mm.

Clue-lines
FTCL1 Standing end to yard.
FTCL2 Block at clue of sail.
FTCL3 Quarter-block near standing end.
FTCL4 Block in rim of foretop.
FTCL5 Lead-block in spirketting, then to forecastle pin-rail.
ø Clue-lines 26 mm; 8 single blocks L217 mm.

Leech-lines (forward side of sail)
FTLL1 Standing end to middle bowline-cringle.
FTLL2 Bull's-eye at lower cringle on reef-band.
FTLL3 Quarter-block on yard.
FTLL4 Block on fore-topmast stay-collar.
FTLL5 Ninepin-block and bitts on forecastle.
ø Leech-lines 19 mm; 4 single blocks L163 mm.



MAINMAST

Maincourse: The sheets* are made fast at their standing end to an eyebolt fastened in the ship's side forward of the quarter-galleries and below the lower sill of the aftermost upper deck gunport. The running part leads forward along the ship's side and reeves through the largest of the three blocks at the clue of the sail, and returns aft to a lead-block with a long strap made fast to a second eyebolt above the first one, touching the forward edge of the quarter-galleries. The strap is served overall and turns in a thimble at its end, by means of which it is seized to the eyebolt.

*When running before the wind the tacks are not used, and seamen then talk of ***sailing betwixt two sheets***.

An iron bracket holds the block more or less horizontal (see Figs. 123 and 130 in Volume II).

The running part of the sheets reeves through this block, returns forward again, and after passing through an oblique hole lined with lead cut in the side athwart the poop breastwork, passes inboard and is belayed to the nearest kevel.

The tacks are made fast at their standing end to an eyebolt in the gunwale over the fourth upper deck gunport. Their running part reeves through the tack-block in the tack of the sail, returns forward to reeve through a block* fastened in the spirketting over the gangway more or less directly above the standing end and its eyebolt; the fall is then belayed to the kevel between the second and third guns on the forecastle.

*This arrangement dispenses with the chesstrees, which are a sort of fixed-block bolted to the side above the standing end; when chesstrees are fitted, the tack reeves through the sheave (which is parallel to the ship's side), then inboard over the top of the gunwale which is protected by a softwood bolster, and is belayed to a kevel on the forecastle. In this case, as with the alternative arrangement described opposite, the tacks are double.
Alternatively, the tack can be single, by dispensing with the tack-block at the tack of the sail: the tack is made fast at its standing end directly to the sail, and its hauling part is led through a hole in the ship's side situated half the length of the mainyard forward of midships; it is belayed to a kevel on the upper deck below the gangway. The hole was in earlier times decorated with a rosette or a lion mask.

Bowline-bridles: The bridles are composed of two spans rigged exactly like those of the fore-topsail.

Bowlines: The weather bowline reeves through a snatch-sheave fastened to the top of the beakhead bulkhead amidships and is belayed round a kevel in the way of the foremast. The lee bowline, which is idle, is let go and unrove, and made fast to the forecastle breastwork.

Reef-lines: Exactly like those of the forecourse; it is equally rare to reef the maincourse.

Buntlines: These may be rigged as I have described for the forecourse; however, there is an alternative way of rigging the buntlines to the courses, which I will describe here (it is illustrated in the inset drawing in Fig. 312 overleaf). The buntline is first made fast to the outer buntline-cringle near the clue, passes up the outer side of the sail to the yard and reeves through a buntline-block seized to the forward side of the yard vertically above the cringle in the foot of the sail. From there it reeves through a double block lashed to the trestletrees below the top, then through a *leg-and-fall block* on the fore side of the mast. Next the buntline doubles back on itself, reeves through the second sheave of the double block beneath the top, then through another block fastened to the yard outboard of the lower jeer-block, and finally down to the foot of the sail again, where it is fastened to the inner buntline-cringle.

leg-and-fall block: see note on p.111. [Trans.].

These constitute therefore the buntline-legs, and the buntline falls reeve through the second sheave of the leg-and-fall block. The falls are made fast at their standing end to the forecastle breastwork and the hauling part reeves through the leg-and-fall block, leads back down again to a lead-block lashed to the breastwork near its standing end, and is belayed round the same block*.

*Yet another arrangement exists for the buntlines: four lines are fastened to the cringles in the foot of the sail, pass up the outside of the sail and reeve through four blocks seized to the forward side of the yard over the cringles; from there they lead forward to two double blocks fastened beneath the foretop, and then are brought together to form the strop of a fiddle-block; the fall of this tackle reeves through a single block fastened to the forecastle breastwork (this variation applies only to the maincourse).

Clue-garnets: Rigged in exactly the same way as those of the forecourse. The hauling part reeves through a lead-block seized to an eyebolt in the quarterdeck spirketting, and is belayed to a shroud-cleat on the second shroud of the main lower mast.

Leech-lines: Rigged like those of the forecourse, save that it will be remembered that there are three bowline-cringles in the leech of the maincourse, as opposed to two for the forecourse. The leech-lines are made fast to the lower cringle, reeve through a bull's-eye in the middle cringle and then through a second in the upper cringle. They are belayed to a cleat nailed to the mainmast.

Earrings, reef-points: As for the forecourse.

Main-topsail: Sheets: identical to those of the fore-topsail; belayed at the main topsail-sheet bitts.

Bowline-bridles: These are rigged somewhat differently to those of the fore-topsail. Notably there are three spans or legs: the first reeves through a running thimble and is made fast at its ends to the top two bowline-cringles; the second also has a running thimble and is made fast to the two lower cringles. The third span turns in the two thimbles at its ends, but also reeves through a running thimble which is spliced into the end of the bowline.

Bowlines: They lead up to a block seized round the masthead of the foremast by a pendant, so that it hangs down below the top; from there they reeve through a second block lashed to the aftermost shroud of the foremast, near the bottom, and are then belayed to a pin in the forecastle pin-rail*.

Reef-tackles: The description which follows is an alternative used for both the fore- and main-topsail. The tackle described above becomes a *runner*, which runs up to finish a little way above the yardarm sheave, and has a thimble turned in its end which fits over the hook of a single hook-block; the falls have their standing end made fast round the head of the mast or to the topmast cap, reeve through the sheaves of a hook-block, then through a second block fastened at the masthead or the cap, and from there they lead down through the lubber's hole to reeve through one of the sheaves of the main topsail-sheet bitts, where they are also belayed. Sometimes the falls lead down through a hole in the after part of the decking of the top, reeve through a thimble in the after catharpins, then through a lead-block abaft the mast, and are belayed to a cleat.

*Alternatively, the main-topsail bowlines may be rigged as follows: the running part leads down to the foretop, reeves through a block seized to the after side of the mast, leads down through the lubber's hole, reeves through a lead-block seized to an eyebolt in the inboard side of the gunwale, and is finally belayed to a shroud-cleat on the aftermost shroud of the foremast.

Runner: "a thick rope used to increase the mechanical powers of a tackle". [Falconer, 1815 Burney ed.].

Buntlines: Rigged in exactly the same way as for the fore-topsail and belayed at the ninepin-bitts abaft the mainmast.

Clue-lines: As for the fore-topsail; the running part is taken down to a lead-block in the spirketting, and is belayed to one of the pins of the quarterdeck pin-rail.

Leech-lines: Similar to those of the fore-topsail, save that the main-topsail has four bowline-cringles. The leech-lines are made fast at their standing end to the second cringle above the clue and then lead up to the yard through a bull's-eye in the third cringle; from the yard they follow the same route as the fore-topsail leech-lines and down to one of the blocks of the ninepin-bitts abaft the mainmast, where they are also belayed.

Earrings, reef-points: Like those of the fore-topsail.

Main-topgallant: Sheets: rigged like those of the fore-topgallant; both sheets are belayed to shroud-cleats in the main-shrouds.

Bowline-bridles: Like those of the maincourse.

Bowlines: Lead forward to a block at the top of the aftermost fore-topmast shroud, then down through a hole in the decking of the foretop, reeve through a block seized to one of the fore-shrouds, and are belayed at a pin in the forecastle pin-rail.

Clue-lines: As with the fore-topgallant, the clue-lines are belayed to one of the pins of the quarterdeck pin-rail.

Fig. 312
RUNNING RIGGING TO THE SQUARE SAILS OF THE MAINMAST

MAINCOURSE

Sheets
MSH1 Standing end to eyebolt near quarter-galleries.
MSH2 Sheet-block at clue of sail.
MSH3 Block held by iron bracket in mizen-channels.
MSH4 Through hole in bulwarks.
MSH5 Kevel on quarterdeck.
ø Sheets 52 mm; 4 single blocks L352 mm.

Tacks
MTK1 Standing end to eyebolt above fourth upper deck gunport.
MTK2 Block at tack of sail.
MTK3 Lead-block in spirketting above gangway.
MTK4 Kevel on forecastle.
ø Tacks 41 mm; 4 single blocks L298 mm.

Bowlines & Bridles
MBW1 Span of 1st bridle to lower bowline-cringle.
MBW2 Other end to middle cringle.
MBW3 Span of 2nd bridle to upper cringle.
MBW4 Other end to thimble of 1st bridle.
MBW5 Bowline made fast to thimble of 2nd bridle.
MBW6 Snatch-sheave on beakhead bulkhead amidships.
MBW7 Kevel on forecastle.
ø Bowlines 36 mm; 1 snatch-sheave (serving both bowlines) L705 mm.

Buntlines (forward side of sail)
MBL1 Standing end to outer buntline-cringle near clue.
MBL2 Bull's-eye between outer and middle cringle.
MBL3 Bull's-eye in middle cringle.
MBL4 Buntline-block on yard above middle cringle.
MBL5 1st sheave of double block below maintop.
MBL6 Ninepin-blocks and bitts on quarterdeck.
MBL1' Standing end to inner buntline-cringle.
MBL2' Bull's-eye in middle of foot of sail.
MBL3' Block at slings of mainyard.
MBL4' 2nd sheave of double block below maintop.
MBL5' Ninepin-blocks and bitts on quarterdeck.
ø Buntlines 22 mm; 4 buntline-blocks L163 mm; 1 double block L271 mm.

Buntlines (alternative - see inset drawing)
1. Standing end to outer cringle.
2. Running part passes up forward side of sail.
3. Buntline-block over cringle.
4. 1st sheave of double block below maintop.
5. Leg-and-fall block.
6. 2nd sheave of double block.
7. Buntline-block above inner cringle.
8. Down forward side of sail.
9. End made fast to inner cringle.
10. Standing end of fall at forecastle breastwork.
11. Fall reeves through lower sheave of leg-and-fall block.
12. Hauling end belayed near standing end.

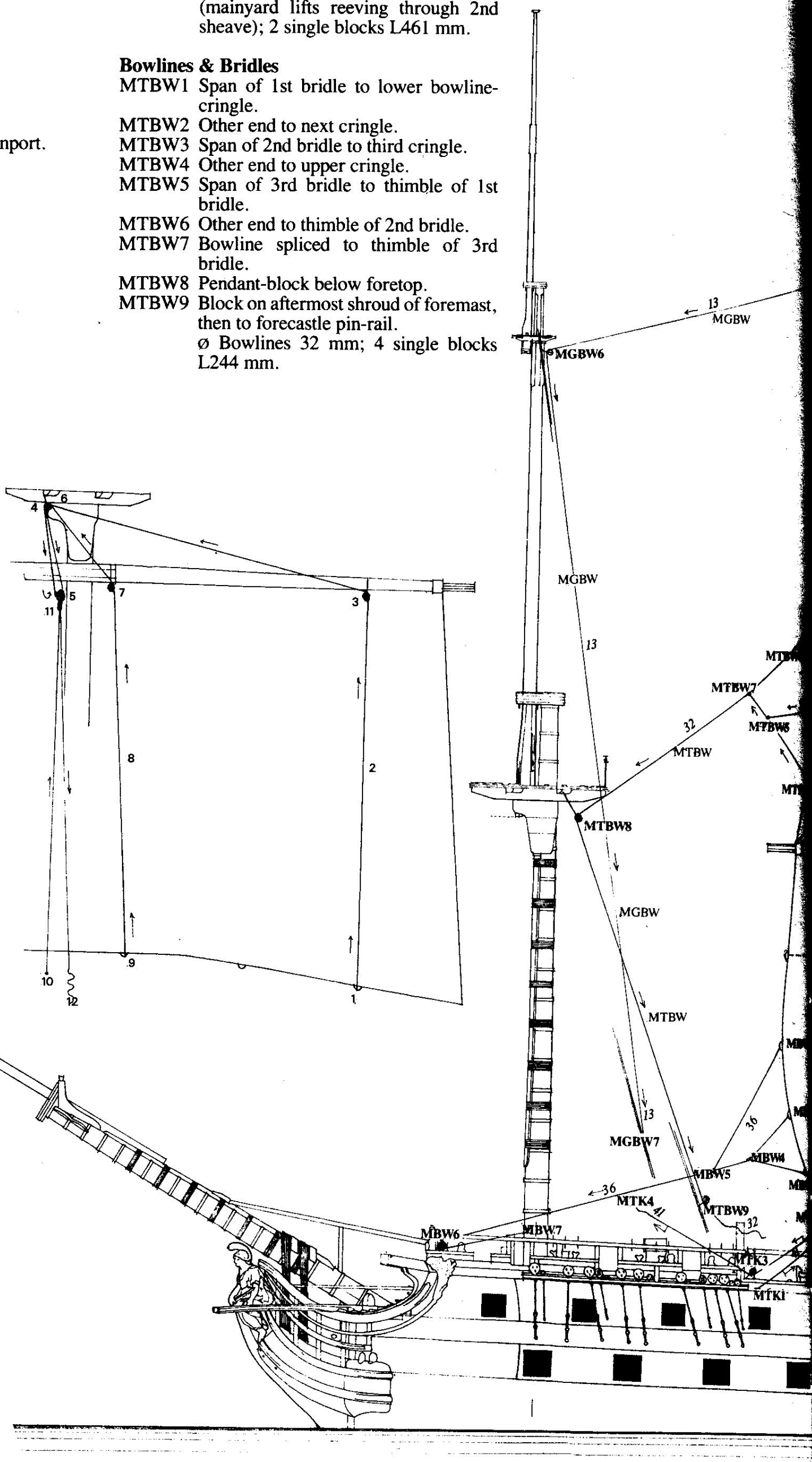
Clue-Garnets
MCG1 Standing end 1/3 in from yardarm.
MCG2 Clue-garnet block at clue of sail.
MCG3 Block on yard near standing end.
MCG4 Block on forward main-shroud.
MCG5 Lead-block in spirketting and belayed to shroud-cleat.
ø Clue-garnets 30 mm; 8 single blocks L244 mm.

Leech-lines
MLL1 Standing end to lower bowline-cringle.
MLL2 Through bull's-eyes in middle and upper cringles.
MLL3 Block 1/3 or 1/4 in from yardarm.
MLL4 Block below maintop.
MLL5 Lead-block at foot of mainmast - range-cleat.
ø Leech-lines 22 mm; 6 single blocks L190 mm.

MAIN-TOPSAIL

Sheets
MTSH1 Clue of the sail.
MTSH2 Shoe-block at yardarm.
MTSH3 Block at slings of mainyard.
MTSH4 Main topsail-sheet bitts.
ø Sheets 65 mm; 2 shoe-blocks (mainyard lifts reeving through 2nd sheave); 2 single blocks L461 mm.

Bowlines & Bridles
MTBW1 Span of 1st bridle to lower bowline-cringle.
MTBW2 Other end to next cringle.
MTBW3 Span of 2nd bridle to third cringle.
MTBW4 Other end to upper cringle.
MTBW5 Span of 3rd bridle to thimble of 1st bridle.
MTBW6 Other end to thimble of 2nd bridle.
MTBW7 Bowline spliced to thimble of 3rd bridle.
MTBW8 Pendant-block below foretop.
MTBW9 Block on aftermost shroud of foremast, then to forecastle pin-rail.
ø Bowlines 32 mm; 4 single blocks L244 mm.



Reef-tackles
MTRT1 Standing end to lower reef-cringle.
MTRT2 Yardarm sheave.
MTRT3 Block at slings.
MTRT4 Ninepin-block and bitts on quarterdeck.
ø Reef-tackles 19 mm; 2 single blocks L163 mm.

Buntlines
MTBL1 Standing end to outer buntline-cringle.
MTBL2 Bull's-eye at inner cringle.
MTBL3 Buntline-block below slings.
MTBL4 Block at topmast-head in topmast-shrouds.
MTBL5 Ninepin-blocks and bitts on quarterdeck.
ø Buntlines 22 mm; 2 buntline-blocks L190 mm; 2 single blocks L190 mm.

Clue-lines
MTCL1 Standing end 1/3 in from yardarm.
MTCL2 Block at clue of sail.
MTCL3 Block next to standing end.
MTCL4 Block in rim of maintop.
MTCL5 Lead-block in spirketting, then to quarterdeck pin-rail.
ø Clue-lines 28 mm; 8 single blocks L217 mm.

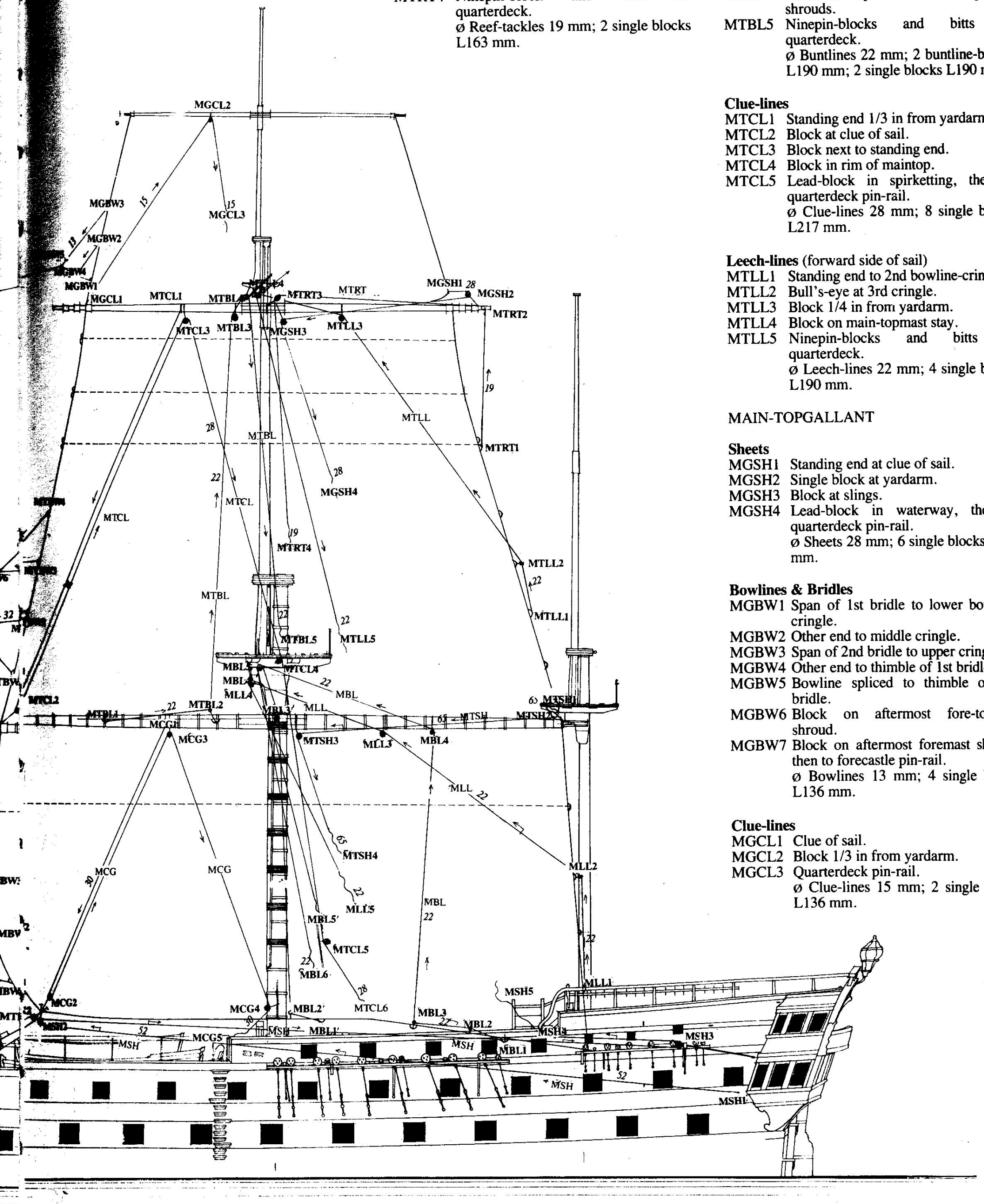
Leech-lines (forward side of sail)
MTLL1 Standing end to 2nd bowline-cringle.
MTLL2 Bull's-eye at 3rd cringle.
MTLL3 Block 1/4 in from yardarm.
MTLL4 Block on main-topmast stay.
MTLL5 Ninepin-blocks and bitts on quarterdeck.
ø Leech-lines 22 mm; 4 single blocks L190 mm.

MAIN-TOPGALLANT

Sheets
MGSH1 Standing end at clue of sail.
MGSH2 Single block at yardarm.
MGSH3 Block at slings.
MGSH4 Lead-block in waterway, then to quarterdeck pin-rail.
ø Sheets 28 mm; 6 single blocks L217 mm.

Bowlines & Bridles
MGBW1 Span of 1st bridle to lower bowline-cringle.
MGBW2 Other end to middle cringle.
MGBW3 Span of 2nd bridle to upper cringle.
MGBW4 Other end to thimble of 1st bridle.
MGBW5 Bowline spliced to thimble of 2nd bridle.
MGBW6 Block on aftermost fore-topmast shroud.
MGBW7 Block on aftermost foremast shroud, then to forecastle pin-rail.
ø Bowlines 13 mm; 4 single blocks L136 mm.

Clue-lines
MGCL1 Clue of sail.
MGCL2 Block 1/3 in from yardarm.
MGCL3 Quarterdeck pin-rail.
ø Clue-lines 15 mm; 2 single blocks L136 mm.



MIZEN-MAST

Mizen-Topsail: Sheets: reeve through a shoe-block at the yardarm; the hauling part reeves through a block seized at the slings of the yard and runs down the mast to be belayed to the mast-cleat on the mizen.

Bowline-bridles: Like those of the other topsails.

Bowlines: These are crossed, by which I mean that the bowline from the starboard leech of the topsail is taken to port and vice versa. Thus the port bowline reeves through a block fastened to the aftermost starboard shroud of the mainmast, near the catharpins, runs down the mast and is belayed at the quarterdeck pin-rail.

Reef-tackles: Like those of the other topsails, save that sometimes the fall or runner of the tackle cannot be led to the ninepin-blocks or bitts, in which case it runs down through the lubber's hole of the mizen-top, past the mizen-shrouds, reeves through a lead-block seized to an eyebolt in the spirketting over the poop and is belayed to a pin immediately above.

The standing part or leg of the tackle is made fast to the lower reef-cringle, and if only a single reef needs to be taken in, the leg is seized to the upper reef-cringle with a stopper or small length of rope, so that one or two reefs can be taken in at will. The same applies to the reef-tackles of the other topsails (up to three reefs).

Buntlines: These are rigged like those of the other topsails, but are belayed at the poop pin-rail.

Clue-lines: They are made fast at their standing end to the yard, at a distance from the slings equal to half the length of the top, and the running part leads down the after side of the sail, reeves through the clue-line block at the clue, and then leads up again to the yard where it reeves through a block seized next to the standing end; from there it reeves through another block at the hounds of the topmast, leads down again through the lubber's hole of the mizen-top, through a lead-block fastened to an eyebolt in the spirketting of the poop and is belayed to a pin in the poop pin-rail.

Leech-lines: Rigged like those of the other topsails and belayed to the mast-cleats nailed to the mizen.

Mizen-topgallant: Sheets: these are formed by the lifts of the mizen topsail-yard; each sheet or lift is made fast at the clue by means of a toggle, reeves through a single block at the yardarm, then through a double block at the hounds of the topmast (the second sheave of this block serves the reef-tackles); from there they lead down to the poop where they are belayed to a belaying-pin abreast the fourth mizen-shroud.

Bowline-bridles: Like those of the other topgallants.

Bowlines: Cross over, reeve through blocks lashed to the aftermost main-topmast shrouds, then lead down through holes in the decking of the maintop to the quarterdeck pin-rail, where they are belayed.

Clue-lines: Like those of the mizen-topsail, they are belayed at the poop pin-rail.

Mizen-course*: Sheets: the clue has a thimble turned in it to take the hook of a block used to sheet the sail in, and the rope referred to as the sheets is made fast at its standing end to the strap of another block at the stern, fastened to the step of the ensign-staff. The sheets reeve back and forth through the sheaves of these two blocks and the hauling end is belayed to a cleat nailed near the ensign-staff.

*Rather than "isolate" the mizen-course, I have preferred to treat it here, despite the fact that it is not a square sail; and in any case it is bent to a yard like the square sails and rigged somewhat similarly.

Tack: This is fixed, and takes the form of a lashing passed through a thimble at the tack of the sail and round the mizen-mast; the lashing is then secured by a number of frapping turns taken over between the thimble and the mast.

Above the tack a lacing is clapped on, running from the tack to the throat through cringles on the *mast-leech* of the sail. The rope forming the lacing is made fast at one end at the throat-cringle, passes round and round the mast and through the other leech-cringles before being made fast at the tack-cringle.

Mast-leech: the fore leech.

Brails: These are rigged to either side of the sail. There is one *throat-brail* (made fast to the lowest cringle in the after leech), three *middle-brails*, and one *peak-brail* at the upper or peak-cringle, making ten brails in all (taking the two sides together). The peak-brail leads diagonally up to the yard where it reeves through a block, then down again to the poop where it is belayed at the pin-rail; the same applies to the upper of the three middle-brails, save that often the running part, after reeving through its own block on the yard, is made fast to the first brail. Thus only one brail is belayed at the poop pin-rail, and this is referred to as "crow-footing"* the brails.

Throat-brail
Middle-brail ***Peak-brail***

*Fr: gréé en patte d'oie.

The other two middle-brails lead up diagonally to two more blocks on the yard, then reeve through two of the sheaves of a threefold block which is also lashed to the yard, and are then belayed to a mast-cleat on the mizen. Finally, the throat-brail reeves directly through the third sheave of the threefold block and down to the mast-cleat.

A *tricing-line* is rigged to the lower part of the mizen-course to permit the clue to be hauled up. A span is rove through the sheave of a block and made fast to the foot and to the after leech of the sail. The tricing-line is spliced round the strap of the block, led up to a second block seized to the yard close to the parrel, then down again to a cleat where it is belayed.

Tricing-line: any line used to haul up a tackle (or yard) to keep it out of the way.

Earrings: The arrangement is similar to that of the square sails, the only difference being that the yard is canted to 45 or 50 degrees instead of being horizontal, and there are thus two eyelets in the upper corner of the sail, with two head earrings, one in the leech-rope and the other in the head-rope, made fast round the stop-cleat at the small or peak of the yard.

That concludes this close-packed and perhaps at times boring description of the rigging to the square sails. If you rebel at the details, try to remember at least the general principles governing all these lines, which I explained briefly at the beginning of this section. Note also that it is amidships and at the foot of the masts or close by that the following lines are belayed: the topsail-sheets (at the topsail-sheet bitts); the leech-lines of the courses (to mast-cleats); the topsail leech-lines and buntlines, and the buntlines of the courses, are belayed at the ninepin-bitts; in the case of the mizen, most of the mizen-brails, the leech-lines and the topsail-sheets are all belayed to mast-cleats nailed to the mast.

All the other lines are belayed along the bulwarks, with the belaying-points of the bowlines being a long way forward of their respective sails in order to improve their mechanical advantage.

The rigging to the two square sails on the bowsprit is belayed at the beakhead bulkhead.

And, as I have already noted, a large number of variations in detail may arise, of which I have described a certain number (wherever possible in the margin, the main body of the text being complicated enough already); but these variations do not diverge in any way from the basic principles.

With the help of the double-page schematic drawings listing the run of the the rigging for each sail in turn, I hope that you will succeed in overcoming the inevitable difficulties posed by these items of rigging.

Fig. 313
RIGGING TO THE SQUARE SAILS OF THE MIZEN
(including the course)

MIZEN-TOPSAIL

Sheets
ZTSH1 Standing end to clue.
ZTSH2 Block at yardarm.
ZTSH3 Block at slings.
ZTSH4 Mast-cleat on mizen.
ø Sheets 32 mm; 4 single blocks L 244 mm.

Bowlines* and Bridles
ZTBW1 Span of 1st bridle to lower bowline-cringle.
ZTBW2 Span of 2nd bridle to middle cringle.
ZTBW3 Other end of 2nd bridle to upper cringle.
TBW4 Other end of 1st bridle to thimble of 2nd bridle.
ZTBW5 Bowline to thimble of 1st bridle.
ZTBW6 Block on aftermost main-shroud.
ZTBW7 Pin in quarterdeck pin-rail.
ø Bowlines 15 mm; 2 single blocks L 136 mm.

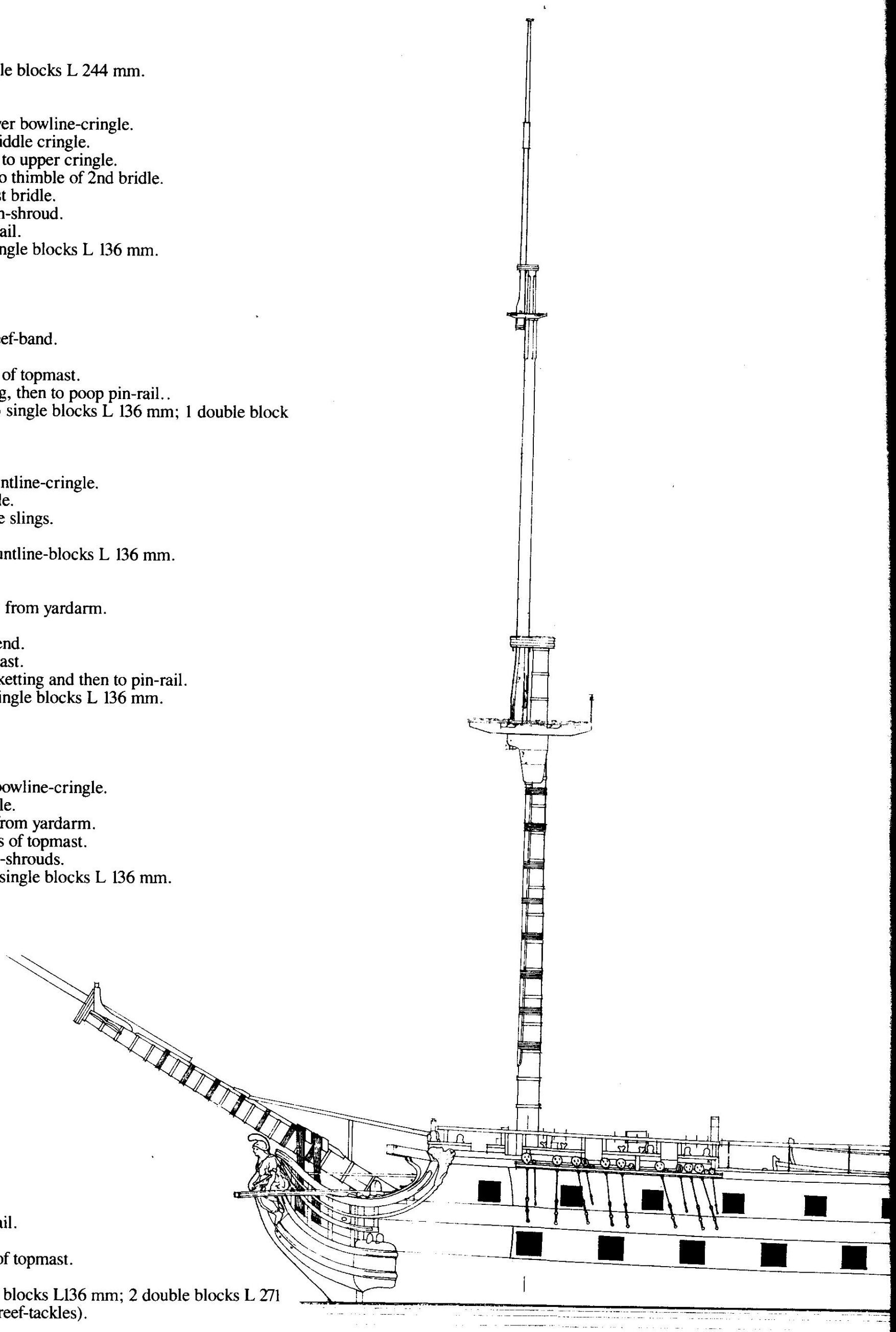
*The bowlines cross over.

Reef-tackles
ZTRT1 Standing end to lower reef-band.
ZTRT2 Yardarm sheave.
ZTRT3 Double block at hounds of topmast.
ZTRT4 Lead-block in spirketting, then to poop pin-rail..
ø Reef-tackles 13 mm; 3 single blocks L 136 mm; 1 double block L 271 mm.

Buntlines
ZTBL1 Standing end to outer buntline-cringle.
ZTBL2 Bull's-eye in inner cringle.
ZTBL3 Buntline-block below the slings.
ZTBL4 Poop pin-rail.
ø Buntlines 15 mm; 2 buntline-blocks L 136 mm.

Clue-lines
ZTCL1 Standing end half-way in from yardarm.
ZTCL2 Clue-line block at clue.
ZTCL3 Block close to standing end.
ZTCL4 Block at hounds of topmast.
ZTCL5 Lead-block in poop spirketting and then to pin-rail.
ø Clue-lines 17 mm; 8 single blocks L 136 mm.

Leech-lines (forward side of sail)
ZTLL1 Standing end to middle bowline-cringle.
ZTLL2 Bull's-eye in upper cringle.
ZTLL3 Block 1/3 or 1/2 way in from yardarm.
ZTLL4 Block strapped to hounds of topmast.
ZTLL5 To shroud-cleat in mizen-shrouds.
ø Leech-lines 15 mm; 4 single blocks L 136 mm.



MIZEN-TOPGALLANT

Sheets
ZGSH1 Standing end to clue of sail.
ZGSH2 Single block at yardarm.
ZGSH3 Double block at hounds of topmast.
ZGSH4 To poop pin-rail.
ø Sheets 17 mm; 2 single blocks L136 mm; 2 double blocks L 271 mm (shared with topsail reef-tackles).

Bowlines* and Bridles

ZGBW1 Span of 1st bridle to lower bowline-cringle.
ZGBW2 Other end to middle cringle.
ZGBW3 Span of 2nd bridle to upper cringle.
ZGBW4 Other end to thimble of 1st bridle and bowline to thimble of 2nd bridle.
ZGBW5 Block on aftermost main topmast-shroud.
ZGBW6 Pin in quarterdeck pin-rail.
ø Bowlines 13 mm; 2 single blocks L 136 mm.

*The bowlines cross over.

Clue-lines

ZGCL1 Standing end to clue of sail.
ZGCL2 Block 1/3 in from yardarm.
ZGCL3 To pin in poop pin-rail.
ø Clue-lines 13 mm; 2 single blocks L 136 mm.

MIZEN-COURSE

Sheets

ZSH1 Standing end round block in ensign-staff step.
ZSH2 Reeves through block at clue.
ZSH3 Through block in ensign-staff step and then to cleat nearby.
ø Sheets 24 mm; 2 single blocks L 190 mm.

Brails

ZBR1 Standing end of peak-brail to peak-cringle.
ZBR2 Block on yard.
ZBR3 Standing end of upper middle-brail to 4th leech-cringle.
ZBR4 Block on yard.
ZBR5 Upper middle-brail to peak-brail (crow's-foot).
ZBR6 Hauling end of peak-brail to poop pin-rail.
ZBR7 Standing end of 2nd middle-brail to 3rd leech-cringle.
ZBR8 Block on yard.
ZBR9 Standing end of lower middle-brail to 2nd leech-cringle.
ZBR10 Block on yard.
ZBR11 Standing end of throat-brail to lower leech-cringle.
ZBR12 Threefold block for three lower brails.
ZBR13 Mast-cleat on mizen.
ø Brails 15 mm; 8 single blocks L 136 mm; 2 treble blocks L 271 mm.

Tricing-lines

ZTL1 Span to foot of sail.
ZTL2 Other end to after leech.
ZTL3 Standing end of tricing-line to block in span.
ZTL4 Block next to parrel.
ZTL5 To cleat.
ø Tricing-lines 17 mm; 4 single blocks L 136 mm.

STUDDINGSAILS (see Fig. 314).

These "extra" sails are hoisted by means of one or two halliards (depending on the sail) rigged to the studdingsail-booms. Other lines are made fast at the lower corners of the sails, the outer clue taking the tack and the inner clue the sheet. However, it should be noted that in fact the distinction between tack and sheet does not apply as for the courses, the tack being in effect simply a second sheet.

Set flying: i.e. not bent to a yard.

Lower fore studdingsails: As a rule these are *set flying*, although there are exceptions; I have however adopted the more usual arrangement. A halliard is made fast to each of the two upper corners of the sail, and the *outer-halliard* reeves through a block seized to the outboard end of the fore-topmast studdingsail-boom, then leads up to a block in a pendant seized to the fore-topmast head, down again through the lubber's hole of the foretop, and is belayed to a mast-cleat on the foremast. The *inner-halliard* reeves through a block lashed under the foreyard a few feet inboard of the stop-cleats. From there it reeves through another block lashed to the yard near the lower jeer-blocks, and leads down to a mast-cleat on the foremast where it is belayed.

Outer-halliard.

Inner-halliard.

The tack reeves through a block at the outboard end of the lower fore studdingsail-boom, then leads right aft to the fixed-block through which the foretack reeves, and is belayed to a shroud-cleat on one of the main lower shrouds.

The sheet is middled and the bight bent to the inner clue, the hauling ends being belayed to one of the pins of the forecastle pin-rail.

The lower fore studdingsail-boom (see page 39) is made fast to the forecastle by means of a number of lashings. Its outboard end is supported by a *topping-lift*; the topping-lift takes the form of a hook-tackle, the pendant of which is made fast to the foremast head. The hook-block is hooked through a thimble turned in to a strop clinched round the boom a third of the way outboard.

Topping-lift.

Jewel-block: small blocks fastened at the fore- and main-topsail yardarms; there were usually two on English ships-of-war.

Fore-topmast studdingsails: They are bent to a small yard, to the middle of which is fastened a single halliard which reeves through a block called a *jewel-block* at the topsail yardarm, then through a second block lashed to the yard near the bollock-blocks; from there it passes down through the lubber's hole of the foretop, reeves through a lead-block at the foot of the foremast, and is belayed to the mast-cleat.

The tack reeves through a block at the outboard end of the topmast studdingsail-boom and is belayed in the foretop.

The sheet reeves through a block lashed to the foreyard a few feet in from the yardarm, and leads inboard to the foretop where it is belayed in the topmast-shrouds*.

*If no topgallant studdingsails are set, which is frequently the case, the topmast studdingsails are often set flying, merely being spread by the topgallant studdingsail-booms like the lower fore studdingsails from the topmast studdingsail-booms. The halliards then lead up to the topmast-cap and are belayed in the foretop.

Fore-topgallant studdingsails: The halliard used to hoist their small yards reeves through a block made fast to the end of the topgallant-yard and then leads down to the foretop where it is belayed.

The tack reeves through a block at the outboard end of the topgallant studdingsail-boom and then leads down to the foretop where it is belayed.

The sheet reeves through a block some way in from the yardarm and then also leads to the foretop where it is belayed.

Lower main studdingsails: These may be bent either to a full yard or to a half yard. In the latter case, the yard spreads the inner half of the head of the sail, and an inner-halliard is made fast to the middle of the yard, reeves through a block lashed to the mainyard arm, then through a second block beneath the yard next to the topsail-sheet block (see Fig. 312), and is belayed to the mainmast mast-cleat.

An outer-halliard is needed to hoist the outer half of the head of the sail to the main-topmast studdingsail-boom. The outer-halliard is made fast to the eyelet in the outer corner of the head of the sail, reeves through a block at the end of the boom, then leads up to a single pendant-block made fast round the head of the main-topmast, down again through the lubber's hole of the maintop, and is belayed to the mainmast mast-cleat. This method of spreading the head of the lower main studdingsail may also be used for the lower fore studdingsail, just as that described for the fore can apply to the main.

A swinging-boom serves to spread the foot of the lower main studdingsail, the inboard end of which is fitted with an iron gooseneck which hooks into a sort of eye at the end of a long iron strap at the forward end of the main-channels (see Vol. II, p. 32).

The tack of the studdingsail reeves through a block made fast at the outboard end of the swinging-boom, and then leads aft to just forward of the mizen-shrouds where it reeves through a double block on the poop planksheer; it is belayed to a shroud-cleat in the mizen-shrouds.

Fore guy.
After guy.

The swinging-boom is stayed by two guys; the *fore guy* is made fast to a timberhead abaft the fore-shrouds, while the *after guy* reeves through the second sheave of the block which takes the tack of the studdingsail; it is belayed on the poop at a shroud-cleat in the mizen-shrouds. It is frequently necessary to raise the outboard end of the swinging-boom, and this is done by means of a topping-lift, in this case a single whip made fast round the truck of the boom and rove through a block seized to an eyebolt in the mainmast cap; from there it runs down to the foot of the mast where it is belayed.

The sheets are middled and the bight made fast to the inner clue of the sail; the two legs then lead respectively fore and aft to the forecastle and quarterdeck, and are belayed to the most convenient belaying-pin.

Main-topmast studdingsails: These are rigged in the same way as those of the fore-topmast save that the tack reeves through one of the sheaves of a double block on the poop planksheer next to the taffarel; it is then belayed to a cleat nearby*.

*Sometimes the main-topmast studdingsails are rigged "English fashion": they have two bowline-cringles and a double bowline bridle; the bowline is hauled taut and belayed in the foretop.

Main-topgallant studdingsails: These are rigged exactly like the fore-topgallant studdingsails.

Mizen-topgallant studdingsails: The halliard for hoisting their small yard reeves through a block at the topsail yardarm, then through a single block seized at the slings of the yard, down through the lubber's hole of the mizen-top, and is belayed to a pin in the poop pin-rail.

The tack reeves through the block seized to the outboard end of the boom, leads down to the double block at the taffarel where it reeves through the second sheave (the first serving the tack of the main-topmast studdingsail), and is belayed to a cleat nailed inside the bulwarks.

The sheet is rigged like those of the other topmast studdingsails and is thus belayed in the mizen-top.

To conclude these two pages devoted to the studdingsails I should add that when the wind is not favourable, or is too strong to allow the studdingsails to be set, their tacks and halliards are unhitched. The freed end of the halliard is then belayed to a shroud-cleat in the lower or topmast-shrouds, while the tacks are coiled either at the yardarm or at the slings, the coil being made fast with lashings of spun-yarn. The booms are brought in*, the studdingsails and their yards sent down, and the halliards unrove.

*The opposite manoeuvre is called ***to launch out*** the studdingsail-booms.

Studdingsail down-hauler.

The topmast studdingsails are rigged with a *downhauler* which allows them to be lowered to the booms and secured.

As I have already stated the studdingsails are set fairly rarely, and when they are set, in the case of ships-of-the-line, they are limited to the lower fore and to the topmast studdingsails. With vessels such as frigates, their commanders are often required to clap on all sail whenever the wind and the point of sailing allows, setting great pyramids of sails whose beauty is all the more appreciated in that the whole crew must be employed in their setting.

Fig. 314
RIGGING TO THE STUDDINGSAILS

LOWER FORE STUDDINGSAILS

Halliards

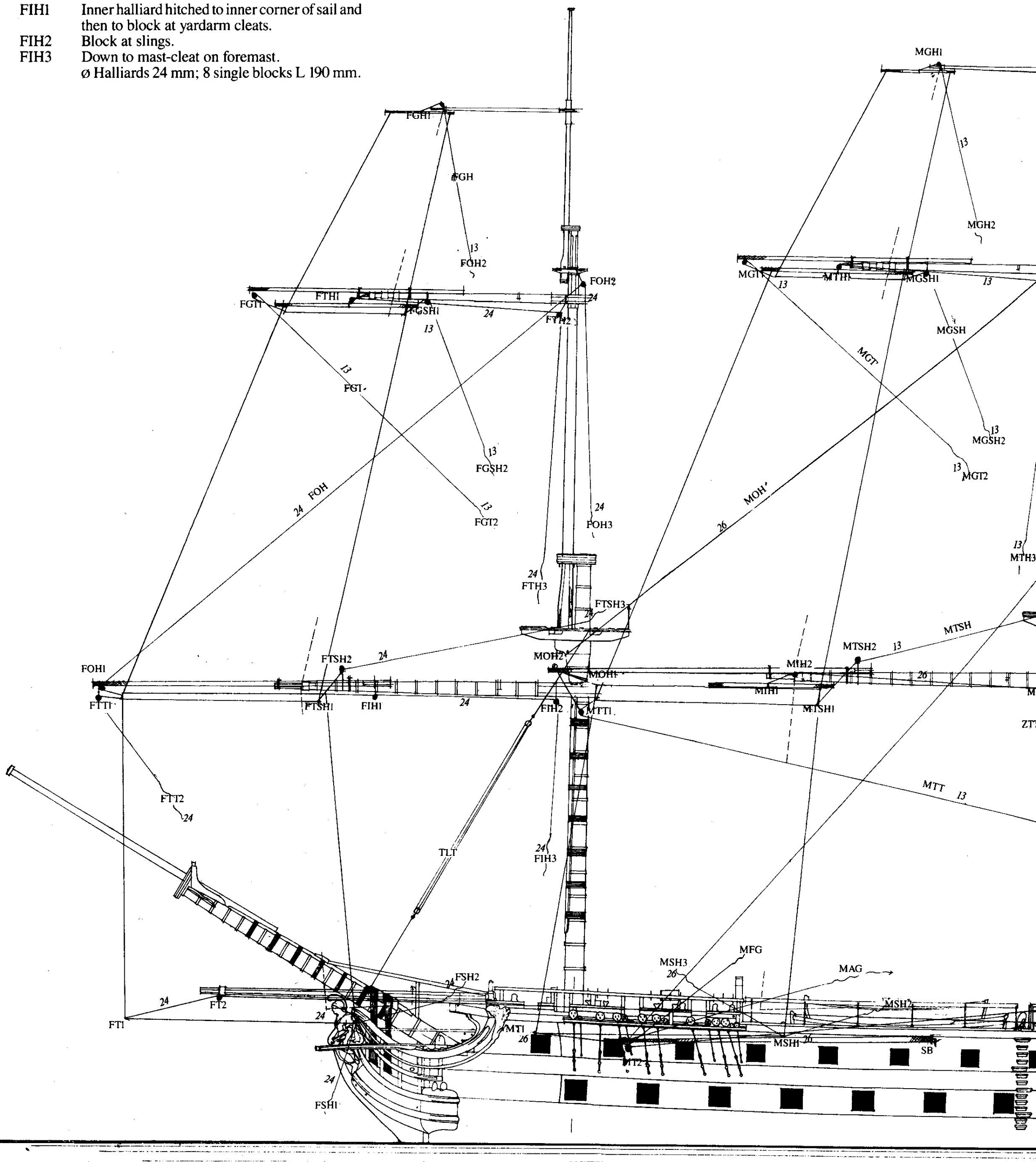
FOH1 Outer-halliard hitched to outer corner of sail and block at end of boom.
FOH2 Block at fore-topmast head.
FOH3 Down to mast-cleat on foremast.
FIH1 Inner halliard hitched to inner corner of sail and then to block at yardarm cleats.
FIH2 Block at slings.
FIH3 Down to mast-cleat on foremast.
ø Halliards 24 mm; 8 single blocks L 190 mm.

Tacks

FT1 Standing end to outer clue.
FT2 Block on boom (and grommet for topping-lift).
FT3 Through fixed-block and then to shroud-cleat in main-shrouds.
TLT Topping-lift tackle.
ø Tacks 24 mm; 2 single blocks L 190 mm.

Sheets

FSH1 Sheet middled and bight to inner c
FSH2 Hauling ends to forecastle pin-rail
ø Sheets 24 mm.



FORE-TOPMAST STUDDINGSAILS

Halliards

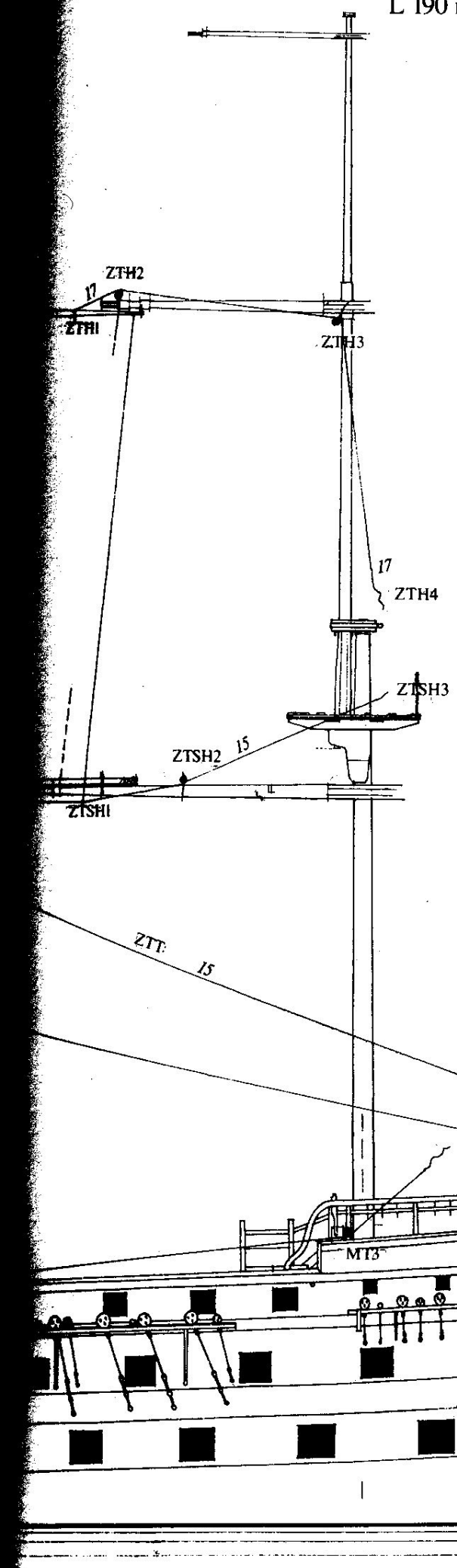
FTH1 From middle of studdingsail-yard to jewel- block at topsail yardarm
FTH2 Block below slings of topsail-yard.
FTH3 Down to mast-cleat on foremast.
ø Halliards 24 mm; 4 single blocks L 190 mm.

Tacks

FTT1 Hitched to outer clue and then through block on pendant at end of boom - 1 grommet.
FTT2 Belayed in foretop.
ø Tacks 24 mm; 2 single blocks

Sheets

FTSH1 Hitched to inner clue.
FTSH2 Block near yardarm cleats.
FTSH3 Belayed in foretop.
ø Sheets 24 mm; 2 single blocks L 190 mm.



FORE-TOPGALLANT STUDDINGSAILS

Halliards

FGH1 Hitched to middle of yard then through block at end of topgallant-yard - 1 grommet.
FGH2 Belayed in foretop.
ø Halliards 13 mm; 2 single blocks L 136 mm.

Tacks

FGT1 Hitched to outer clue and then through block at end of boom.
FGT2 Belayed in foretop.
ø Tacks 13 mm; 2 single blocks L 136 mm.

Sheets

FGSH1 Hitched to inner clue and then through block at yardarm cleats.
FGSH2 Belayed in foretop.
ø Sheets 13 mm; 2 single blocks L 136 mm.

LOWER MAIN STUDDINGSAILS

Halliards

MIH1 Inner-halliard hitched to middle of studdingsail-yard.
MIH2 Block at mainyard arm.
MIH3 Block beneath yard at slings.
MIH4 Down to mast-cleat on mainmast.
MOH1 Outer-halliard hitched to outer corner of sail.
MOH2 Block at end of topmast studdingsail-boom.
MOH3 Block at topmast head.
MOH4 Down to mast-cleat on mainmast.
ø Halliards 26 mm; 8 single blocks L 217 mm.

Tacks

MT1 Hitched to outer clue.
MT2 Block at end of swinging-boom*.
MT3 1st sheave of double block on poop plankshеer, belayed to shroud-cleat in mizen-shrouds.
MFG Fore guy to timberhead abaft fore-shrouds.
MAG After guy to 2nd sheave of double block, then to shroud-cleat.
ø Tacks 26 mm; 2 single blocks; 2 double blocks L217 mm.

Sheets

MSH1 Middled, and bight to inner clue.
MSH2 To quarterdeck pin-rail.
MSH3 To forecastle pin-rail.
ø Sheets 26 mm.

*The position of the swinging-boom is somewhat theoretical, since as we have seen its gooseneck is hooked in the main-channels.

MAIN-TOPMAST STUDDINGSAILS

Halliards

MTH1 Hitched to middle of yard and through jewel-block at main-topsail yardarm.
MTH2 Block at slings of main topsail-yard.
MTH3 Down to range-cleat on mainmast.
ø Halliards 26 mm; 4 single blocks L 217 mm.

Tacks

MTT1 Hitched to outer clue and rove through block at end of topmast studdingsail-boom.
MTT2 Double block at taffarel.
MTT3 Cleat inside bulwarks.
ø Tacks 26 mm; 2 single blocks L 217 mm; 2 double blocks shared by tack of mizen-topmast studdingsails L 217 mm.

Sheets

MTSH1 Hitched to inner clue.
MTSH2 Block on yard near cleats.
MTSH3 Belayed in maintop.
ø Sheets 26 mm; 2 single blocks L 217 mm.

MAIN-TOPGALLANT STUDDINGSAILS

Halliards

MGH1 Hitched to middle of studdingsail-yard and rove through block at topgallant yardarm.
MGH2 Belayed in maintop.
ø Halliards 13 mm; 2 single blocks L 136 mm.

Tacks

MGT1 Hitched to outer clue and rove through block at end of boom.
MGT2 Belayed in maintop.
ø Tacks 13 mm; 2 single blocks L 136 mm.

Sheets

MGSH1 Hitched to inner clue and rove through block inboard of yardarm cleats.
MGSH2 Belayed in maintop.
ø Sheets 13 mm; 2 single blocks L 136 mm.

MIZEN-TOPMAST STUDDINGSAILS

Halliards

ZTH1 Hitched to middle of studdingsail-yard.
ZTH2 Block at mizen-topsail yardarm.
ZTH3 Block at mizen topsail-yard slings.
ZTH4 Down to poop pin-rail.
ø Halliards 17 mm; 4 single blocks L 136 mm.

Tacks

ZTT1 Hitched to outer clue and rove through block at end of boom.
ZTT2 Double block at taffarel (shared with tack of main-topmast studdingsail).
ZTT3 Cleat inside bulwarks.
ø Tacks 15 mm; 2 single blocks L 136 mm.

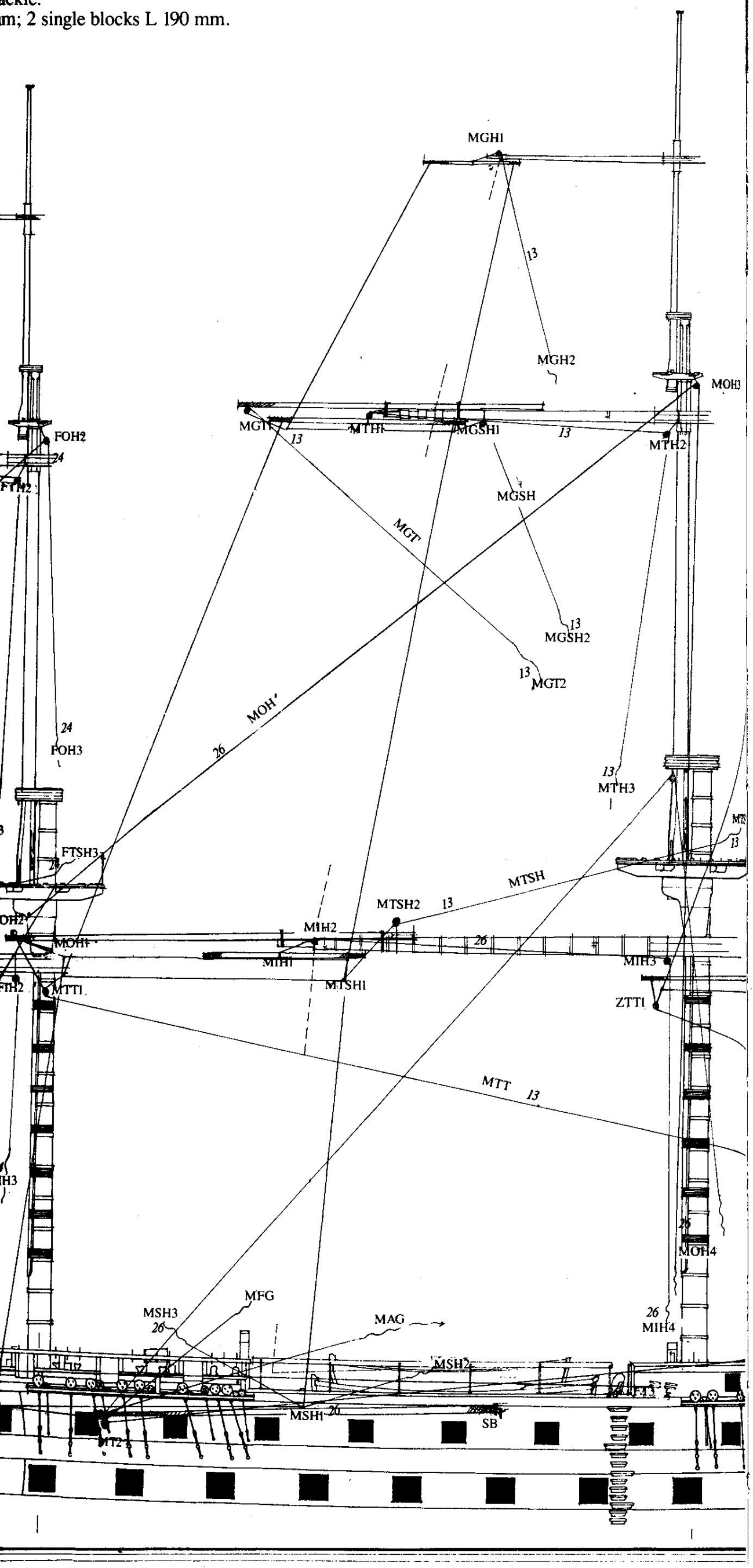
Sheets

ZTSH1 Hitched to inner clue.
ZTSH2 Block on crossjack-yard.
ZTSH3 Belayed in mizen-top.
ø Sheets 15 mm; 2 single blocks L 136 mm.

to outer clue.
m (and grommet for topping-lift).
d-block and then to shroud-cleat
ads.
ackle.
m; 2 single blocks L 190 mm.

Sheets

FSH1 Sheet middled and bight to inner clue.
FSH2 Hauling ends to forecastle pin-rail.
ø Sheets 24 mm.



FORE-TOPMAST STUDDINGSAILS

Halliards

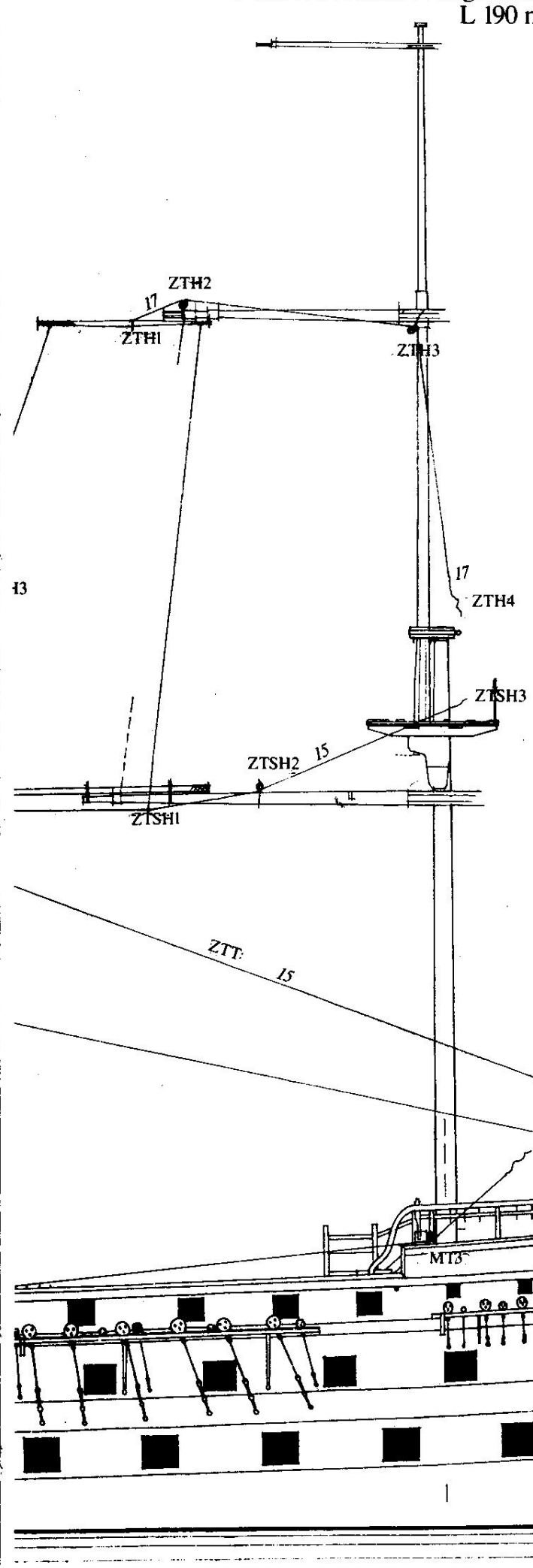
FTH1 From middle of studdingsail-yard to jewel- block at topsail yardarm
FTH2 Block below slings of topsail-yard.
TH3 Down to mast-cleat on foremast.
ø Halliards 24 mm; 4 single blocks L 190 mm.

Tacks

FTT1 Hitched to outer clue and then through block on pendant at end of boom - 1 grommet.
FTT2 Belayed in foretop.
ø Tacks 24 mm; 2 single blocks

Sheets

FTSH1 Hitched to inner clue.
FTSH2 Block near yardarm cleats.
FTSH3 Belayed in foretop.
ø Sheets 24 mm; 2 single blocks L 190 mm.



FORE-TOPGALL

Halliards

FGH1 Hitched
end of
FGH2 Belayed
ø Halli

Tacks

FGT1 Hitched
end of
FGT2 Belayed
ø Tacks

Sheets

FGSH1 Hitched
yardarm
FGSH2 Belayed
ø Sheet

LOWER MAIN S

Halliards

MIH1 Inner-h
studdin
MIH2 Block a
MIH3 Block b
MIH4 Down t
MOH1 Outer-h
MOH2 Block a
MOH3 Block a
MOH4 Down t
ø Halli

Tacks

MT1 Hitched
MT2 Block a
MT3 1st shea
belayed
MFG Fore gu
MAG After g
to shro
ø Tack
blocks

Sheets

MSH1 Middle
MSH2 To qua
MSH3 To fore
ø Shee

*The position o
theoretical, since
in the main-chann

Fore-and-aft sails

Hanks: pieces of metal (sometimes wood) bent to the shape of a Greek omega. Sometimes made of rope, in which case they are plain rings like grommets.

Staysail down-hauler.

These sails are not bent to yards but to stays, by means of rings or *hanks*; these stays are part of the standing rigging, and are either the stays of the masts or special stays running parallel to them. A halliard is made fast to the peak of the sail to haul it up, and once the halliard has been let go the sail comes down by its own weight, assisted by a *down-hauler*. The tacks (whether single or double) serve to hold the sail in place, while the sheets (which may also be single or double) serve to haul the clue of the sail aft, to one side or the other.

The fore-and-aft sails are generally lowered before being furled, which simplifies their rigging, already considerably reduced by comparison with the square sails.

HEAD-SAILS

Jibstay.

Out-hauler: not to be confused with the down-haulers, its role being in effect the opposite.

In-hauler.

Standing jib: The standing jib is bent to a *jibstay* which runs parallel to the fore topgallant-stay. The lower end is made fast to one of the rings of the iron traveller (see p. 116). The traveller moves along the jibboom, being hauled up by an *out-hauler* which turns in a thimble at its end, the thimble fitting over the hook of the traveller. The out-hauler reeves through a small sheave in the truck of the jibboom, then back down through one of the sheaves of the bowsprit rack-blocks, and finally leads to one of the beakhead bulkhead stanchions where it is belayed. To lower the traveller down the jibboom, an *in-hauler* is made fast to one of its rings and led directly to the beakhead bulkhead, where it is belayed. The movement of the traveller is made easier by small trucks on its lower circumference. The stay reeves through the hanks of the jib, leads up to the head of the fore-topmast where it reeves through a cheek-block lashed to the port side of the masthead. From there it leads down to the foretop where it is bowsed taut by means of a tackle and made fast.

Peak: the upper corner of a triangular sail.

The standing jib is hoisted by means of a halliard hitched to the *peak*, and the halliard reeves through a second cheek-block on the starboard side of the topmast head. From there it leads down abaft the foremast, reeves through one of the ninepin-blocks, and is belayed to one of the pins in the bitts.

Tack: the fore lower corner of a triangular sail, as well as the rope used to make it fast. In trapezoidal sails there is an ***upper*** and a ***lower tack***, although the upper tack is also called the ***rock***.

Clue: the after lower corner of a triangular sail.

The *tack* is seized to a ring on the traveller.

The sheets are double, being middled with the bight hitched to the *clue*, so that there are two legs of equal length allowing the sail to be hauled out to starboard or to port by reeving the sheet through a block lashed to the bulwarks inboard and forward of the fore-shrouds; it is then belayed to the timberhead abaft the cathead timber which serves the anchor-stopper, or else to the timberhead of one of the beakhead bulkhead stanchions.

A down-hauler is hitched to the peak of the sail, reeves through the hanks, then through a single block seized to the traveller, and leads aft to the beakhead bulkhead; the down-hauler allows the jib to be lowered more easily down its stay.

Inner jib: The inner jib differs from the other head-sails in that it is not bent to a stay but set flying. It is set by means of its halliard, which leads up to the head of the fore-topmast and reeves through a cheek-block on the port side (in fact, the second sheave of the cheek-block serving the jibstay of the standing jib); from there it leads down again to the ninepin-bitts, reeves through a block and is belayed.

The tack is made fast to a traveller, this time not iron but of rope, and also furnished with trucks; the traveller runs on the jibboom and has an out-hauler which reeves through a sheave in the truck of the jibboom, and then leads aft again through one of the sheaves of the rack-blocks to the beakhead bulkhead, where it is belayed.

The sheets are double and are rigged like those of the standing jib; I should add that the lead-blocks are lashed to eyebolts in the spirketting, and the hauling ends are belayed to range-cleats near the lead-blocks.

Fore topmast-staysail: The fore topmast-staysail is bent to the fore-topmast preventer-stay, so that the preventer-stay is rigged below the stay, as will be clear from my drawings.

I repeat that the hanks of the head-sails are fashioned so that they can be opened, the closure being formed by a seizing of thin line.

The halliard is hitched to the peak, leads up to the fore-topmast head, reeves through a cheek-block on the starboard side, then through one of the ninepin-blocks, and is belayed to a nearby cleat*.

The tack is made fast to an eyebolt on the jackstaff-standard forward of the bees.

The sheets are double, like those of the other head-sails.

As with the standing jib, there is a down-hauler, the lead-block of which is made fast to the clue.

*Alternatively, the halliards of the head-sails may lead down the fore-topmast and the fore lower mast, reeve through a lead-block at the foot of the foremast and be belayed to a cleat nailed to the deck-planking; or else belay at the beakhead bulkhead like the braces of the spritsail and the fore-topgallant.

Fig. 315
RIGGING TO THE HEAD-SAILS

STANDING JIB

Stay
SJST1 Lower end to traveller.
SJST2 Cheek-block on fore-topmast (port side).
SJST3 Down to foretop and tackle.
øStay 39 mm; 1 double cheek-block (shared with inner jib halliard).

Halliard
SJH1 Peak of sail.
SJH2 Cheek-block on fore-topmast (starboard side).
SJH3 Ninepin-bitts.
ø Halliard 19 mm; 1 double cheek-block (shared with fore-topmast staysail-halliard).

Tack
SJT To ring on traveller.
ø Tack 28 mm.

Sheets
SJSH To blocks made fast to bulwarks forward, then to timberhead.
ø Sheets 36 mm; 2 single blocks L 298 mm.

Down-hauler
SJDH1 Standing part to peak, then down through hanks.
SJDH2 Block on traveller.
SJDH3 To beakhead bulkhead.
ø Down-hauler 13 mm; 1 single block L 136 mm.

INNER JIB

Halliard
IJH1 Standing end to peak.
IJH2 Cheek-block on fore-topmast (port side).
IJH3 Ninepin-bitts.
ø Halliard 19 mm.

Tack
IJT To rope traveller.

Sheets
IJSH To lead-blocks in spirketting and then to cleats nearby.
ø Sheets 34 mm; 2 single blocks L 244 mm.

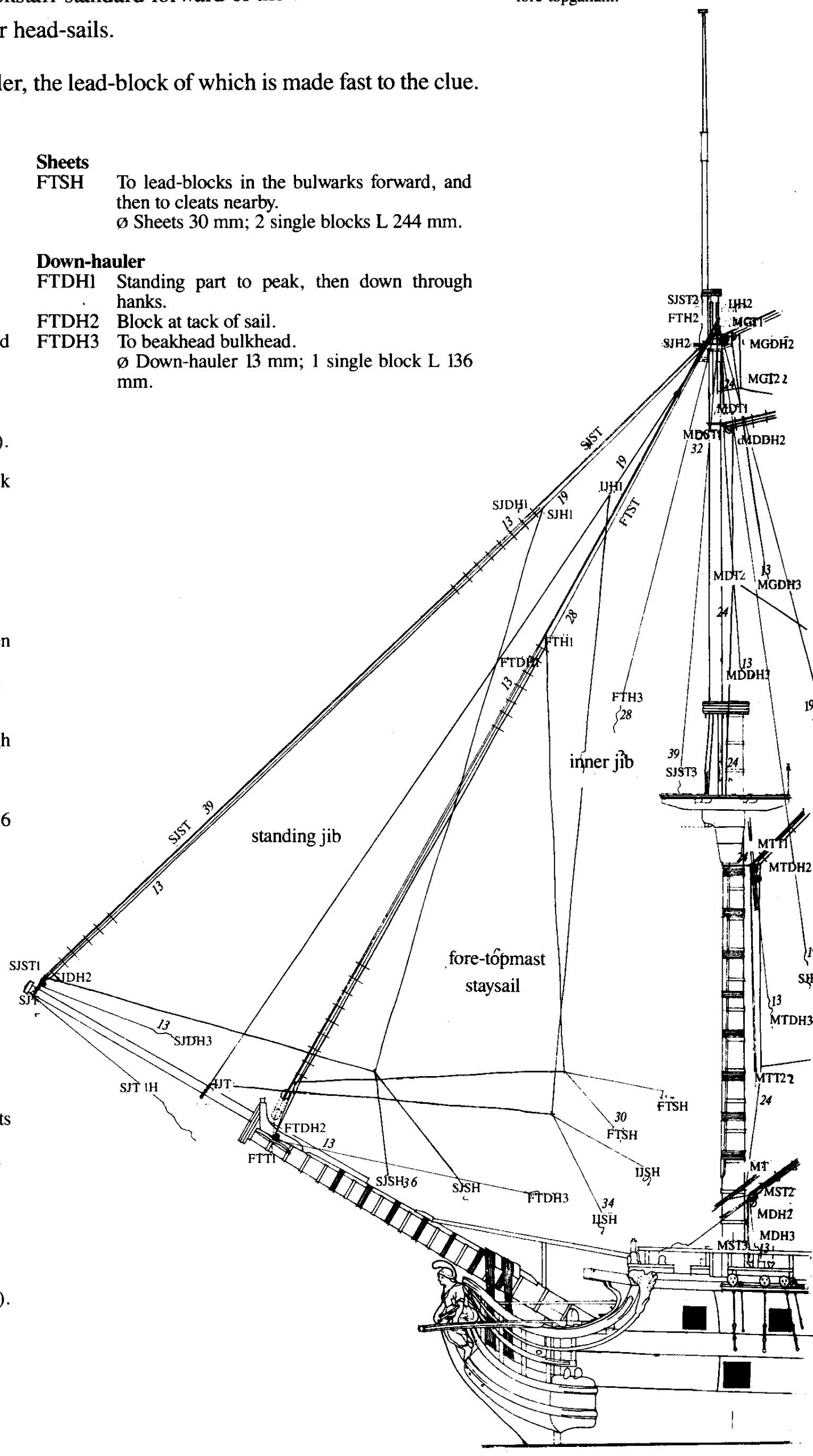
FORE-TOPMAST STAYSAIL

Halliard
FTH1 Standing part to peak.
FTH2 Cheek-block on fore-topmast (starboard side).
FTH3 Ninepin-bitts.
ø Halliard 28 mm.

Tack
FTT1 To eyebolt on jackstaff-standard.
ø Tack 26 mm.

Sheets
FTSH To lead-blocks in the bulwarks forward, and then to cleats nearby.
ø Sheets 30 mm; 2 single blocks L 244 mm.

Down-hauler
FTDH1 Standing part to peak, then down through hanks.
FTDH2 Block at tack of sail.
FTDH3 To beakhead bulkhead.
ø Down-hauler 13 mm; 1 single block L 136 mm.



SAILS BENT BETWEEN THE FOREMAST AND THE MAINMAST (see Fig. 316).

Main staysail: The stay on which this sail runs ends in an eye, which enables it to be seized to the mainstay above the mouse, while the other end reeves through a single block lashed to the foremast below the collar of the stay; it is hove taut and secured by means of a tackle.

The halliard is hitched to the peak of the sail and leads up to a block lashed to one of the crosstrees of the maintop; from there it leads down the mast and reeves through a block made fast to a ring at the foot of the mast to starboard, and it is belayed to the same block.

The tack is made fast to the anchor-stopper cleat, or if the foot of the sail is smaller the tack is made fast to the collar of the main preventer-stay.

The clue is rigged with a thimble to which a tackle is hooked serving as the sheets. The tackle is made fast to an eyebolt below the gangways between the seventh and eighth gunports on the upper deck.

The sail is brought in by means of a down-hauler; like those of the standing and inner jibs, it is hitched to the peak.

Main topmast-staysail: The main topmast-staysail is bent to the main-topmast preventer-stay, so that the preventer-stay is frequently rigged below the stay.

The halliard reeves through a cheek-block or a pendant-block on the starboard side of the head of the main-topmast, leads down through a hole in the decking of the maintop to a lead-block at the foot of the mainmast, and is belayed at this block, or alternatively to the main topsail-sheet bitts. The nock is made fast at the strap of the preventer-stay block (below the foretop). The tack is simply a line spliced into the eyelet of the sail and made fast at the other end to the collar of the mainstay.

The sheets are double, and the hauling part reeves through one of the sheaves of the fixed-block in the ship's side in the way of the quarterdeck breastwork (the other sheaves already serve the lower main studdingsail tack and the foresheet); it is then belayed to a belaying-pin nearby, or else directly to the main topsail-sheet bitts.

The down-hauler is rigged like that of the main staysail, being made fast at the peak, reeving through a block at the nock and being belayed to a cleat on deck.

Middle staysail: The middle staysail is bent to a staysail stay, the forward end of which is made fast to a rope traveller fitted with trucks like a parrel, and running up and down the fore-topmast; the after end runs up to the head of the main-topmast, reeves through a cheek-block on the port side and then down again to the maintop where it is belayed.

The halliard reeves through a block or a thimble seized to the main-topgallant stay, near the head of the topgallant-mast, leads down through the lubber's hole of the maintop to a lead-block at the foot of the mainmast, and is belayed there, or else at the main topsail-sheet bitts.

The nock is made fast to the traveller and the tack to the rigging at the head of the foremast.

The sheets are double, the hauling part reeving (like that of the main topmast-staysail) through the fixed-block in the ship's side; it is belayed to a cleat nearby, or else directly to the main topsail-sheet bitts.

There is a down-hauler, rigged like those of the other staysails.

Main topgallant-staysail: Bent to the main-topgallant stay.

The halliard reeves through a block or a thimble seized to the main-topgallant stay near the masthead, leads down through a hole in the decking of the maintop to the foot of the mainmast, and is belayed like the middle staysail halliard.

The nock is made fast to the main-topgallant stay-block, while the tack is made fast a little way below the block to the hauling part of the stay.

The sheets are double, reeve through the same fixed-block as for the other sheets, and are belayed to a pin nearby or else at the main topsail-sheet bitts*.

*Sometimes the main top-gallant-staysail sheets are single, in which case the sheet reeves through a thimble seized to the main preventer-stay above the collar and leads to the maintop; it is handed and belayed in the top.

The down-hauler is rigged like those of the other staysails.

Sometimes the sheets of the four staysails between the foremast and the mainmast are belayed directly to cleats near the after ladder leading up to the gangway.

Another variant is for all the halliards to lead down to the foot of the mainmast like the main staysail halliards.

SAILS BENT BETWEEN THE MAINMAST AND THE MIZEN (see Fig. 316).

Mizen staysail: The mizen staysail is bent to a staysail stay which has an eye at its upper end to enable it to be clapped on above the mouse of the mizen-stay, while the other end reeves through a block lashed to the mainmast above the mizen-stay; it is made fast to the strap of the block, or else to the collar of the mizen-stay.

The halliard reeves through a block lashed to the stay just under the mizen-top, and is belayed to a pin in the port-side poop pin-rail.

The tack is made fast to the mainmast above the mizen-stay, by means of a lashing.

The sheet is single, and its hauling end is belayed to one of the pins of the poop pin-rail.

The down-hauler is like those of the other staysails.

Mizen topmast-staysail: The sail is bent to the mizen-topmast stay.

The halliard reeves through a block lashed to the stay at the hounds of the topmast, and leads down to port to one of the pins of the poop pin-rail.

The nock is made fast to the strap of the stay-block, while the tack is secured to the mizen-stay.

The single sheet is belayed to a cleat on the quarterdeck, inside the bulwarks and immediately below the poop breastwork.

Down-hauler as on the other staysails.

That therefore concludes this highly detailed section on the rigging to the sails. The important thing is to retain the basic principles, since this will make it easier to understand how the ship is sailed, which we will come to in Volume IV.

A large number of changes may be made by the *Master Attendant*, and the ship's officers likewise do not hesitate to introduce variations. Many of the small details of rigging are liable to interpretation, for a whole host of reasons: simplification, effectiveness, strength, etc. The general principles however remain the same.

Master Attendant: [Fr: agréeur]: a port official responsible for the rigging of ships being fitted out. See Volume I, p. 11.

I have indicated a number of alternative ways of rigging certain items, but there are many others, and those who fully master the art of rigging will be able to appreciate such differences of detail on models or paintings and prints.

I should conclude by adding that a ship never carries all her sails, and that certain sails may never be used throughout a whole commission.

Fig. 316
RIGGING TO THE STAYSAILS

MAIN STAYSAIL

Stay
MST1 Upper end to mouse of mainstay.
MST2 Block below collar of mainstay.
MST3 Tackle at foot of foremast.
ø Stay 32 mm; 1 single block L 244 mm.
ø Tackle falls 19 mm; 1 single block L 163 mm; 1 double block L 271 mm.

Halliard
MH1 Standing end to peak.
MH2 Block below maintop.
MH3 Block at foot of mainmast (to starboard); belayed to block.
ø Halliard 26 mm; 2 single blocks L 217 mm.

Tack
MT To collar of main preventer-stay.
ø Tack 28 mm.

Sheets
MSH To tackle below gangways, between 7th & 8th gunports.
ø Sheets 28 mm.
ø Tackle falls 11 mm; 2 single blocks L 136 mm; 2 double blocks L 271 mm.

Down-hauler
MDH1 Standing end to peak; hauling end rove though hanks.
MDH2 Block at tack of sail.
MDH3 To cleat on deck.
ø Down-hauler 13 mm; 1 single block L 136 mm.

MAIN TOPMAST-STAYSAIL

Halliard
MTH1 Standing end to peak.
MTH2 Cheek-block at masthead (to starboard).
MTH3 Down to main topsail-sheet bitts.
ø Halliard 26 mm; 1 cheek-block.

Tacks
MTT1 Nock to strap of topmast preventer-stay block.
MTT2 Tack to collar of mainstay.
ø Tacks 24 mm.

Sheets
MTSH To main topsail-sheet bitts.
ø Sheets 26 mm.

Down-hauler
MTDH1 Standing end to peak.
MTDH2 Block at upper tack.
MTDH3 To cleat on deck.
ø Down-hauler 13 mm; 1 single block L 136 mm.

MIDDLE STAYSAIL

Stay
MDST1 Forward end to traveller.
MDST2 Cheek-block at topmast head (port side).
MDST3 Down to maintop.
ø Stay 32 mm; 1 cheek-block.

Halliard
MDH1 Standing end to peak.
MDH2 Thimble on main-topgallant stay.
MDH3 Down to main topsail-sheet bitts.
ø Halliard 26 mm; 1 thimble.

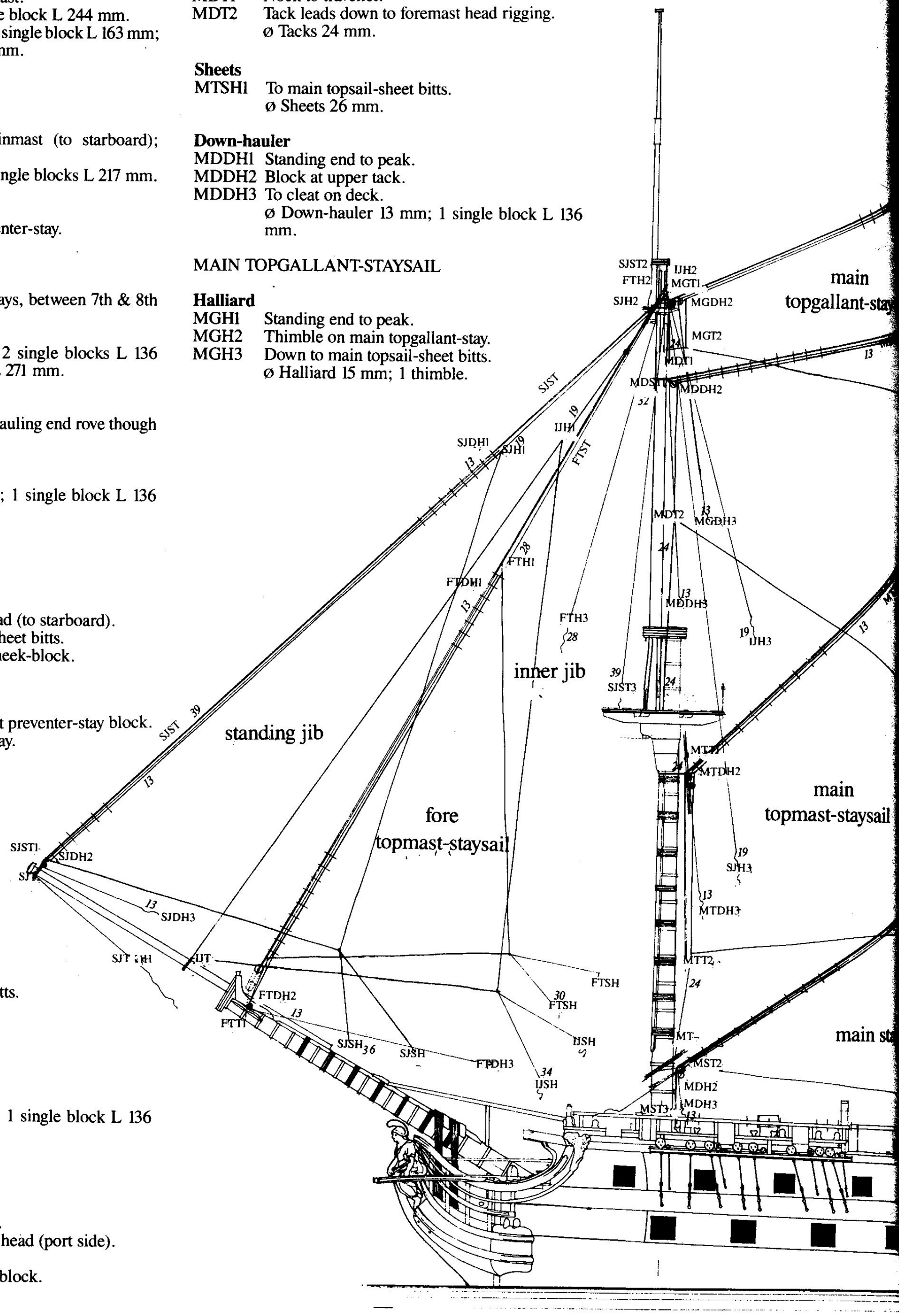
Tacks
MDT1 Nock to traveller.
MDT2 Tack leads down to foremast head rigging.
ø Tacks 24 mm.

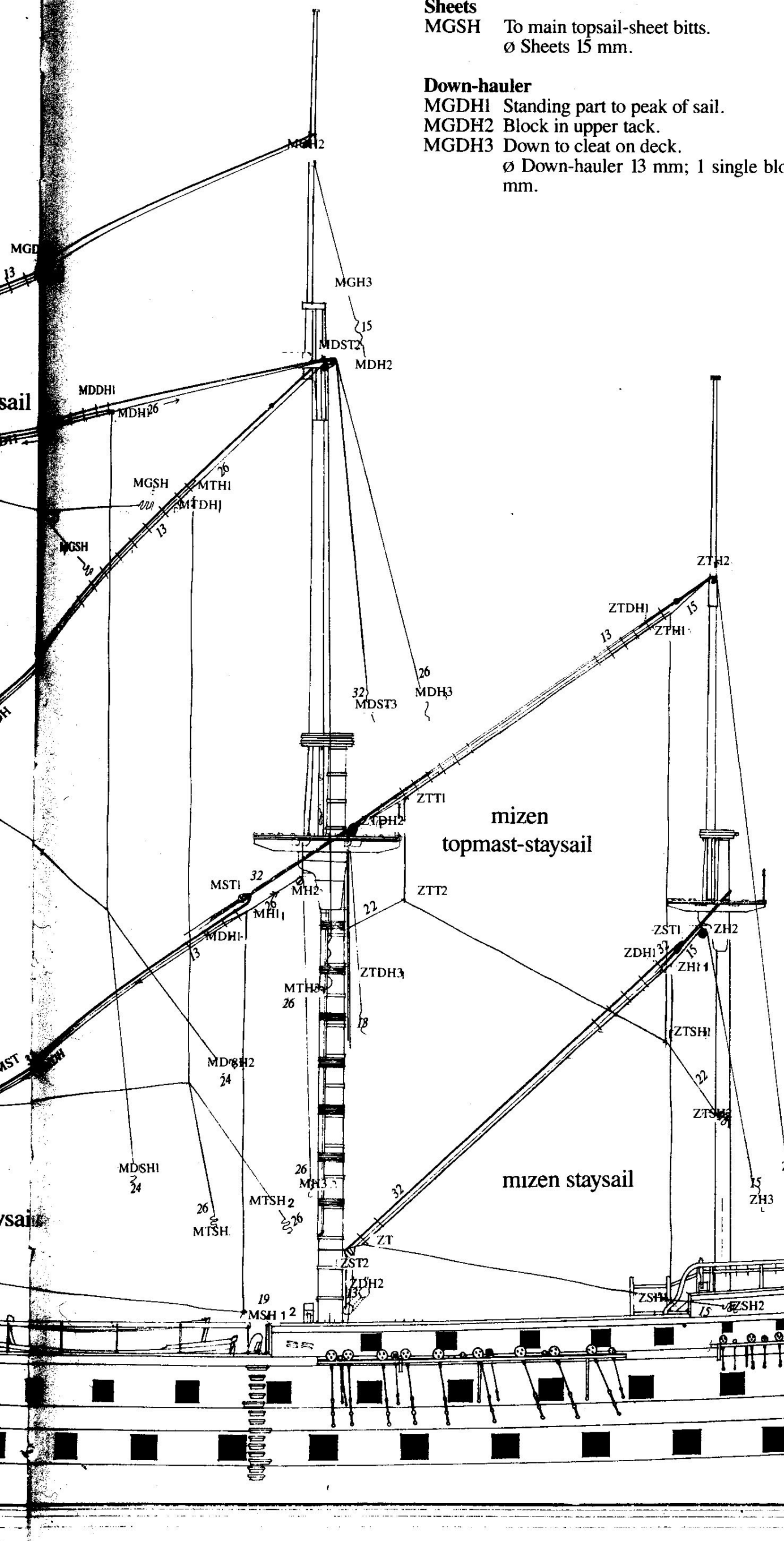
Sheets
MTSH1 To main topsail-sheet bitts.
ø Sheets 26 mm.

Down-hauler
MDDH1 Standing end to peak.
MDDH2 Block at upper tack.
MDDH3 To cleat on deck.
ø Down-hauler 13 mm; 1 single block L 136 mm.

MAIN TOPGALLANT-STAYSAIL

Halliard
MGH1 Standing end to peak.
MGH2 Thimble on main topgallant-stay.
MGH3 Down to main topsail-sheet bitts.
ø Halliard 15 mm; 1 thimble.





Tacks
MGT1 Nock to main topgallant-stay block.
MGT2 Tack to hauling part of stay.
ø Tacks 24 mm.

Sheets
MGSH To main topsail-sheet bitts.
ø Sheets 15 mm.

Down-hauler
MGDH1 Standing part to peak of sail.
MGDH2 Block in upper tack.
MGDH3 Down to cleat on deck.
ø Down-hauler 13 mm; 1 single block L 136 mm.

MIZEN STAYSAIL

Stay
ZST1 Upper end round mouse of mizen-stay.
ZST2 Block above mizen-stay, and belayed to block.
ø Stay 32 mm; 1 single block L 244 mm.

Halliard
ZH1 Standing end to peak.
ZH2 Block below mizen-top.
ZH3 Poop pin-rail, port side.
ø Halliard 19 mm; 1 single block L 163 mm.

Tack
ZT Lashing round mainmast.

Sheet
ZSH1 Single rope made fast at clue.
ZSH2 To poop pin-rail.
ø Sheet 19 mm.

Down-hauler
ZDH1 Standing part to peak.
ZDH2 Block at tack and belayed to cleat on deck.
ø Down-hauler 13 mm; 1 single block L 136 mm.

MIZEN-TOPMAST STAYSAIL

Halliard
ZTH1 Standing part to peak.
ZTH2 Block at mizen-topmast hounds.
ZTH3 Down to poop pin-rail.
ø Halliard 15 mm; 1 single block L 136 mm.

Tacks
ZTT1 Nock to block of mizen-topmast stay.
ZTT2 Tack made fast to mizen stay.
ø Tacks 19 mm.

Sheet
ZTSH1 To clue of sail.
ZTSH2 To cleat on quarterdeck.
ø Sheet 15 mm.

Down-hauler
ZTDH1 Standing part to peak.
ZTDH2 Block at upper tack.
ZTDH3 To cleat on deck.
ø Down-hauler 13 mm; 1 single block L 136 mm.

TRAVELLERS

Standing jib traveller
Out-hauler: standing end to traveller, then through port-side sheave in jibboom truck; sheave of port-side rack-blocks; stanchion of beakhead bulkhead.

Inner jib traveller
Out-hauler: standing end to traveller, then through starboard sheave in jibboom truck.

Rigging to the square sails

Item	Sprit-topsail			Spritsail			Forecourse			Maincourse		
Sheets				74	3	26	96	5 1/2	48	100	6	52
Tacks							90	4 1/2	39	98	4 3/4	41
Bowlines							60	4	34	63	4 1/4	36
Bridles							10	4	34	13	4 1/4	36
Clue-lines/-garnets	50	2	17	60	2	17	90	3 1/4	28	100	3 1/2	30
Buntlines				44	1 3/4	15	84	2 1/4	19	96	2 1/4	22
Buntline-legs							92	2 3/4	24	104	3	26
Leech-lines							84	2 1/4	19	96	2 1/4	22

	Fore-topsail			Main-topsail			Mizen-topsail			Fore-topgallant		
Sheets	72	7	60	80	7 1/2	65	54	3 3/4	32	96	3	26
Bowlines	77	3 1/4	28	82	3 3/4	32	64	1 3/4	15	90	1 1/2	13
Bridles	17	3 1/4	28	18	3 3/4	32	64	1 3/4	15			
Clue-lines	96	3	26	110	3 1/4	28	74	2	17	96	1 3/4	15
Buntlines	88	2 1/4	19	96	2 1/2	22	64	1 3/4	15			
Leech-lines	88	2 1/4	19	96	2 1/2	22	64	1 3/4	15			
Reef-tackles	94	2 1/4	19	104	2 1/4	19	64	1 1/2	13			
Runners	11	3 3/4	32	11	3 3/4	32						

	Main-topgallant			Mizen-topgallant		
Sheets	110	3 3/4	28		2	17
Bowlines & Bridles	100	1 1/2	13		1 1/2	13
Clue-lines	104	1 3/4	15	44	1 1/2	13

Studdingsails	Halliards			Sheets			Tacks		
Lower main	246	3	26	44	3	26	106	3	26
Lower fore	210	2 3/4	24	34	2 3/4	24	96	2 3/4	24
Main-topmast	224	3	26	28	3	26	62	3	26
Fore-topmast	204	2 3/4	24	24	2 3/4	24	58	2 3/4	24
Main-topgallant	170	1 1/2	13	100	1 1/2	13	100	1 1/2	13
Fore-topgallant	170	1 1/2	13	100	1 1/2	13	100	1 1/2	13
Mizen-topgallant	60	2	17	9	1 3/4	15	70	1 3/4	15

Rigging to the fore-and-aft sails

Item	Standing jib			Inner jib			Fore-topmast staysail			Mizen-course		
Runners*	30	4 1/2	39	25	4 1/4	36						
Halliards	50	2 1/4	19	45	2 1/4	19	36	3 1/4	28			
Sheets	36	4 1/4	36	34	4	34	36	3 1/2	30	45	2 3/4	24
Tacks	18	3 1/4	28		3	26	16	3	26		2 3/4	24
Down-haulers		1 1/2	13				60	1 1/2	13	140	2	17
Brails										60	1 3/4	15

*Halliard runners: on some ships, in order to make it easier to hoist the standing jib and the inner jib, a runner is rigged to the peak, turning in a double block at its end. While on the subject, I should perhaps mention another way of rigging the standing jib halliards, which is to make them double: the standing end is made fast on the port side to the fore-topmast head and reeves through a block strapped or hooked to the peak of the sail, and then through a second block or cheek-block lashed to the starboard side of the masthead, above the head rigging. From there the halliard runs down to a lead-block on the forecastle just abaft the fore-shrouds, and is made fast above the block to a belaying-pin or to a cleat.

	Main staysail			Main-topmast staysail			Middle staysail			Main-topgallant staysail		
Halliards	45	3	26	54	3	26	54	3	26	44	1 3/4	15
Sheets	14	3 1/4	28	35	3	26	35	3	26	18	1 3/4	15
Tacks	9	3 1/4	28	13	2 3/4	24	13	2 3/4	24	13	2 3/4	24

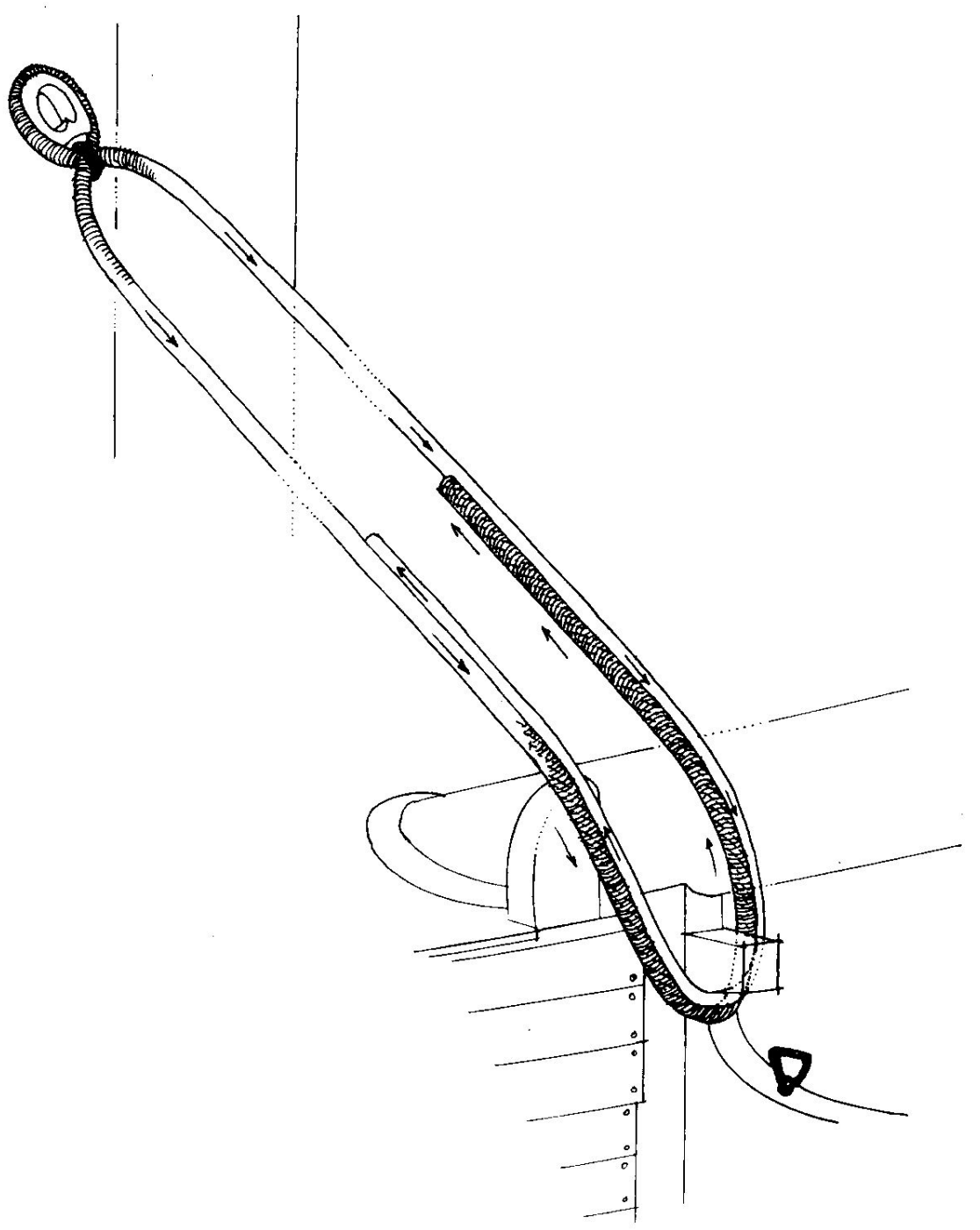
	Mizen staysail			Mizen-topmast staysail		
Halliards	33	2 1/4	19	36	1 3/4	15
Sheets	9	2 1/4	19	18	1 3/4	15
Tacks	9	2 1/4	19	9	2 1/4	19

The tables are set out in three columns: the first column gives the length in French fathoms [1.62 m], the second the circumference in inches, and the third the diameter in millimetres.

To apply these figures to other types of ship-rigged vessel, all that is needed is to reduce or increase them proportionately, since the above dimensions are calculated for a ship of 44 foot beam. In the case of three-deckers, a small amount should be added to the resulting quotient.

*All these dimensions, particularly the thicknesses, may vary slightly according to local usage in different dockyards. The ones given are from a manuscript relating to Rochefort.

The little sketch below shows how the collar of the mainstay is twisted under the hook of the gammoning-knee; each part is identified by means of small arrows in order to make this clear; the same applies to the other stays and preventer-stays of both the main- and foremasts.



6. ANCHOR CABLES AND RELATED ROPES

In the section devoted to the Bo'sun (Vol. II, pp. 102-3), I described the ship's anchors in full, and I will not therefore repeat myself here; however, I only mentioned in passing their cables and other ropes, preferring to wait until now before discussing them in detail.

Cables: These are cable-laid ropes, as explained at the beginning of this chapter. The cables are thus laid up from three hawser-laid ropes. The length of a cable* is 120 fathoms or 194.4 metres, and the weight is supposed to be twice that of the anchor, which gives it a circumference or size equal to 1/24th of the beam*.

**A cable's length*: as noted in Volume II, English cables were usually also 120 fathoms long, but English fathoms of six feet or 1.83 metres. Thus an English cable was some twenty-five metres longer than a French cable.

*The tendency at present (in 1780) is to reduce these dimensions by a tenth, and indeed proposals have been made recently to increase the weight of the anchors.

An alternative calculation is to double the weight of the anchor and divide by 22 for ships-of-the-line or 23 for smaller ships, the resultant figure being the square of the circumference of the cable, which is equal therefore to the square root.

These apparently crude rules are the product of long experience, and similar ones apply for calculating the weight of the main anchors, which should be as many times 120 lbs [58.7 kgs] as there are feet of beam.

In practice, the four main anchors vary somewhat in weight, there being 700 lbs' [342.3 kgs] difference between the spare anchor (the heaviest) and the small bower; I have included at the end of this section a table giving the weights and principal dimensions of all the anchors in use in the French Navy.

Our 74 has five 22 inch cables, with a diameter therefore of 19 centimetres; four of these cables are of best quality hemp, and the fifth of combings. The small bower anchor being lighter has a cable which is smaller by about a tenth, thus about 17 cms in diameter; this makes it easier to unbend if the hawse is fouled (see Vol. II, p. 104). I shall describe that operation and all the other manoeuvres to do with anchoring in Volume IV.

Sheet-shot: to ***shoot the cable*** is to splice two cables or ***shots*** together; strictly speaking therefore the sheet-shot is that bent to the sheet-anchor, rather than to the best bower, but on French ships the best bower is heavier than the sheet-anchor. [Trans.]

The anchor at the starboard cathead is bent to the *sheet-shot*, composed of three cables forming the best bower cable. Abaft the best bower is the sheet anchor, which has a cable spliced from two *shots*; this anchor is positioned in the fore-channels, and its cable leads in through the outer hawsehole on the starboard side.

The small bower anchor is at the port cathead, and its cable is one cable's length long; this leads in through the inner hawsehole on the port side.

Thus the six cables with which our 74 is supplied are bent to three anchors: three to the best bower, two to the sheet anchor, and one to the small bower.

Cable drawing splice: a ***cable short splice*** of which the tails are wormed along the cable and seizings put on.

To whip: to bind tightly the end of a rope with several turns of sailmaker's twine or small line; the unravelled ends (which show for example that it is an unused rope) are then cut off flush with the whipping.

Where several cables are shot or spliced together, the most common splice used is the *cable drawing splice*; this is done by laying the two cables end to end and tucking each of the three ropes twice; next, separating one strand from each of the six ropes, tuck them again; repeat with another strand from each of the six ropes. The tails are then tapered and wormed along the splice for about 18 inches [49 cms], the ends being *whipped* with two ropeyarns removed from the strands. Finally, snaked seizings are clapped on (see Fig. 317).

Alternatively, a *tapered short splice* can be used; this is easier to pass out through the hawseholes, but its execution is more demanding and delicate. The splice is tucked three times with all the six ropes, and then the ends are unlaid for a distance of a fathom and a half [2.4 m]; with the unlaid strands a nine-strand sennit is plaited, and this in turn is served down with two ropeyarns at either side of the splice to make the pointing (see Fig. 317).

Clinch: the "knot" used is called an ***inside clinch***.

Puddening or ***pudding***; also called a ***wreath***.

The cables are *clinched* to the anchors, or more precisely, to the anchor-rings; but first of all the ring is parcelled with a strip of tarred canvas wound round and round, each turn overlapping the previous one by half its width; the parcelling is then covered by a *puddening* made of half-worn rope, which is wound round the ring as tightly as possible until the whole circumference is

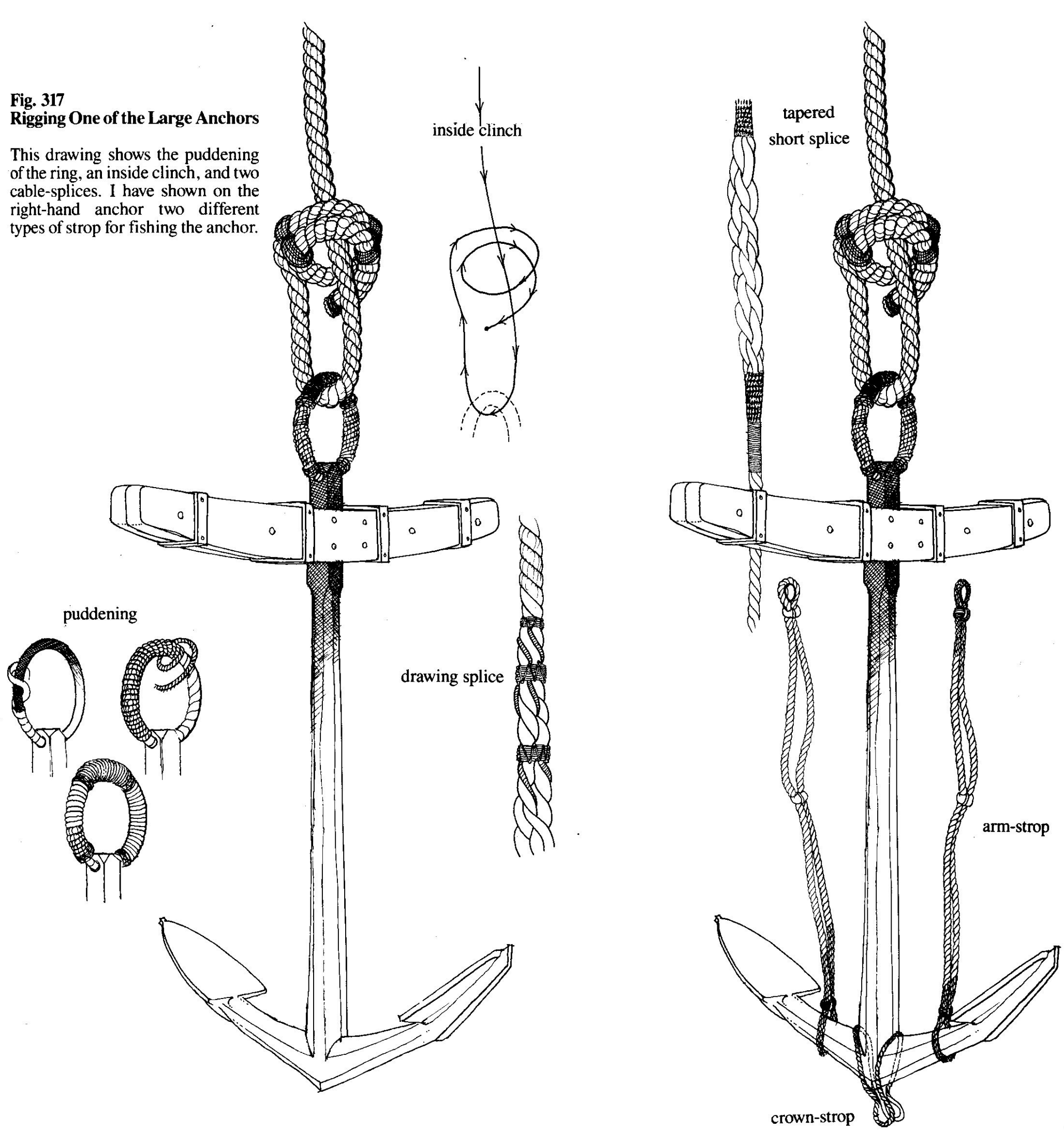
covered, as far as the point where it disappears into the hole in the square of the anchor. This puddening is secured by four seizings or snaked seizings, two of which are next to the shank, one on either side, and the other two at approximately "ten to two", so that they do not get in the way of the clinch of the cable.

With the ring puddened so as not to hurt the cable, the cable is now clinched*. An inside clinch is formed by crossing the cable round its standing part and then passing it round again through the bight so formed; then two seizings called "bends" are clapped on opposite each other, the first securing the half-hitch and the second making fast the end of the cable. See Fig. 317 below.

*The usual practice, whenever the ship is on a long voyage and is more than fifty leagues from land, is to unclinch the cables from their anchors and stow them in the cable-tier, the hawseholes being blocked up with hawse-plugs. If however the voyage is short, only the cable of the sheet-anchor and the cables of the stream-anchors are unbent.
In harbour riding-plugs are used, which are in two pieces, each one hollowed out in a semi-circle, through which the cable passes - see Volume II p. 153.

Fig. 317
Rigging One of the Large Anchors

This drawing shows the puddening of the ring, an inside clinch, and two cable-splices. I have shown on the right-hand anchor two different types of strop for fishing the anchor.



The cables are stowed in the cable-tier (see Volume II, Plates XXX and XXXI), and their ends are made fast to the rings of the massive eyebolts running down into the riders, or else clinched round the heel of the foremast.

As a rule the best bower cable is to starboard and the two-shot cable of the sheet-anchor is to port*.

*Alternatively, the best bower may be stowed transversely in the forward part of the tier, with the two other cables placed aft of it and coiled fore-and-aft.

The cables are coiled with each turn or *fake* taken from left to right, or "with the sun"; since this corresponds to the direction in which they were laid up, it helps to prevent kinks forming*, which would otherwise be almost impossible to prevent when veering cable in a hurry.

Fake

*Opinions were divided: William Hutchinson, in his *Treatise on Practical Seamanship* (1777), advocates strongly that new cables should be coiled against the sun, or else with the sun but with the end taken through the coil. [Trans.]

Only experienced seamen, called *tierers*, are put in charge of coiling or stowing the cables, which calls for a great deal of skill and experience.

Tierer.

When the ship is at sea, the cable of the small bower anchor is stowed on top of the two shots of the sheet-anchor cable, but it is a wise precaution to heave it up whenever the ship is near land so that the other cables can be used in a hurry if necessary.

*Known as the ***bitter end***, because it could be made fast to the bitts; hence the expression, to do something "to the bitter end". [Trans.]

I should perhaps add at this point that the end of the small bower cable which is in the tier* is tapered and pointed, in order to clear a foul hawse more easily. Tapering and pointing a cable involves unlaying completely all of the strands and either forming a new one in the middle or inserting a *heart* and interweaving its strands with those of the cable. The strands are then tapered, and a pointing of nine-strand sennit is made over the top, the whole being served with two strands of rope-yarn. The tail is seized round a thimble (see Plate XLIX), and the thimble is puddened. This pointing makes it easier to pass the cable out and back through the hawseholes when clearing the hawse.

Heart or ***heart-strand:*** the central strand in four-strand ropes.

The cables require particular care; the Bo'sun* must look to them constantly, and they must never be stowed until they have first been allowed to drain.

*He is aided in his task by a petty-officer called in French a *bosseman*; there is no direct equivalent to this rate in the English Navy, but he might perhaps be called "yeoman of the anchors". [Trans.]

The coils are lashed down on the flat of the cable-tier by means of ropes made fast to ringbolts driven into the flat at various points. Where necessary the fakes are protected from chafe by mats or sennit.

Usually, once the cable is clinched, it is parcelled with old canvas from the clinch to the cable-hatch, and this precaution is further reinforced by the use of mats called *plait* from the waterline to the bitts, in order to protect it from chafing against the hawseholes and the stem.

Plait: In English ships it was common to have more than one such service on the cable, at positions corresponding to the greatest risk of chafe. According to Darcy Lever [op. cit.], coasters "particularly in the coal trade" had a *short* or *windward service* at about 45 fathoms, a second service at 75 fathoms, and a *long* or *leeward service* almost at the end, leaving only one fake in the tier. [Trans.]

Cablets: These small cables are differentiated only by their size, and indeed the cablet of a ship-of-the-line may serve as the cable of a sloop-of-war.

Our 74 is equipped with four cablets, each made up of two shots. Cablets are laid up like cables, but using combings rather than first-choice hemp. Two of the cablets measure 10 inches (approximately 86 mm in diameter), and the two others are rather smaller, at 9 1/2 inches (ø 82 mm).

The cablets are used for the ship's two stream-anchors, which are placed in the fore-channels on the port side to counter-balance the weight of the sheet-anchor. When a stream-anchor is used (see Volume IV), the cablet is passed out through the outer hawsehole on the port side. The cablets are stowed in the same way as the cables, two in the cable-tier between the cables, and two on the orlop on either side of the cable-hatch (see Plates XXIII and XXX in Volume II). The cablets are used for various purposes, such as towing with boats. One end is tapered and pointed, the other end being bent to the ring of the stream-anchor.

An *anchor bend* is formed as follows: a round turn is made through the ring, followed by a half-hitch; then two seizings* are clapped on - a throat-seizing at the half-hitch and an end-seizing at the end (see Fig. 318).

Anchor bend: a round turn and half-hitch; it is only used for anchors.

*These seizings are confusingly called ***bends***.

A number of other items of rigging are required to manoeuvre the anchors.

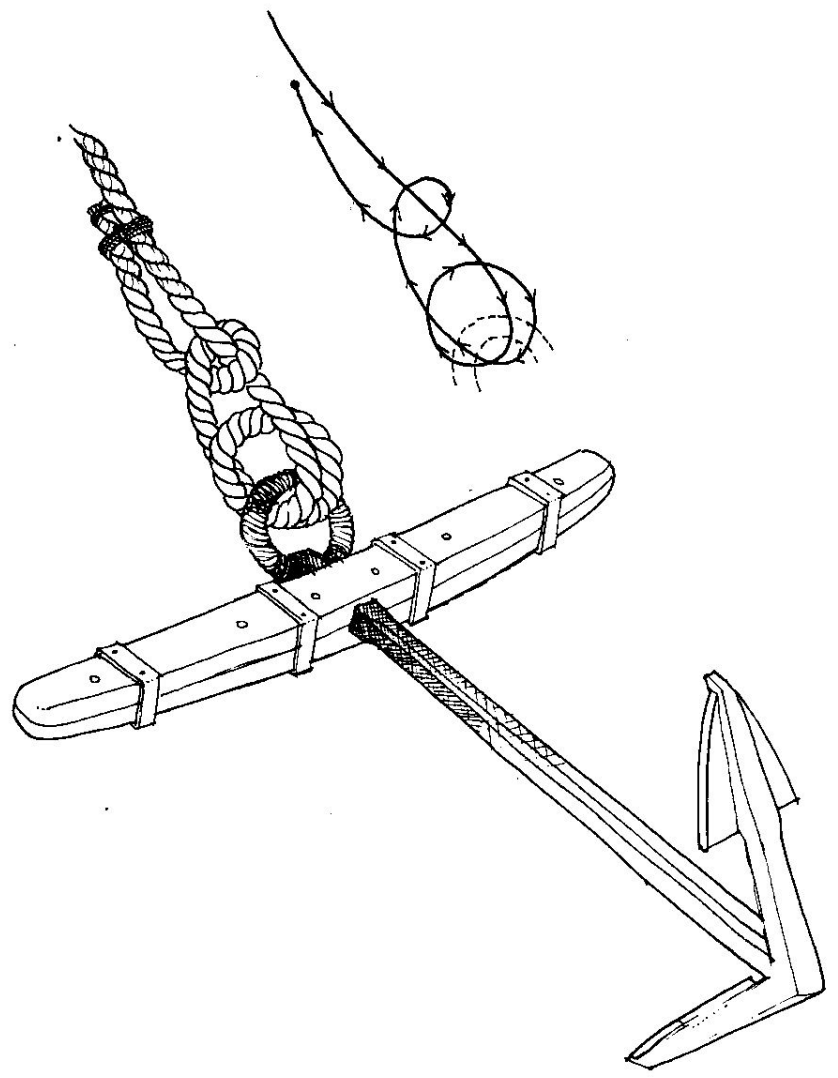


Fig. 318
Anchor Bend (for Cablets)

The throat-seizing or bend has been omitted.

Fish-strops: The long fish-strops or "arm-strops"* consist of a length of 6″ or 7″ rope (diameter 60 - 65 mm) served overall. The rope is doubled and the ends spliced together. An iron thimble is seized into the upper bight, while the lower bight fits round one of the arms of the anchor where it is secured by a throat-seizing. The strop when doubled is the same length as the shank of the anchor. The splice is positioned half-way up, where a further seizing is clapped on. In Fig. 317 I have illustrated a long strop on each arm.

*These appear not to have been used on English ships, and my translations of the French *traversière* and *coude* are therefore invented terms. [Trans.]

The purpose of the fish-strops is to make it easier to fish the anchors, in other words to haul up the shank against the ship's side with the arms placed vertically abaft the cathead. The thimble takes the hook of the fore-tackle described in section 3. of this chapter. When the fish-strops are not in use they are seized to the middle of the stock.

Another type of fish-strop may be used, which is shorter: this "crown strop"* consists of a short length of rope served overall with spun-yarn and passed round the crown and the two arms of the anchor (see Fig. 317).

Buoy-ropes: We have already examined the buoys carried by our 74. Their principal function is to mark the position of the anchors, to which they are secured by means of a buoy-rope, which is fastened at one end to the buoy; the hitch used to secure it to the anchor varies according to whether the anchor is large or small. But first let us examine the knot which secures it to the buoy: it is passed through the eye seized in the *slings* at the bottom, a sheet-knot is formed, and the end is seized to the buoy-rope beneath.

Slings of the buoy: the vertical ropes; those surrounding its waist are called the ***hoops***.

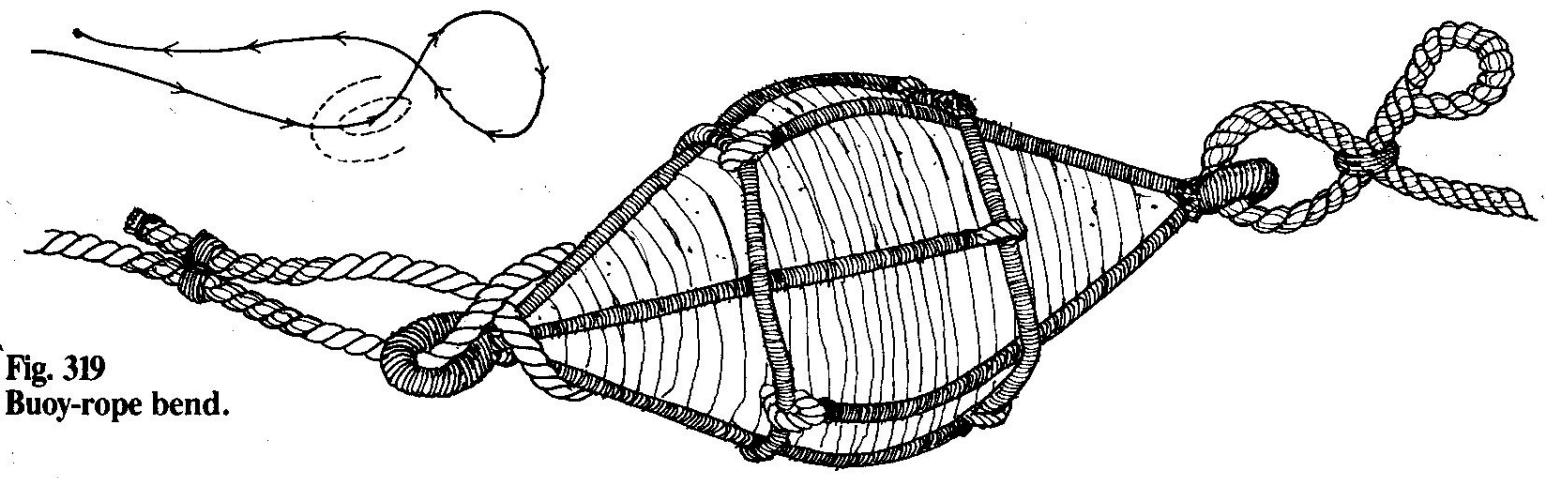


Fig. 319
Buoy-rope bend.

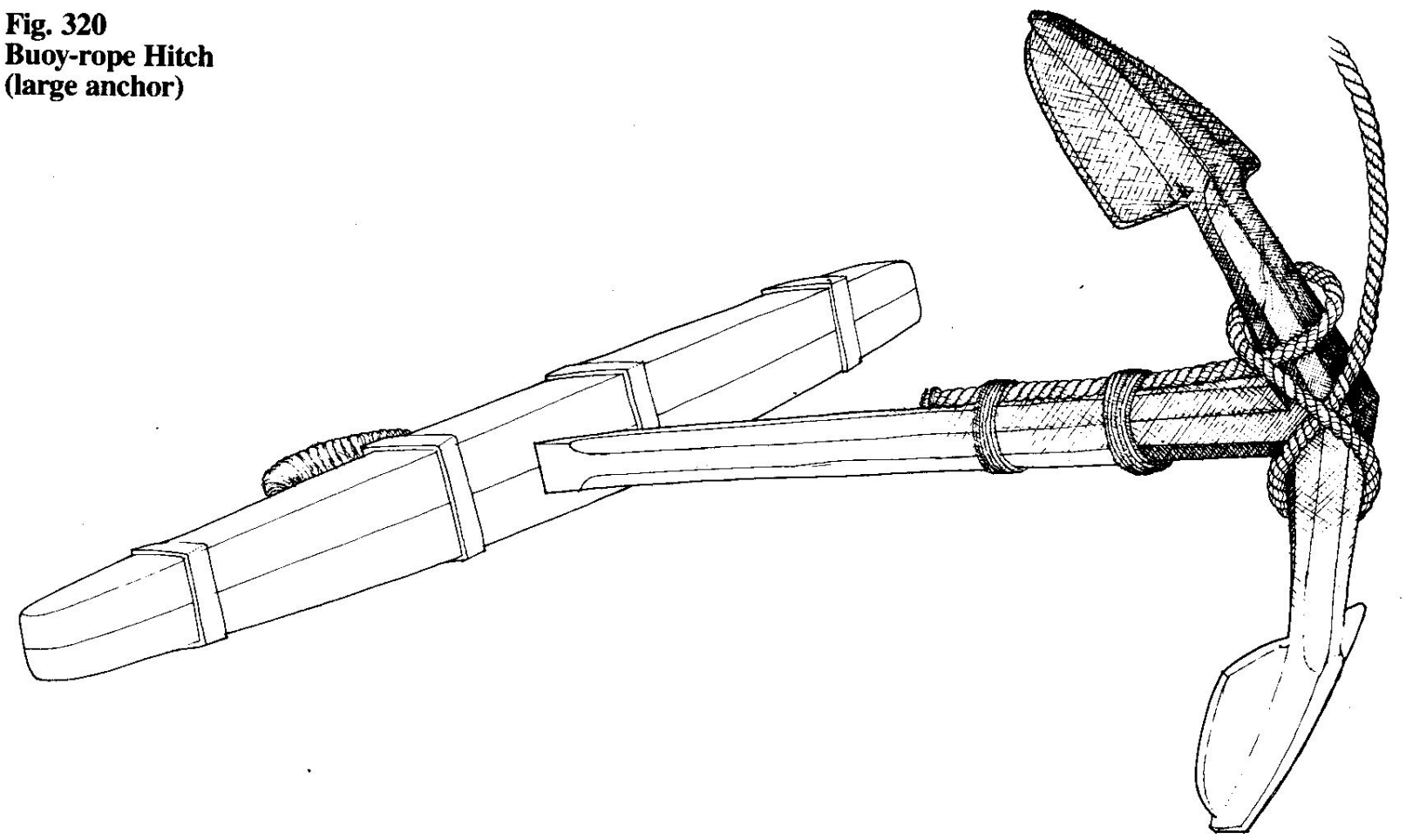


Fig. 320
Buoy-rope Hitch
(large anchor)

Buoy-rope hitch.

*On English ships it was customary to form a stopper-knot at the end, called a ***buoy-rope knot*** to prevent the rope slipping through the lashings. [Trans.]

Buoy-rope clinch (large anchor): The *buoy-rope hitch* must be secure enough to enable the anchor to be raised by the buoy-rope, should it prove impossible to do so by means of its cable. The hitch is formed by taking a clove-hitch round the two arms so as to seize the crown and pulling tight; the end of the rope is then lashed securely to the shank*.

Buoy-rope clinch (small anchors): This is more complicated, and the buoy-rope is used to raise kedge-anchors and sling them beneath the ship's boats. The buoy-rope is passed round the shank below the stock, then once more, this time passing through the ring and round the stock, and then it is brought down along the shank to the crown. Two seizings are clapped on the two turns opposite each other, and then two further seizings are put round the rope along the shank; finally lashings of rope or plait are crossed round the crown of the anchor and the throat (see Fig. 321).

Our 74 is equipped with three buoy-ropes for the large anchors, each 100 fathoms [162 m] long; they are of 8 1/2″ rope (about 70 mm in diameter). There are a further two buoy-ropes for the smaller anchors, which are of 6″ rope (50 mm diameter), and only 50 fathoms long.

The buoy-ropes are cable-laid, and the ends are simply whipped to prevent them unlaying.

The slings and hoops of the buoys should be sufficiently clear in Fig. 319 for me to be able to dispense with further explanations.

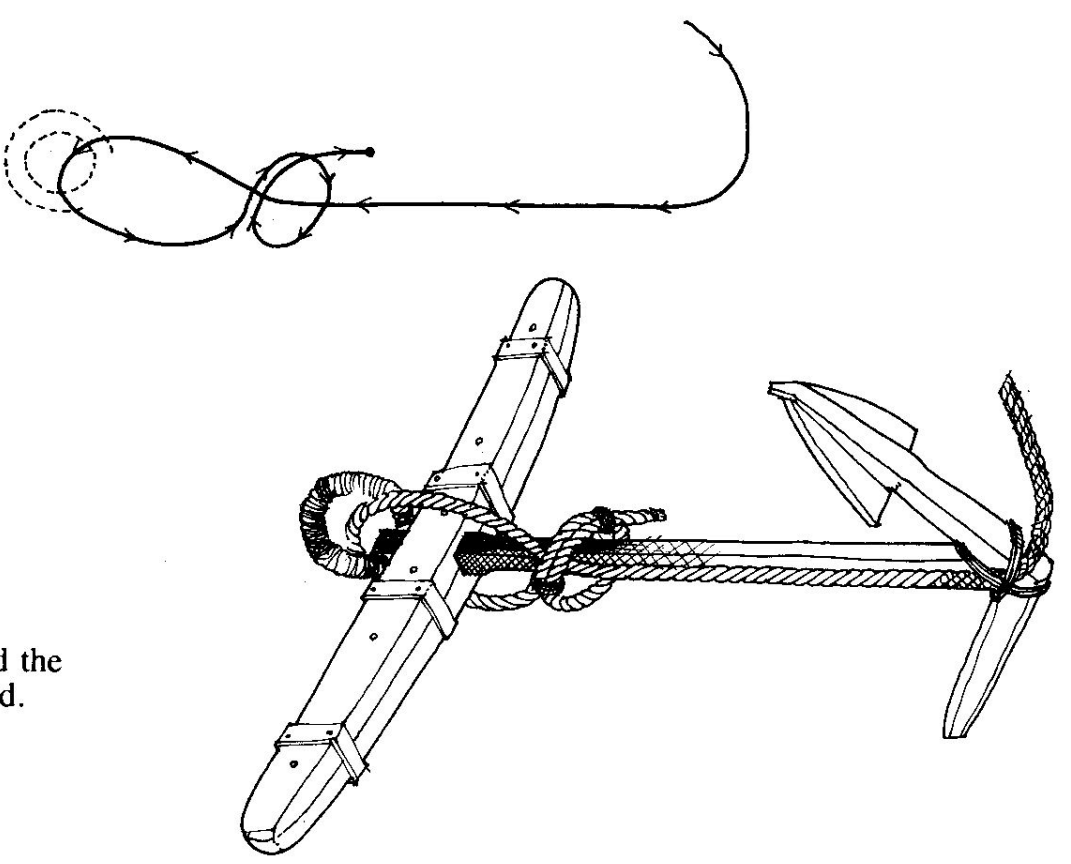


Fig. 321
Buoy-rope clinch
(Small Anchors)

The two seizings round the shank have been omitted.

Messenger and nippers: The size and stiffness of the cables makes it impossible to rig them directly to the capstan, and thus a special rope has to be used, called the messenger. We will examine in detail how it is used in Volume IV, but for the moment suffice to say that the cable is seized temporarily to the messenger by means of lashings passed several times round both ropes, a number of them being clapped on over a certain distance. These lashings are called *nippers*, since they serve to "nip" the two ropes together.

Nippers.

The messenger is taken four or five times round the capstan, the two ends are lashed together (see below) so that it becomes an endless rope, and as it is hauled round by the men at the capstan-bars the cable is brought in, the nippers being removed as the cable disappears down the cable-hatchway and being clapped on again at the beginning.

The messenger is *moused* every four feet [1.30 m] or so, the mouses being about the size of an ostrich-egg; their purpose is to prevent the nippers from slipping. They are extremely complicated to make, and like so many items of sailor's fancywork, harder still to explain. I will restrict myself therefore to saying that the mouses are composed of balls of oakum hardened with spun-yarn, and they are pointed like the ends of the cables. The explanations given on page 106 for the mouses of the stays should give a good idea of how those of the messenger are fashioned. Their length is roughly equal to the circumference of the messenger, which in turn is half that of the cables.

Moused: Some people dispense with the mouses, quoting the example of English ships in which the messenger was not moused; they maintain they serve no useful purpose, obstruct the turning of the capstan, and that they flatten and then tear off, putting the messenger out of action.

The messenger has an eye spliced in each end, the splice being then pointed over like a tapered cable-splice. The two eyes are then secured together by a lashing. I have shown the messenger on Plate XXXIV of Volume II; it is about 60 fathoms [100 m] long and 10″ in circumference (diameter 86 mm), and it is cable-laid. It is usually stowed on the orlop between the cablets (see above).

The nippers are woven from seven-, nine- or even eleven-stranded sennit of spun-yarn, the strands being 6 to 8 feet [1,95 - 2.60 m] long; the action of weaving the sennit shortens the nippers by about a quarter; they are not tapered, preserving their original width throughout.

The messenger is laid against the outboard side of the cable*, and five or six nippers are clapped on between the hawsehole and just abaft the bitts, one at each mouse. The seamen whose task it is to pass the nippers round the cable and the messenger are accompanied by boys who hold onto the ends of the nippers and walk aft with the cable, taking them off as they approach the hatchway, and returning with them to the seamen, who clap them on again at the beginning*.

*In order not to obstruct its passage down through the cable-hatchway.

*This required considerable agility when the cable was being hove in fast, and the boys came by extension to be called "nippers" themselves, a term which remains in English today. [Trans.]

Stoppers: These are short lengths of rope roughly half the thickness of the cables.

The *stoppers* are arranged at regular intervals as far as the hatchway, and others are placed, following the run of the cable, forward of the bitts or else on the bitts themselves. The stoppers have a thimble turned in at one end rather like the deadeyes are turned in the ends of the shrouds, by means of a throat-seizing and an end-seizing, and this thimble secures the stopper to the deck-ring. The other end finishes in a stopper-knot which prevents the laniard which seizes and stops the cable from slipping off; the laniard is formed from two or three fathoms [3.24 - 4.86 m] of light line which is doubled for part of its length and hitched under the stopper-knot by passing the two ends through the bight in a noose.

Stoppers: called ***cable-stoppers***, or ***deck-stoppers.***

The stoppers are about 3 feet [1.0 m] long and are served with spun-yarn; when in use they are laid forward along the cable and made fast by several turns of the laniard which is passed round both the cable and the stopper, the end being secured by a number of half-turns or a seizing of spun-yarn. The purpose of the stoppers is to immobilize the cable, especially when surging or fleeting up the messenger (see Volume IV).

Dog-stoppers; ring-ropes: not made in quite the same way in the English Navy, but the principle is the same. [Trans.]

Other sorts of stoppers, called *dog-stoppers* or *ring-ropes*, are used in the cable-tier; these are removable and are made fast to ring-bolts, their purpose being to check the cable from running out so fast that there is no time to clap on the cable-stoppers. Ring-ropes are plaited and tapered so that they are more flexible and twist more easily round the cable.

Check-stoppers or ***spun-yarn-stoppers:*** made of spun-yarn, these break when sufficient force is applied, slowing down the cable.

Use is also made of *check-stoppers*, but we will come to these later.

Cat-tackle; cat-block; cat-fall.

Snatch-sheave: a cheek-block with its outer end left open.

Cat-tackle: This is a machine or tackle composed of the sheaves of the cathead and those of the large block called the *cat-block*; a rope, called the *cat-fall*, reeves alternately through the sheaves. The cat-fall is made fast to a ring-bolt inboard and on the after face of the cathead. On our 74, the arrangement is however somewhat different, because there is a *snatch-sheave* on the forward face of the cathead through which the cat-fall can reeve if desired; this requires its standing end to be made fast to a ring-bolt on the forward face instead.

The cat-fall is 53 fathoms [86 m] long and made from 4 3/4″ rope [diameter 40 mm].

Anchor-stopper.

Anchor-stoppers: Once the anchor has been catted home it is held there by a thick rope called the *anchor-stopper*, which is served with spun-yarn for a third of its length and ends in a wall-knot. It is sometimes leathered for the first one or two feet [60 cms] below the knot in order to protect from wear the part which passes through the hole in the cathead; it is blocked in the hole by the knot. To secure the anchor at the cathead, the stopper is passed through the anchor-ring from the inside, up over the end of the cathead in the groove cut in its outer face, hauled taut, and belayed with several turns round the anchor-stopper cleat bolted to the deck of the forecastle. The cat-block is then unhooked leaving the stopper to support the weight of the anchor alone. The anchor-stoppers on our 74 are 8 1/2″ in circumference [76 mm diameter] and 17 fathoms [27.5m] long.

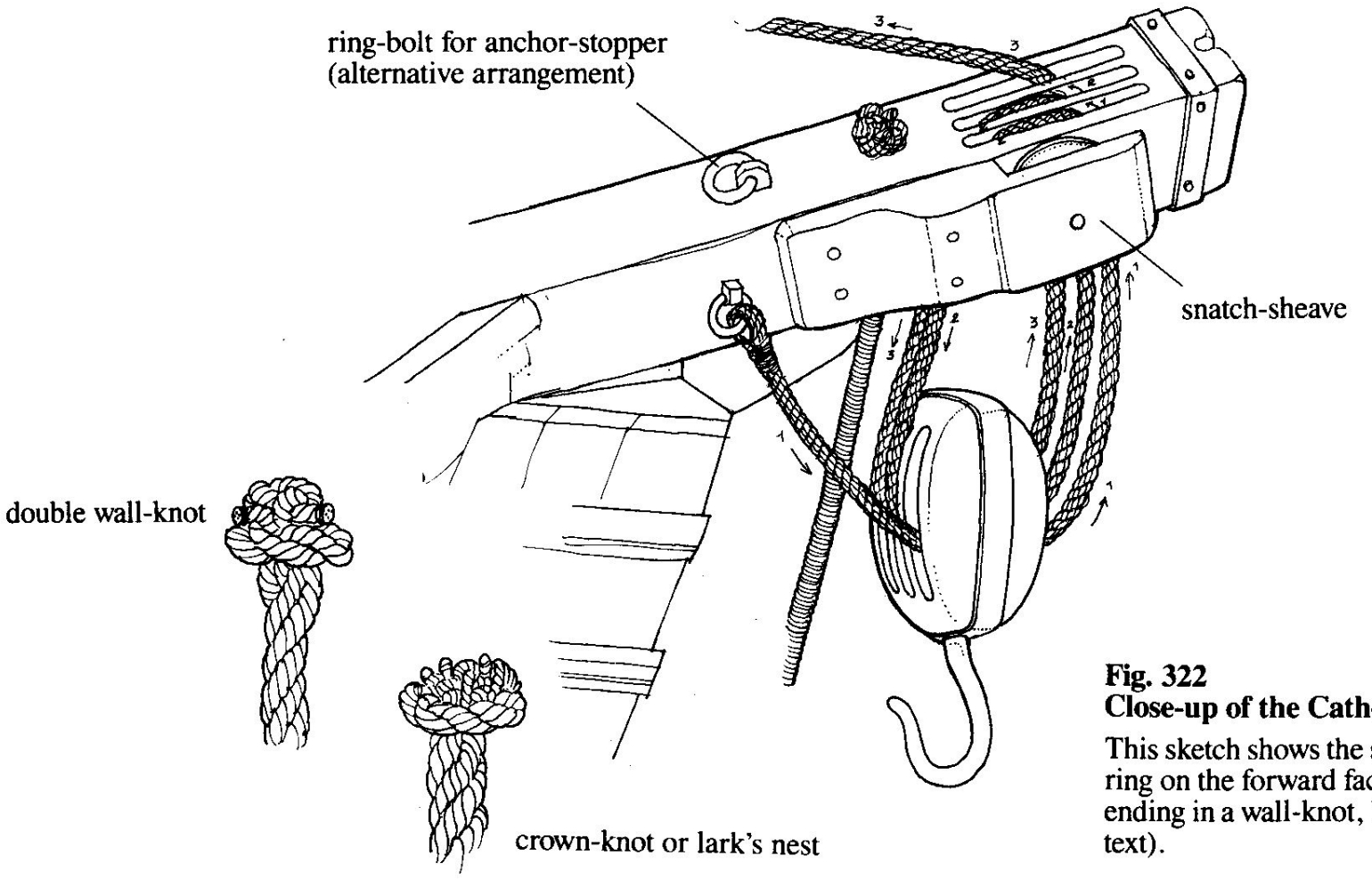


Fig. 322
Close-up of the Cathead

This sketch shows the standing end of the cat-fall made fast to a ring on the forward face of the cathead and the anchor-stopper ending in a wall-knot, but other arrangements are possible (see text).

Shank-Painters: The purpose of the shank-painters is to take the weight of the anchor when it is fished; they are made fast to the lower part of the shank and to the timberheads of the forecastle. They are somewhat smaller than the anchor-stoppers, measuring 7″ [65mm diameter] and 12 1/2 fathoms [20.3m] in length. Our 74 is supplied with 8 shank-painters.

I will take this opportunity to correct an oversight in Volume II, page 101: when I gave the lengths of the cat-falls, anchor-stoppers and shank-painters, I gave their total length added together, and not their individual lengths.

The shank-painter has a small eye spliced in one end, through which the other end is passed to form a noose; this is put round the timberhead from which the anchor is to be suspended. The shank-painter is then passed round the arm and the shank of the anchor and led up to the neighbouring timberhead where it is belayed by several turns.

When *cockbilling the anchor*, in other words getting it ready for letting go, the shank-painter is eased out slowly until the anchor is suspended vertically again by its own weight, hanging from the stopper, and at this point the shank-painter is removed completely. The stopper is let go by freeing it smartly from its cleat, taking care to stand well away from the whiplash as it clears the ring of the anchor. On our 74, the snatch-sheave on the forward face of the cathead allows a somewhat different arrangement. The anchor-stopper, instead of being crowned with a wall-knot, is seized to a ring-bolt situated a little behind the stopper-hole; the stopper leads out and down the groove in the end of the cathead, reeves through the ring of the anchor and returns up to the snatch-sheave, before being belayed to the stopper-cleat. The anchor is let go simply by cutting the seizings.*

To cockbill the anchor: to lower it until it hangs from the cathead.

*The snatch-sheave can be dispensed with, and the stopper then leads from its ringbolt down through the stopper-hole, through the ring of the anchor, up along the groove in the end of the cathead, and is belayed to a strong cleat fastened to the back of the cathead.

Miscellaneous items.

RIGGING TO THE RUDDER

Rudder-strop: This is designed to prevent as far as possible the rudder from unshipping from the braces, if subjected to a blow of any kind. On our 74 the rudder-strop leads through the mainpiece, and the bights turn in two thimbles fitted to two ring-bolts driven into the false-post; it is served overall with spun-yarn, and is just long enough to allow the rudder to move freely.

Rudder-pendants: Two rings are welded to the rudder-iron situated in the upper part of the rudder, and these take two iron or copper chains, the links of which are bent to a figure-of-eight. Ropes are fastened to rings at the end of the chains, and made fast to ring-bolts driven into the stern below the pilasters separating the second and third lights of the wardroom*. The purpose of the rudder-pendant is to retain the rudder in the event that it should unship.

*Note that the two rings at the ends of the chains are seized together to keep them vertical.

On our 74 a further precaution has been taken to secure the rudder: a rope is spliced round a thimble in a ringbolt on either side of the blade; these ropes then lead forward below the tuck-rail, under the quarter-galleries and up to the poop, where they are belayed to cleats. Iron staples driven in along the lead of these ropes hold them in place, but still allow them to move freely. In the event that the tiller should sheer, the rudder must be immobilized before a new tiller can be shipped, and this is the purpose of these ropes. Frequently however the rudder-pendants perform this function on their own, in which case they lead up to the poop rather than being fastened to the stern. On our 74 this double precaution allows the rudder to be secured more effectively, and it is worth noting that replacing the tiller in a heavy sea is both difficult and dangerous.*

*Chocks of wood are used also, driven home between the sides of the helm-port and the rudder-post.

For all these details, examine Figures 128, 129, 176 and 198 in Volume II.

Tiller-ropes: In the section on the Carpenter in Volume II, I explained how the helm functions, and you will therefore be familiar with the tiller-ropes, which I mention here only in passing. I should however say a few words on the subject of the *helm-indicator*, which is an instrument composed of a fleur-de-lys pointer which moves laterally in a slide on the forward side of the wheel, thanks to a small rope called a *spurling line* which is wound round a small drum placed in the same axis as the barrel of the wheel, but wound in the opposite direction to the tiller-rope. A system of sheaves and blocks transmits the movement of the spurling line to the pointer; the slide has a graduated scale so that taking this as as the chord of the arc described by the tiller the number of degrees of rudder can be read off easily. Some people consider the helm-indicator to be altogether too fragile an instrument, serving no useful purpose, and prefer to estimate from the number of turns of the tiller-rope on the barrel fore and aft of its fixed point how far over the tiller has been moved, and furthermore mark the *king spoke* in some way or other, but the helm-indicator has at least the merit that it allows the position of the helm to be seen from a distance. Let us now examine a number of other miscellaneous ropes:

Helm-indicator or ***tell-tale of the tiller:*** called "axiometers" by the French, they were first introduced aboard the *Achille* in 1727. They were adopted by the (English) Royal Navy in 1748. [Trans.]

Spurling line.

King spoke: the spoke which is at 12 o'clock when the helm is amidships. It was usually marked with grooves turned in the end, or with a few turns of decorative ropework so that it could be felt in the dark. [Trans.]

Swifter: this word has a number of meanings, but here it is a sort of life-line; sometimes it is knotted at regular intervals. Its use is by no means universal.

Swifters: Lines called *swifters* are rove through staples along the waterline. Their purpose is to assist men who fall into the water in battle, but they also serve for various repairs, and more generally for the bowmen of the ship's boats to hook onto.

Concluding line: not used in the English Navy as the entering ladder, although used for stern ladders and other rope ladders. [Trans.]

Concluding Line: A concluding line is rove between the cleats forming the steps of the entering-ladder and the side of the ship; it is made fast top and bottom.

Entering-ropes: As already described in Volume II, the entering-ropes are secured to the stanchions of the gangways and provide a sort of rudimentary bannister for the entering-ladder; they are of white hemp, and are knotted every three feet, and are only rigged for officers, being sleeved with red baize for flag-officers and green baize for the lower ranks.

*If the ship has a driver instead of a mizen-course, the stern-ladder is hung from the boom.

Stern-ladder: This is a rope ladder with turned wooden rungs, and is extended over the stern by a spar*. The rungs are formed by thick pieces of wood 14 to 15 inches [37 - 40 cms] long; at their ends they have a groove and a hole drilled through; these allow a rope to be rigged through the hole and made fast with a lashing at each rung; the ropes forming the sides of the ladder are 3″ to 4″ in circumference [81 - 104 mm], served overall to within 3 or 4 feet of the water.

The ropes to which the rungs are secured are in fact formed from a single length spliced together at its ends. At the bottom of the ladder it describes a simple semi-circle, and an eye-seizing is clapped on at the top, the eye serving to lash it to the spar.

Horses: not to be confused with the horses or footropes of the yards and bowsprit.

While on the subject of rope ladders, I should mention the *horses*, which are short ladders bowsed taut providing access to the shrouds; others lead up to the mastheads from the tops.

The rungs are turned, and are 16 to 18 inches [43 - 48 cms] wide, with a hole drilled at either end. They are prevented from slipping by mouses raised on the ropes, and those for the shrouds (which are fixed) have seven or eight rungs.

*Called ***hammock-cranes*** on English ships.

Hammock-nettings: Protective nettings are placed along the gangways, both outboard and inboard, on the beakhead, and sometimes along the gunwale of the tops. These nettings are made from tarred marline or house-line and are strung along the rails of the gangway stanchions* and the breastrail of the beakhead. The nettings are double, so as to form not only a safety barrier but also a sort of receptacle, when action-stations are called, for the seamen's hammocks and canvas bags, which thus provide some protection from small-arms fire.

Save-tate: A large netting made of thick tarred line and called a *save-tate* may be stretched over the decks from the lower shrouds in order to protect the crew from falling blocks, rigging and splinters in battle.

Save-tate or ***overhead netting***: by no means always rigged in battle. Smyth [op. cit.] refers to these as also being called "splinter-nettings", but see below. Often simply called after the part of the ship they protect: i.e. "quarterdeck netting".

Among other nettings used on board I should mention that used to stow the fore-topmast staysail (and sometimes the inner jib as well) when they are furled; it is stretched from the cap of the bowsprit to the collars of the forestay and fore preventer-stay. If only used for the inner jib it is smaller. It is described above on page 126.

On the gundecks, *splinter-nettings* are sometimes hung against the ship's sides to limit the terrible effect of splinters in battle.

Splinter-nettings: made of sennit and nailed to the ship's sides.

When the topsails are furled "topgallant fashion", small nets called *bunt gaskets* may be used to gather up the bunt of the sail. We will examine these in Volume IV. Other coarse nets are used for hoisting the shot from the shot-lockers and for taking on stores or hoisting them out. It is not usual for ships-of-the-line to rig enormous *boarding-nettings* over their decks to deter boarders.

Bunt-gaskets.

Boarding-nettings.

Slings: In Plate XXXIV in Volume II I described a special type of slings called *can-hooks*, and other types of slings are illustrated in Figure 323 overleaf. All these rope-slings are used primarily for hoisting casks of water or wine.

Can-hooks: used for hoisting casks.

Parbuckle: Also used for casks of water, and shown in Figure 323.

Preventer top-ropes: *Preventer top-ropes* are fitted to the upper masts as a safety measure; they are the same thickness as the top-ropes which they complement (see Volume IV). They pass under the heeling of the topmasts and topgallant-masts, in a score cut for the purpose.

Preventer top-rope: Fr. *braquet*. Not rigged on English ships, and the term is invented. [Trans.]

Boat-gripes: We have already seen how the longboat rests on boat-chocks which are moulded to the form of its lower hull. The thwarts of the longboat are removed so that the barge can be placed inside it, chocked on either side by wedges of softwood. The cutter nests inside the barge in the same way, save that its thwarts are not removed.

Obviously these boats must be secured against the movement of the ship, hence the need for boat-gripes. Three ringbolts are driven into the binding-strakes of the upper deck to port and starboard, one opposite each chock and one in the middle.

Each gripe is formed of a heavy rope with a hook at one end and a thimble at the other, or else a deadeye. The starboard gripes are hooked into their respective ringbolts, pass under the longboat, and are crossed over each other over the gunwale of the cutter on the port side. The port-side gripes also lead under the longboat and up over the starboard gunwale of the cutter. The thimbles are thus opposite each other and can be seized together with lashings, the lashings then being bowsed taut with frapping-turns. If deadeyes are used, they are bowsed taut with laniards in the usual manner.

Another way of securing the boats consists of passing a line through one of the ringbolts and making it fast, then leading it over the boats to the corresponding ringbolt on the other side, back through the first ringbolt, and so on; once each pass has been hauled taut two frappings are clapped on on either side. The same operation is carried out for the two remaining pairs of ringbolts.

It is this latter method which is employed on our 74, since the ringbolts are directly opposite the boat-chocks, so that the fore and after gripes cannot pass easily under the longboat. Bolsters of softwood are placed in the way of the gripes, especially over the gunwales of the cutter*.

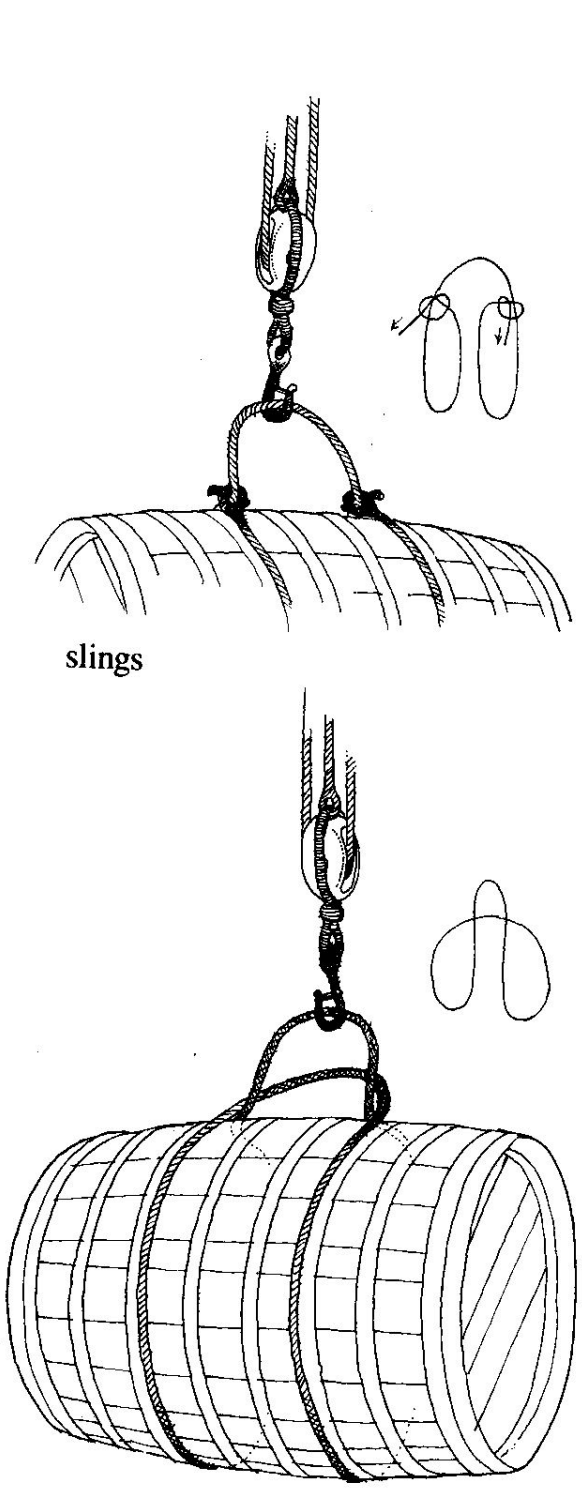
*Sometimes small low saddles of wood with a wide score for the gripes are fitted over the gunwale of the cutter, so that the gripes bear on these saddles rather than on the gunwale itself.

Stowage of the spare spars: The spare topmasts rest on small chocks and are secured by a few turns of line taken through ringbolts. The other spars (except for the yards) are stowed wherever there is room on either side of the longboat, and they are held together by lashings at their ends and tied down with gripes to ringbolts in the deck. However, the precise arrangement is left to the officer responsible, and all that matters is that the lashings should be ship-shape, secure, and yet easy to remove.

I will only mention in passing the ropes and tackles of the guns, which I have already covered in Volume II and to which we will return in Volume IV. The life-floats were described in the section on the Bo'sun in Volume II, and the halliards for the flags and pendants will be covered in Volume IV, in Chapter XXI.

Fig. 323
Slings - Parbuckle - Netting

The nettings have a square mesh, which is not however knotted as is usual. They are made by simply stretching out lengths of spun-yarn or marline with the help of nails and twisting them in and out step-wise at equal distances one from the other.



Weights and principal dimensions of anchors

Weight (Fr. lbs)	Length of the shank	Length of the arms	Breadth at the throat	Thickness at the throat
7,500	5.63	2.00	0.334	0.327
7,000	5.52	1.95	0.324	0.231
6,900	5.44	1.92	0.320	0.228
6,500	5.39	1.89	0.314	0.226
6,000	5.30	1.84	0.302	0.222
5,800	5.25	1.81	0.298	0.219
5,500	5.20	1.78	0.294	0.217
5,200	5.09	1.76	0.285	0.213
5,000	5.03	1.74	0.282	0.210
4,800	4.98	1.73	0.276	0.208
4,600	4.92	1.70	0.271	0.208
4,400	4.79	1.67	0.267	0.206
4,000	4.63	1.62	0.258	0.204
3,800	4.55	1.59	0.253	0.199
3,600	4.46	1.57	0.249	0.195
3,500	4.44	1.54	0.246	0.192
3,400	4.38	1.51	0.242	0.190
3,000	4.30	1.46	0.228	0.181
2,900	4.22	1.46	0.224	0.177
2,800	4.11	1.44	0.222	0.174
2,600	4.00	1.43	0.217	0.172
2,400	3.90	1.38	0.210	0.168
2,200	3.79	1.32	0.204	0.163
2,000	3.71	1.30	0.197	0.159
1,900	3.62	1.27	0.190	0.156
1,800	3.57	1.24	0.188	0.154
1,700	3.46	1.19	0.179	0.150
1,600	3.44	1.16	0.177	0.147
1,500	3.35	1.13	0.170	0.147
1,400	3.33	1.11	0.168	0.145
1,200	3.25	1.08	0.162	0.141
1,000	3.14	1.02	0.152	0.138
900	3.03	1.00	0.145	0.133
800	3.00	0.94	0.143	0.131
700	2.92	0.92	0.113	0.131
600	2.87	0.86	0.110	0.126
500	2.76	0.75	0.108	0.097
400	2.43	0.70	0.097	0.090
300	2.27	0.70	0.097	0.090
200	2.11	0.59	0.083	0.077
100	1.89	0.48	0.079	0.061

*The stock is the same length as the shank.

*The weights are in French pounds of 489 grammes, and the dimensions are in metres.

*The weight of each of the large anchors should be approximately half the weight of its cable, this being taken as 120 fathoms [195 m] long, and half an inch [13.5 mm] in circumference for every foot of beam.
Alternatively, the large anchors should weigh 120 pounds [58.7 kgs] for every foot of beam.

7. RIGGING OF THE SHIP'S BOATS

*The Captain sometimes obtains for his personal use an extra very light boat called a ***gig***, which can on occasions perform invaluable service when a man falls overboard, since its extreme lightness makes it much quicker to launch than the cutter.

In this section we will examine how the boats of our 74 are rigged. There are three* boats in all as you know, and the rig of their masts and sails is borrowed from that of fishing boats, but generally of more modest proportions. Ships' boats in the Navy are generally propelled by oars, and thus their rigging must be easy to take down, take up little room, and be as light as possible. There are no Regulations governing the rigging of ships' boats, and thus many variations are possible. I have done my best to select a rig which is fairly representative of practice on the Atlantic seaboard rather than in the Mediterranean, so that the boats of our 74 have rectangular sails; if I had chosen as my model a 74 built in Toulon I should have been obliged to show her boats lateen-rigged, universal practice in the Mediterranean at this time. As we shall see, I have chosen two different rigs which allows me therefore to expand somewhat on the small boats of the Navy, for you should know that I am by no means blind to the charms of vessels other than warships - but that is another story!

LONGBOAT

*Generally stepped more or less at the mid-point of the length.

*It is a miniature version of the mizen-mast step of our 74.

The mainmast* is 2 3/4 times the beam in length, and its given diameter, which is situated at the level of the thwart against which it is stepped, is equivalent to 1/48th of its length. The mast-step consists of a timber nailed to the boat's keelson*. An iron collar is positioned on the mast-thwart of the mainmast, which is rather thicker and broader than the other thwarts. The collar is hinged and can be opened (see Figure 207, Vol. II). The foremast is shorter by about one eighth, the same proportions govern its thickness, and it is stepped in the same manner about one tenth of the way aft.

Fig. 324
The Longboat

A dotted line shows the extent of the storm mainsail. There is a vane at the foremast head and a flagstaff at the main. Two alternative methods of rigging the shrouds are shown, one on the foremast and the other on the main. A dotted line shows an alternative arrangement for the mainstay.



Scale: 1/72

The *jigger mast* is twice the beam in length, and the same rules govern its thickness. It is stepped inside the transom, to port*; it is held in place by two iron clamps, and rests on the shelf which supports the davit-timbers. The bowsprit, or more accurately the jibboom, is 1 1/2 times the beam in length; once again the same rules govern its diameter, and its thickest point is at the heel; it is secured by an iron collar bolted to the stem (see Fig. 207, Vol. II), and by a crupper round the bow-thwart.

A number of alternative rigs can be offered for the longboat: foremast, main and jigger rigged with spritsails* - fore and main with *lugsails* and the jigger with a spritsail - fore and main with lateen sails and the jigger with a spritsail again. There are no hard-and-fast rules, but for our 74 I have chosen lugsails, which is a common rig on the Atlantic coast, and the tendency is to rig the smaller boats in the same manner. The fore- and mainsails are bent to yards whose length is (respectively) equal to 1.0 and 1.2 times the beam (greatest diameter 1/50th of the length, smallest half that). This yard is raked so as to form an angle of 60 to 70 degrees with its mast, the masts themselves being raked aft 3 inches in the foot [81 mm in 324 mm] for the mainmast, and half that for the foremast*. The yards are slung about a foot below the sheave through which the halliard reeves, and the halliard is made fast one third of the way along the yard. An iron traveller is fitted over the masthead and the halliard is made fast at its standing end to a ring welded to the side of it; from there it reeves through the masthead sheave, runs down to the foot of the mast, and is belayed to a cleat; this is the arrangement which I have adopted for the foremast of the longboat.

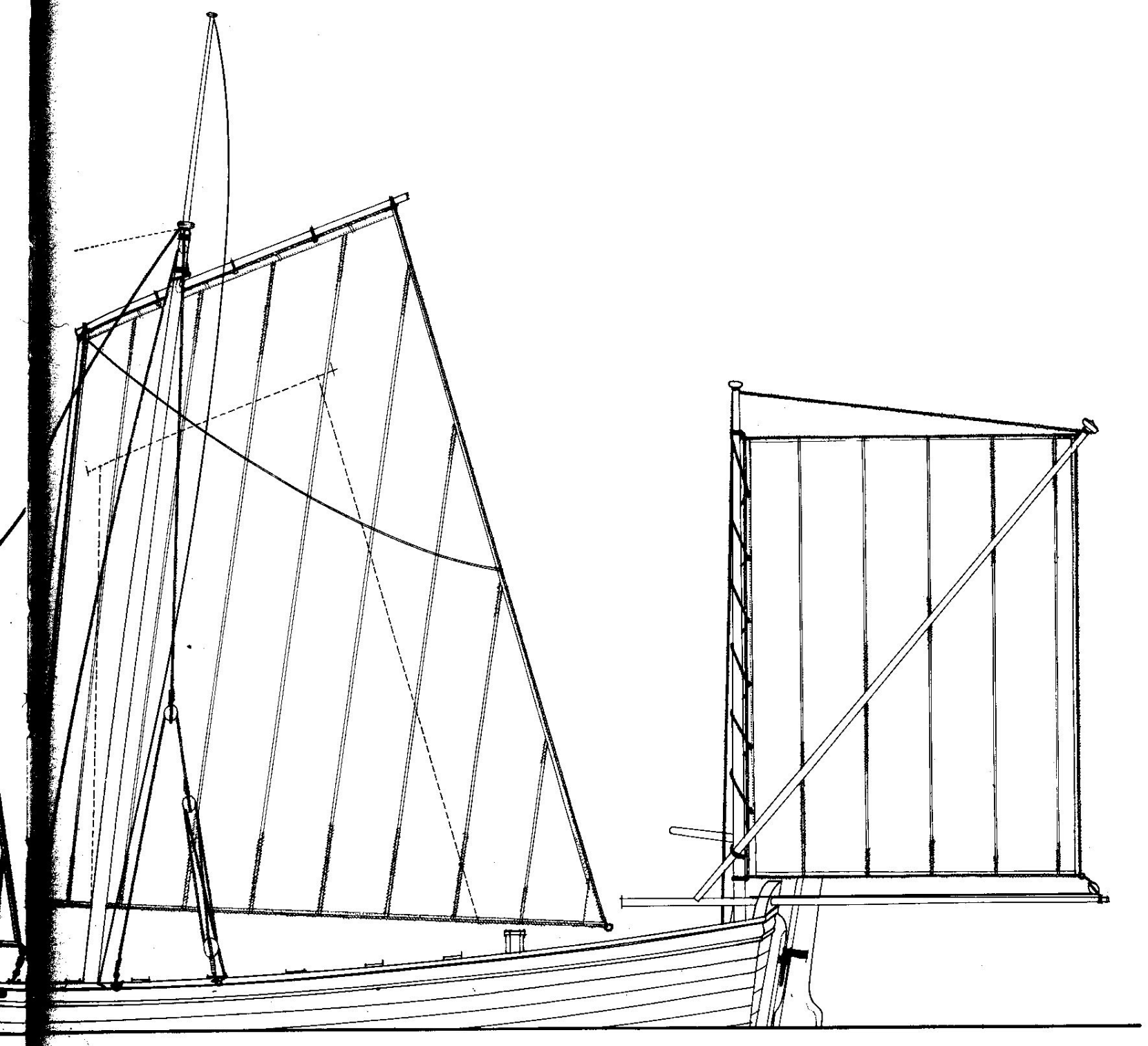
Jigger mast: small supplementary mast stepped right at the stern in vessels which because of their length require a third mast, without for all that justifying a true mizen; thus for example the brigs shipping out of St Malo and the barks from Nantes have a jigger mast. I should make it clear that this sort of mast is never counted when defining the rig of a vessel by the number of masts stepped.

*The jigger mast must be stepped off-centre so that the tiller can be moved.

*See below.

Lugsails: the yard is suspended "by the thirds", a peculiarity of luggers and chasse-marées, both types of vessel being extremely common off the coasts of Brittany; the largest however ship out of Newfoundland for the cod and capelin fisheries.

*There is nothing fixed about these degrees of rake: they may be raked more, or indeed not at all.



As an alternative (shown on the mainmast), the halliard may be composed of a tie secured by a wall-knot in the ring on the traveller, the other end reeving through the masthead sheave and turning in a block at its end; the fall, which is thinner, is made fast at its standing end to the gunwale, reeves through the block and is belayed round a cleat nailed also to the gunwale. The halliard is always placed on the weather side and serves as a stay. The yard is secured to the traveller by a cringle which is served all round. The cut of the sails is extremely simple, since it is dictated by the length of the yards (less a small amount for their arms) and the height to which they are hoisted; the drop of the sail is as far as the gunwale, the fore leech is parallel to the mast, and the after leech of the foresail is dictated by the position of the mainmast, that of the main by the position of the stern-sheets, the clue coming back as far as their fore edge or at most their middle.

Bearing out spar.

The tacks of both sails are got down by a line made fast to the gunwale of the longboat, and the sails are set by means of sheets made fast to the clue; the sheets are double and reeve on either side through blocks or fixed-blocks attached to or set into the gunwale some way aft. Close-hauled a spar called a *bearing out spar* may be used like a bowline to extend the weather leech. To brail up the sails double leech-lines are used, one passing up either side of the sail; they are made fast roughly half-way down the after leech, and meet at the upper tack, where they are spliced to a second line; this line reeves through a thimble lashed to the end of the yard and when hauled taut with the sheets let fly the sail is brailed up against the mast and the yard.

These sails, and indeed all the boat sails, are put together in the way already explained, the canvas used being single mélis of the lightest type, the width of each cloth being 29 inches [786 mm]. I forgot by the way to mention that all the sailcloth destined for the King's service must incorporate a blue marking-yarn woven into the warp 1″ to 1 1/4″ [27 - 34 mm] from either edge. The seams are one inch wide. Patches may be sewn into the corners of the sails.

Storm mainsail: the storm mainsail differs from the usual mainsail in that it is essentially a *standing lugsail* rather than a *dipping lugsail* - the yard or ***lug*** does not require to be lowered when changing tack.

Sometimes the foresail and mainsail have one or two reef-bands sewn to the lower part of the sail, parallel to the foot. On occasions, in place of the mainsail, a *storm mainsail* is bent to a yard which is only 2/3rds of the length of the usual yard, and this is not hoisted nearly so high, so that the drop of the sail is significantly less; however, the main distinguishing feature of this foul-weather sail is that its lower tack is made fast at the foot of the mainmast (it is shown dotted in Figure 324). Indeed, the principal disadvantage of lugsails is that the yard must be dipped each time the boat goes about, otherwise the fore part of the sail is flattened against the mast. With the storm mainsail, its area is small enough to avoid this disadvantage.

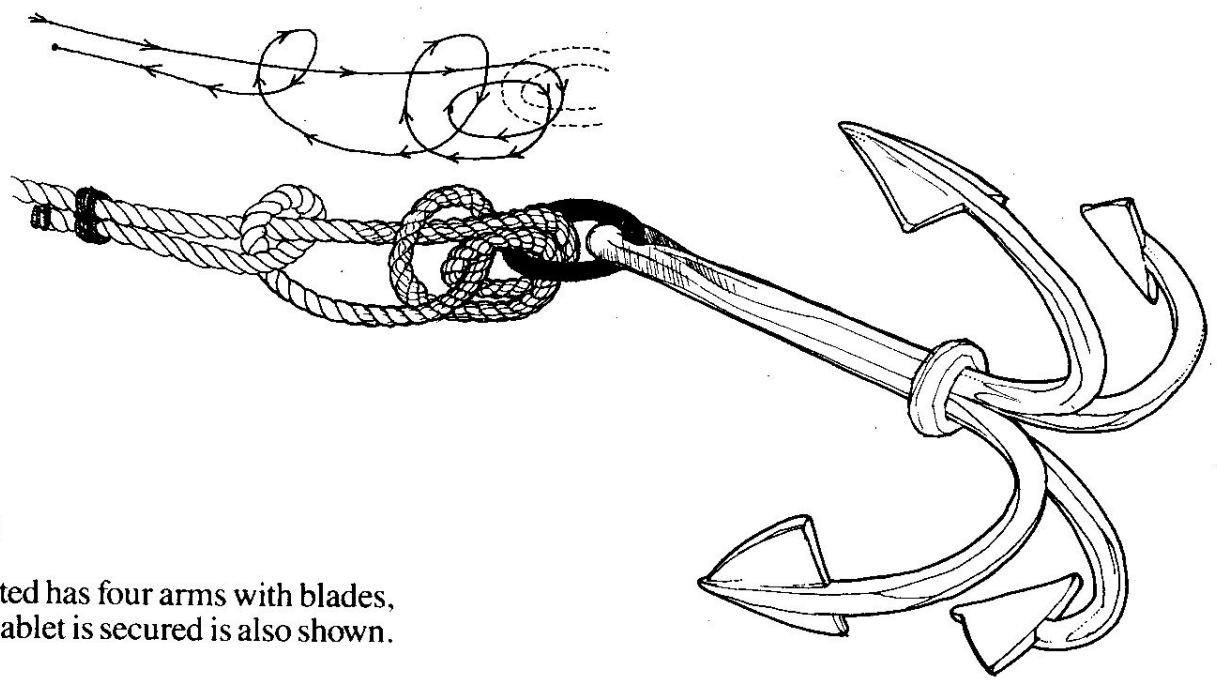


Fig. 325
Boat Grapling

The one illustrated has four arms with blades, and the way its cablet is secured is also shown.

When a vessel rigged with lugsails is *taken aback*, i.e. when for whatever reason (generally unexpected) the wind strikes the sail from ahead even when close-hauled, the sail is flattened against the mast, often with considerable force, and the vessel may be in great danger; however, with the storm mainsail the greater part of the canvas yields to the wind and the small amount which is flattened against the mast is insufficient to cause any real danger; this is the great advantage of this smaller sail, which is used during the foul-weather season. I have been rather carried away in my description, but I can only plead that the rigging of small boats is a subject which I find fascinating. It should nevertheless be remembered that the ship's boats are primarily designed for rowing, and have therefore a relatively modest sail area compared for example with a *chasse-marée*, which might have a mainmast as much as four times (instead of 2.75) its beam in length - this is admittedly an extreme example, for the chasse-marées of St Jacut, which were noted for the enormous amount of sail which they carried; the other spars were also proportionately longer.

Taken aback.

Chasse-marée: literally "tide-chaser". These were very fast vessels used to take fish in to market from the slower fishing-boats. They were sometimes used with considerable effect as gunboats, for smuggling, and even as privateers.

However, let us return to the masting of our longboat. The foremast and mainmast are each supported by a single pair of shrouds; they are middled, the bight is placed over the masthead below the truck, and the two legs come down on either side; at their lower end they have a single block; in the case of the foremast there is a simple laniard which is hooked to the gunwale at its forward end, reeves through the block, and is then made fast round a cleat.

Alternatively (and this is the method I have adopted for the mainmast), the laniard reeving through the shroud block is a runner, made fast to a small tackle composed of a single and a double block.

The stays are clapped on below the mast trucks; the forestay performs the function of jib-halliard as well (see below), while the mainstay is made fast at the foot of the foremast; alternatively, it may lead forward to the head of the foremast, reeve through a block seized below the truck and then down to the foot of the mast, but this arrangement does not provide very solid support.

Let us look now at the jib, which is rigged by means of a halliard, a tack and a sheet; these reeve through sheaves or small blocks at (respectively) the foremast head, the outboard end of the jibboom, and at the gunwale.

Finally, let us examine the jigger mast, which has a *spritsail*: the sail is approximately rectangular in shape and is laced to the mast or else slides on wooden hoops. The upper corner or peak of the sail is extended by a sort of yard angled at 40° - 50°, and this yard is called a *sprit*; at its lower end it is held against the heel of the mast by means of a rope cringle called a *snotter*, while the peak is supported by a rope which is made fast round the sprit below the truck, reeves through a sheave at the masthead, and is belayed at the foot of the mast. It will be obvious that this rope acts as a sort of brail, allowing the sprit and the sail to be brought in against the mast. The position of the jigger mast right in the stern demands the use of a boom not dissimilar to the jibboom; the sheet reeves through a sheave or a small block lashed to the end of this boom, and is belayed round a cleat on the transom. Note how the boom is placed to port of the jigger mast and actually passes through a hole in the transom, being fastened inside by means of an iron collar and a lashing.

Spritsail: fore-and-aft sail; not to be confused with *the* spritsail, which is a square sail.

Sprit; snotter.

The explanations which I have given above for the spritsail bent to the jigger mast of the longboat apply equally to the spritsails forming the principal rig of the other two boats.

Having concluded my description of the way the longboat is rigged, let us now examine a number of additional items with which it is equipped. When the boat is propelled by oars, the masts and sails must be struck down, and they are lashed to the thwarts against the sides. Alternatively, it is sometimes preferable to support them in *crotches* overhead, 3 or 4 feet [97 - 130 cms] above the thwarts. The crotches are made of iron, and their upper part forks into two horns; there are two, one of them in the middle of the bow-thwart, and the other in the middle of the aftermost thwart (forward of the stern-sheets).

Crotches: iron, or sometimes timber supports.

*For example when ferrying troops; the men are standing, and the boat is towed.

There are also wooden stanchions, designed to support a breastrail when required*; the stanchions may even be used to erect a breastwork over the gunwale to provide protection from musket-fire. There are four iron-hooped stocks to take the crotches of the swivel-guns when the boat is armed. A flag-staff is fitted to the head of the mainmast by means of iron collars, the flag usually flown being a command pendant (see Vol. IV). If the jigger mast is not rigged, its place may be taken by an ensign-staff, and on occasions a jackstaff is rigged at the bows. There is a vane at the head of the foremast or the main. In order to provide some protection from the elements, a canopy or awning may on occasions be rigged, spread over the crotches for the masts and spars, and supplemented by pieces of wood placed fore-and-aft and athwartships. The stern-sheets are protected by a small awning called a *tilt*, supported on wooden laths or *staves* and cross-pieces.

Tilt; tilt-staves.

Gangboard: not to be confused with the planking of the gangways.

There is a *gangboard* for getting in and out of the boat, and this is usually placed amidships along the thwarts; it is one foot wide [32.5 cms], and at most two thirds the length of the longboat. It is composed of two or three narrow boards joined together by cross-pieces forming cleats.

The boats have no anchors in the strict sense, but are equipped with boat graplings (see Fig. 325). For the oars, you should refer to Figure 326 below. At the end of this chapter there is a list of boats' stores, to which I have added some notes, and this will amplify somewhat the explanations given above.

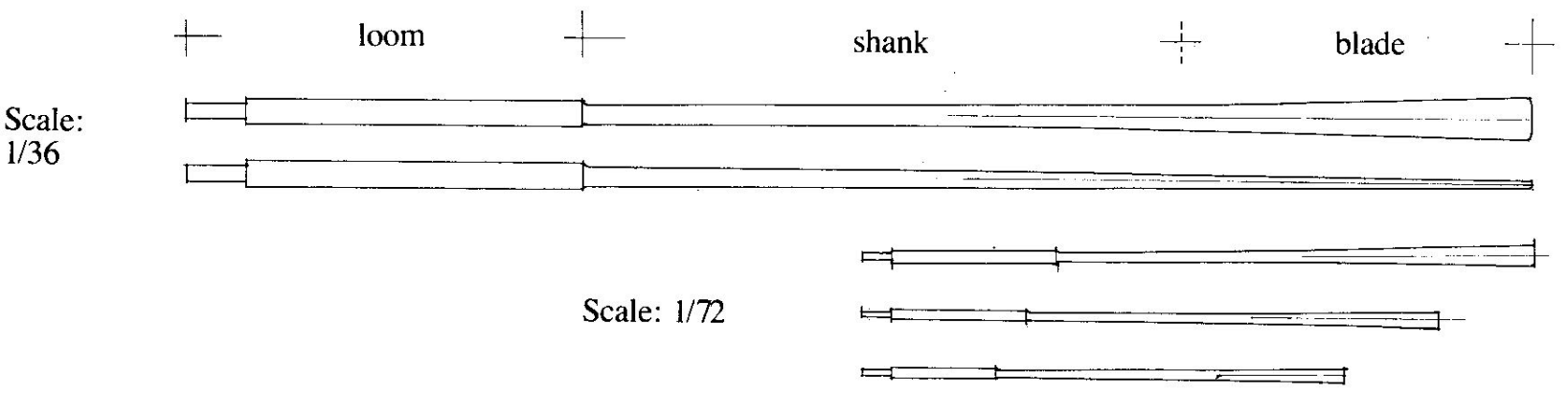


Fig. 326
Oars of the Ship's Boats

The oars are made of beech, ash or fir, and since they are designed to be used double-banked, their length is equal to 1 1/2 times the maximum breadth of the boat. About one third of this is made up by the *loom**. The loom is the part which is within board, and it is usually square in section to provide a counterweight; it ends in a rounded section called the *handle* where the oarsman places his hands. The part which is dipped into the water is called the *blade*, and the part between the blade and the pivot or thole is called the *body* or *shank*. The thickness of the oar at the row-lock is equal to 1/48th of the overall length, the breadth of the blade 1/36th of the same length and one inch thick; the blade represents 1/5th of the overall length of the oar. The oars are pulled against the fulcrum formed by the thole-pin, and are thus placed forward of the pin, secured in place by rope *grommets*. Double-banked oars are stowed on the bottom boards, blades forward.

*Obviously the length of the loom must be such that the two oarsmen seated on the same thwart do not get in each other's way: it is equal to half the maximum breadth less the width of the gangboard.

BARGE

*The lugsail rig is also common.

Sliding gunter lug: frequently confused with the spritsail rig.

*Sometimes the jib is balanced by a jigger, although this is unusual for the smaller ship's boats.

The barge is most commonly spritsail-rigged*, but on occasions it may be "gunter-rigged": in the latter case, the yard, instead of being raked, is rigged vertically and serves to extend the height of the mast, to which it is fastened by two iron hoops within which it is able to slide freely. The dimensions of this yard, usually referred to as a *sliding gunter lug*, are the same as for sprits, and the amount of "overlap" is such that the lug projects above the mast by two thirds of the length of the mast. A triangular sail is bent to the lug and the mast by means of lacings. However, I have ignored this variant and adopted instead the much more common spritsail rig for both masts, supplemented by a jib, although this latter sail is by no means universal*. The masts follow the same proportions as those given for the longboat, based on the maximum breadth.

The jib and its boom are rigged exactly as on the longboat. The foremast, which is stepped like that of the longboat, has three small sheaves at its head, which is accordingly reinforced; the lower of the three sheaves serves the jib halliard.

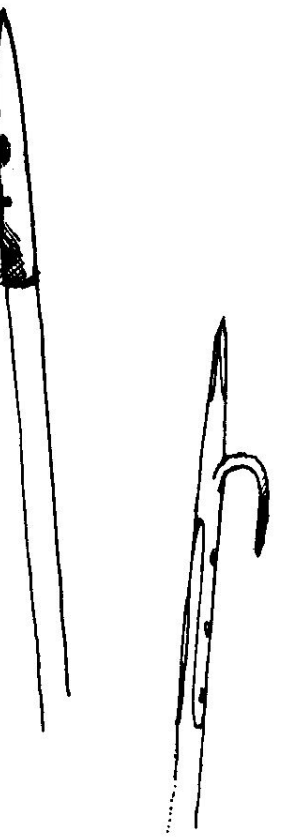
The foresail is almost rectangular in shape, and is put together in the usual manner; a halliard is made fast to the *nock* and reeves through the middle sheave before being belayed round a cleat or simply round the sail-thwart. The sail is laced to the mast or else made fast to wooden hoops, and the tack is secured by several turns taken round the foot of the mast. The peak of the sail is extended by the sprit, the heel of which is seized to the mast by a snotter; the peak is lashed to the end of the sprit, below the truck, and the sprit itself is topped by a *topping-lift*, which reeves through the uppermost sheave at the masthead and is belayed at the foot of the mast. The clue is rigged with either a single sheet or double sheets.

Nock: the upper fore corner of a rectangular sail.

Topping-lift.

As I have already explained, hauling on the topping-lift acts as a brail, bringing in the sprit and the sail against the mast. A light spar serves as a boom to extend the clue or the after leech to leeward when sailing close-hauled, thus serving in effect the role of bowlines. The mast is supported by a single shroud like that of the longboat, although sometimes there is no shroud at all. The mainmast is rigged in exactly the same way as the foremast, save that there are only two sheaves in the head, which may on occasions be replaced by small blocks. Sometimes the peak of the sprit may be secured by two braces. The mainmast may also be fitted with a pendant-staff, for a command pendant (see Vol. IV), secured by a small mast-cap of iron and a lashing, while a vane is fixed in the truck of the mainmast or foremast. An ensign-staff is made fast at the transom.

Fig. 327
Boat-Hook Irons

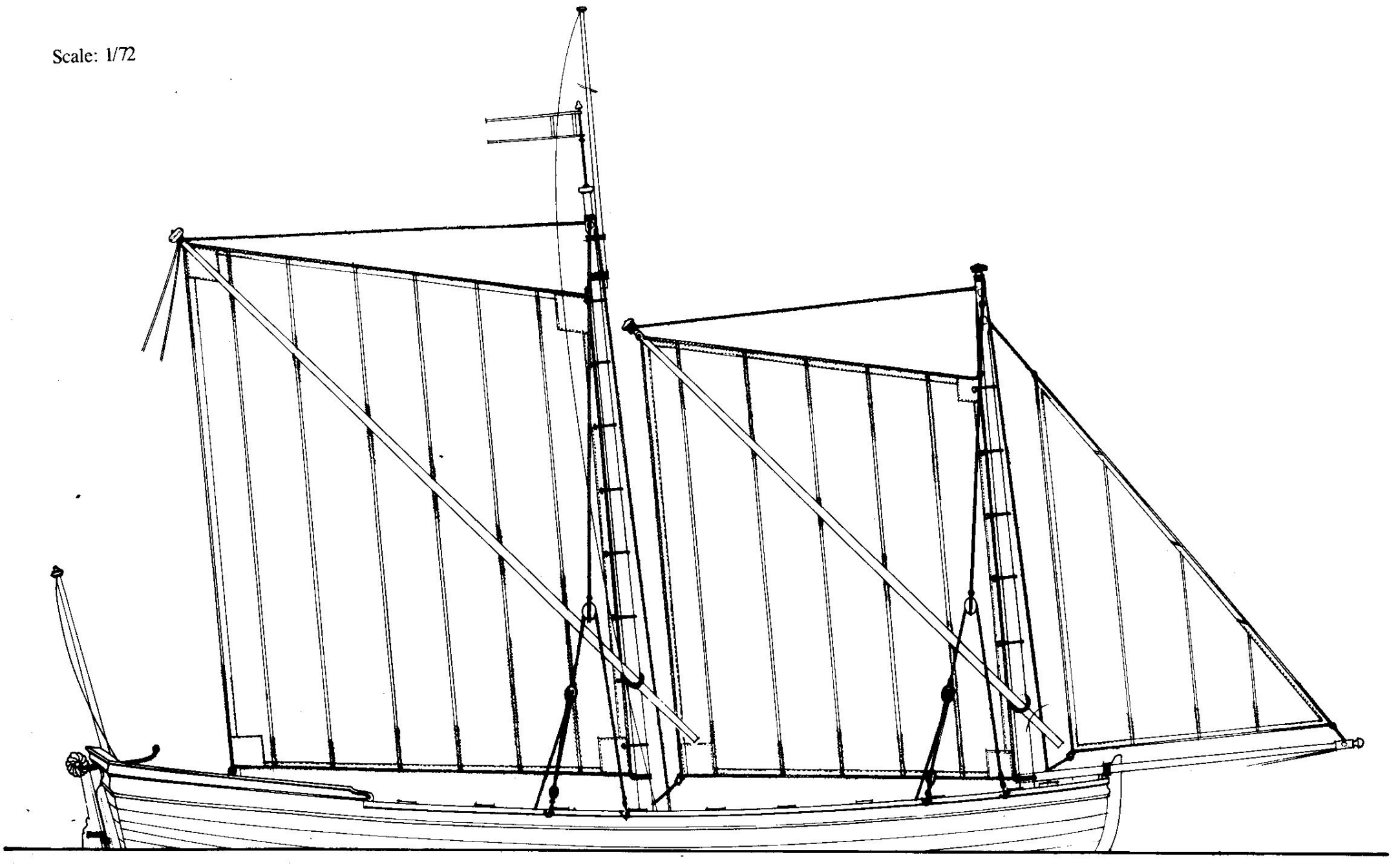


As with the longboat, the smaller boats are also fitted with crotches to take the spars when rowing, and to spread an awning; the tilt over the stern-sheets for the officers is also similar, but rather more refined, since it is fitted with curtains. There is one shown in Figure 452 in Volume IV.

Fig. 328
The Barge

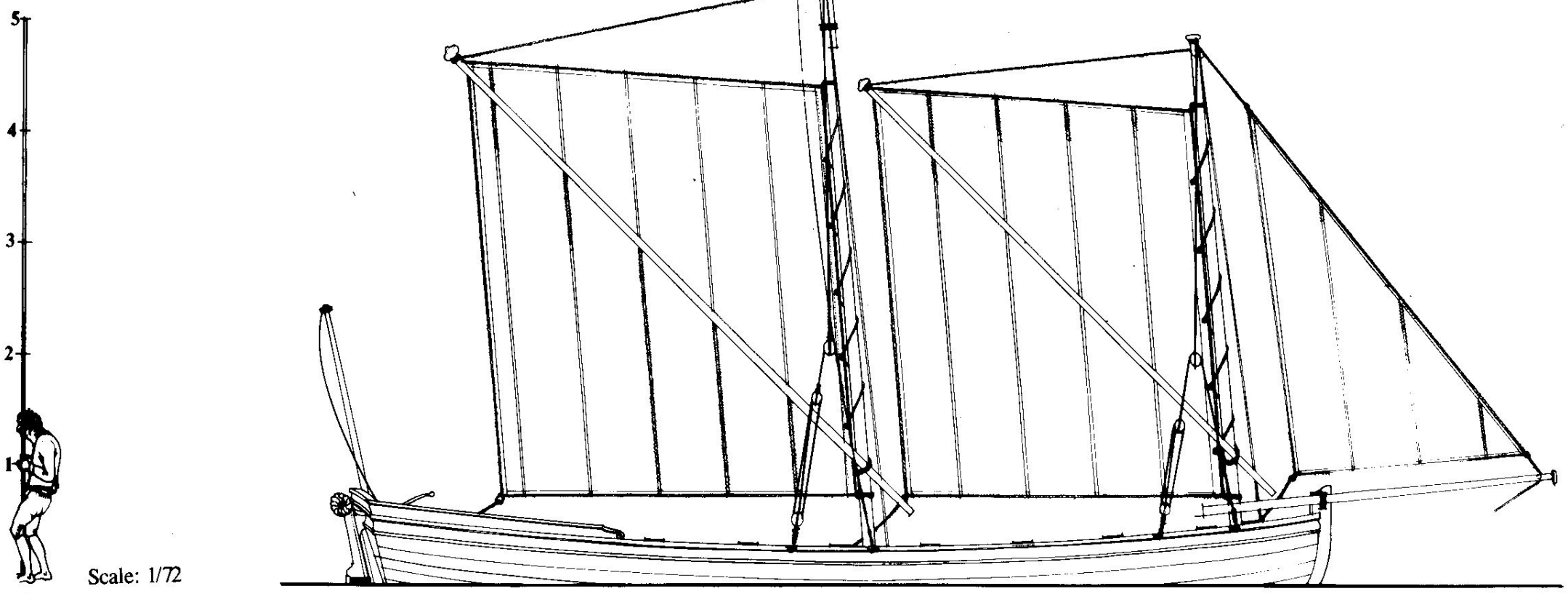
The vane should be shown at the foremast head, since in this position it will be obstructed by the pendant-staff.

Scale: 1/72



CUTTER

The cutter is in every respect identical to the barge in terms of its rigging.

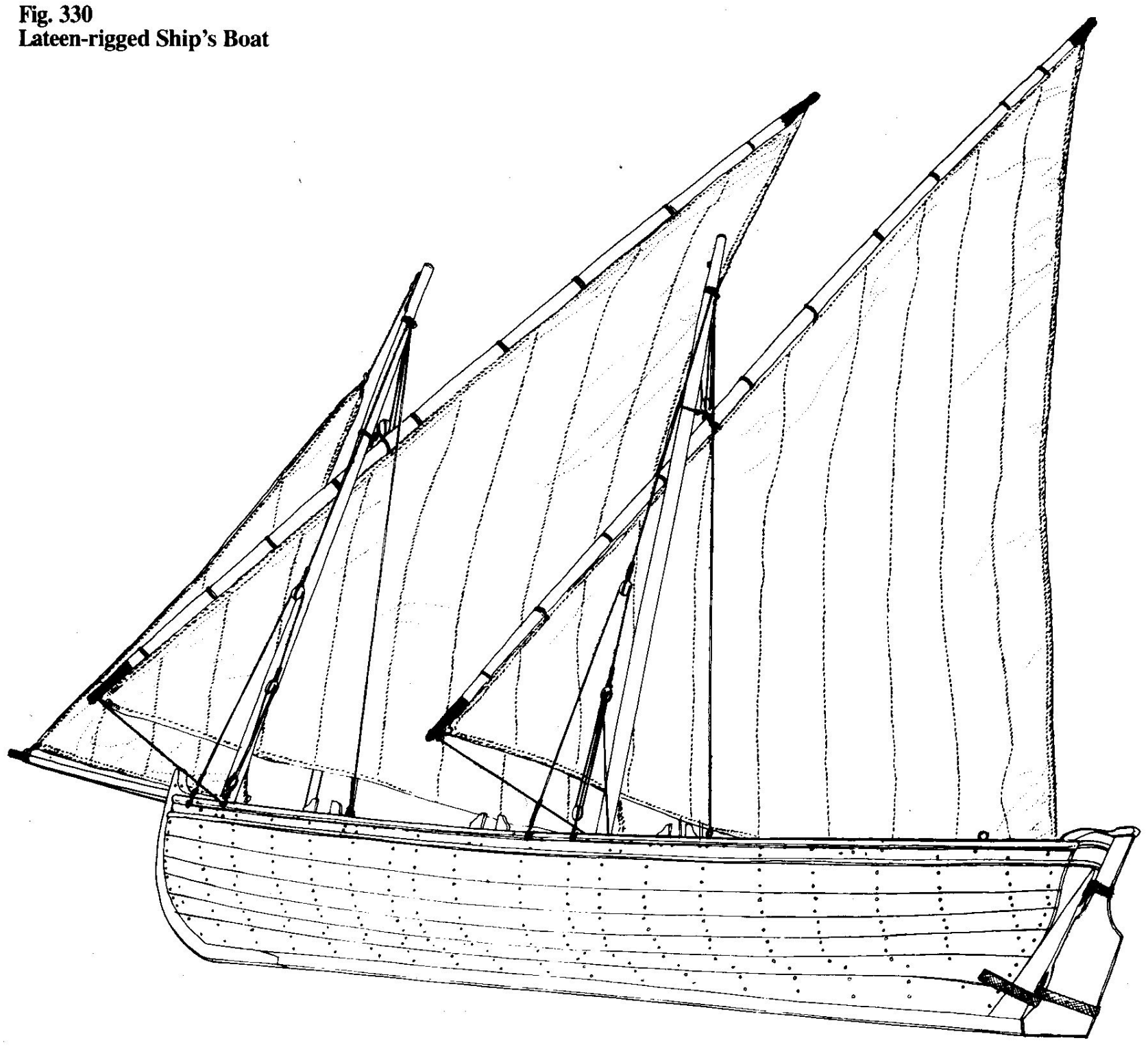


Scale: 1/72

Fig. 329
The Cutter

I will take this opportunity to mention that the various lines used for the boats, whether for the shrouds, sheets or tacks, are all the same diameter, measuring 13, 11, and 10 mm respectively for the longboat, barge and cutter. The mainstay of the longboat is half the thickness of the other lines.
The cablets used for anchoring are slightly more than twice those diameters.
There is a hole or *drain* in the bottom of the boats, situated in a small bilge or well beneath the aftermost row-thwart; the water runs down under the floor-timbers through a small limber-passage and gathers there, to be bailed out by means of a *boat-scoop* when the boat is in the water. If the boat is high and dry or being hoisted in, all that is required is to remove the drain-plug. Great care must be taken however to ensure that the plug is removed when the boats are on their chocks, since otherwise they could fill with spray.
Once again, the vane should really be shown at the foremast head, as in Fig. 324.

Fig. 330
Lateen-rigged Ship's Boat



EQUIPMENT OF THE LONGBOAT

Awning	Page 224
Boat-grapling	Fig. 325
Boat-gripes	Page 217
Boat-hook irons	Fig. 327
Boat-hook staves	-
Boat-scoops	-
Cablets	Fig. 325
Canvas roof of tilt	-
Cloths for decorating the boat	see Vol. IV
Command flag or pendant	see Vol. IV
Crotches for the spars	Page 223
Davit	Fig. 206
Davit-rollers	Figs. 206-10
Distinguishing pendants	see Vol. IV
Ensign, in its bag	-
Ensign or jack	Fig. 324
Ensign-staff truck	-
Fid	Fig. 248
Gangboard[1]	Page 224
Hatchet	Pl. XXXVII
Hinge-plates[2]	-
Iron pins[3]	-
Jibboom collar	Fig. 209
Mainmast clamp	Fig. 207
Mast-fittings	Fig. 324
Masts	Fig. 324
Mast-trucks	-
Mortice-locks[4]	-
Oars, including spares	Fig. 326
Pendant-staff	Fig. 324
Rudder-irons	Fig. 208
Sails	Fig. 324
Sprit-trucks	-
Stern-fast[5]	-
Thimbles	-
Tilt-staves	Page 224
Vane acorns	Fig. 175
Vanes	Fig. 175
Vane-spindles	Fig. 175
Vane-stocks	Fig. 175
Wooden mallets	-
Wooden stanchions	Page 224
Wooden thole-pins, incl. spares[6], and their securing lines	-
Wooden tillers	Fig. 208
Yards	Fig. 324

EQUIPMENT OF THE BARGE AND CUTTER

Awning
Boat-grapling
Boat-hook irons
Boat-hook staves
Boat-scoops
Cablet
Canvas roof of tilt
Cloths for decorating the boat
Command flag or pendant, in its bag
Crotches for the spars
Distinguishing pendants
Ensign, in its bag
Ensign-staff truck
Fid
Gangboard
Hatchet
Hinge-plates
Iron mast-cap to take the pendant-staff
Iron tiller[7]
Jibboom collar
Mainmast clamp
Mast-fittings
Masts
Mast-trucks
Mortice-locks
Oars, including spares
Pendant, in its bag
Pendant-staff
Rudder-irons
Sails
Sprits
Sprit-trucks
Thimbles
Tilt, complete with curtain-poles, rings and curtains of red serge for boats of ships commanded by flag-officers, and of green serge for all others.
Tilt-staves
Vane acorns
Vanes
Vane-spindles
Vane-stocks
Wooden mallets
Wooden thole-pins, incl. spares, and their securing lines

[1]The gangboard is removable, and in this instance is about 2/3rds the length of the boat; triangular 1″ cleats are nailed to its upper surface every 12 inches. At one end, the under side of the plank is scored and provided with a strop, enabling it to be made fast on the boat's stem.

[2]Hinge-plates: two iron straps joined by a hinge-pin. They are for the lids of the lockers in the stern-sheets.

[3]Not to be confused with the wooden thole-pins; these are of iron, and serve to confine the cable or other rope as it passes over the gunwale.

[4]For the stern-lockers.

[5]Small hawser also serving as a tow-line; used to secure the stern of the boat on a beach on which the sea is breaking heavily, the bow being secured by the grapling.

[6]These are wooden pins which fit into holes in the gunwale; the oar is secured to the pin by means of a grommet. Sometimes the grommet is dispensed with, two tholes being fitted instead.

[7]Iron for the two smaller boats.

PAINTING OF THE MASTS

The painting of the masts is left to the individual initiative of the officers, but only black and white are ever used. The lower masts are painted overall, the lower part in black for a distance of several feet above the coat, and the main part in white. The hoops are picked out in black, or else left browned. The upper part of the mast is painted black, generally from a little way below the bibbs. Sometimes the rubbing-paunches are painted black for their whole length, but more usually they are left the same colour as the mast. The bibbs, trestletrees, crosstrees, tops and mast-caps are all painted black. The topmasts are painted black over the part which extends below the mast-cap of the lower mast, but above the cap they are merely treated with resin so that they retain their natural colour; sometimes however the hounds and the masthead of the topmasts may be painted black. The topgallant trestletrees are black, and the topgallant-masts may also be painted at their upper part, or alternatively no paint may be applied at all.

The bowsprit is painted black over its entire length, or sometimes in black only from the beakhead to the gammoning, in white from there to the first hoop beyond the jackstaff-standard, and then in black again, including the bees and the cap. The jibboom is left unpainted for all but a few feet at its extreme forward end. All the yards are painted black, while the studdingsail-booms are often only painted at their outboard end.

The bumpkin is also painted black, as are the swinging-booms. The blocks, if painted at all, are painted black, and in all events the ironwork is painted black, the shell sometimes being merely oiled.*

*The jeer-blocks and bollock-blocks are usually painted black.

All this black appears to make the rigging thinner, giving an impression of lightness; however, some people believe that black paint shortens the life of the masts and spars because of the fact that it absorbs heat, a problem which is all the more acute in the tropics, and for this reason they advocate the use of white paint.

The rigging, being tarred, is a reddish brown colour, and the sails are never white: at best they are off-white, or a light ochre somewhere between yellow and russet.

BOSUN'S STORES

On pages 112 and 113 of Volume II I listed all the main items coming under the Bo'sun's department, but to this list should be added everything to do with the rigging: blocks, hearts, deadeyes, parrels, rack-blocks, etc., and then of course all the ropework. Furthermore, he is responsible for all the spares as well: pieces of rope in every size at 1/2 inch intervals from 2 to 7 inches; 6, 9, 12 and 15-thread line; line for seizings; marline, house-line, spun-yarn; junk; blocks of every kind. All these spares are kept in the storerooms on the orlop, forward of the bitts (see page 57, Volume II).

XV

MAINTENANCE

Maintenance

This short chapter is, as its title indicates, devoted to the maintenance-work carried out on our 74. The first section covers laying up, since as a rule it is when the ship returns to port at the end of a commission that a large number of repairs must be carried out. None of this work can be done until the ship has been emptied of its stores.

1. LAYING UP

The work of emptying the ship is carried out by the crew under the orders and supervision of their officers and petty-officers. It is only when the stores have been taken off that the ship is handed over to the Port Captain (see Volume I, pp. 14-15), and becomes his responsibility.

Emptying the ship consists primarily of removing: the guns and their carriages, powder and shot, anchors and cables, casks, the stores of the various warrant officers, and the rudder; of the rigging, only the lower masts and the bowsprit are left in place, supported by their shrouds and stays; the mast-caps are removed*, but more often than not the tops are not sent down; the galley fires and ovens are taken apart (by the Dockyard masons); the ballast is left on board, and will only be shifted when the ship is about to be commissioned again; the ship's boats are left on board. Thus lightened, our 74 now has a height of gundeck sill of eight feet [2.60 m], whereas fully stored and armed this height is, it will be recalled, only five feet [1.62 m].

*An upturned cask is placed over the end of the head-tenon.

The guns and the anchors are stored in special parks; the small arms are kept in the Dockyard armoury; those masts which are not made-masts are submerged in mast-ponds filled with seawater. All the other stores, including the made-masts and spars, are placed under cover in a storehouse reserved for the particular ship*. The Port Captain provides all the equipment necessary for stripping the ship: pontoons, lighters, boats etc. As the stores are taken off, inventories are drawn up and lists signed and countersigned by the ship's officers and those of the Dockyard.

*English practice was to store each type of stores together, labelled, and under the charge of a specialist; thus for example all the blocks of all the ships in Ordinary would be placed in the same storehouse, under the charge of a blockmaker. [Trans.]

Once the ship has been emptied it is handed over to the Port Captain, who appoints the watchmen*. At the bow and the stern the weight is relieved by shores bearing on floating caissons*, the purpose being as far as possible to prevent the ship from hogging*. The ship is moored to the caissons by means of old cables passed out through the second-to-last gunports at the bow and the stern. The decks are shored with pillars, the lower finishing of the quarter-galleries is removed, the scuppers are fitted with *spouts* to keep the water away from the ship's sides. The mast-wedges are knocked out, the coats are tarred, and scantlings are placed over all the hatchways and covered with tarpaulins; lengths of sennit are nailed over the top; the top of the stem is protected in the same manner. The upper deck gunports are boarded up, and the gundeck hatchways covered with gratings.

*These positions are particularly reserved for former ship's carpenters and caulkers, retired from seagoing service on account of injury, ill-health or wounds.

*Called *coffres flottants* or *caisses d'appui* in French; they were not used in the English Navy. [Trans.]

*Some people recommend that while ships are laid up in Ordinary they should be ballasted with seawater, in order to make them sit as low as possible in the water, thereby preventing hogging.

Spouts: short lengths of hollowed-out wood.

Boot-topping: the ship is heeled over on one side as far as possible (called a ***parliament heel***), and the filth scraped off; the operation is then repeated for the other side.

Hogged: not to be confused with the arching of the keel, also called hogging.

Every day the ship is washed down with seawater; the decks are swept every two days, and when the weather is fair the gundeck port-lids are raised in order to create a through-draught, and a wind-sail is fitted. The pumps are inspected daily and the bilges emptied by means of buckets. Those are the main tasks of the watchmen, who live on board, sleeping in the wardroom.

However, despite these precautions of regular ventilation, washing down and daily inspection, the ship will inevitably deteriorate, and every three years will have to be cleaned, which I will describe shortly. The other years a *boot-topping* is carried out, and in the meantime the hull is *hogged* whenever necessary.

This operation consists of using a sort of large flat broom called a *hog*, made up of a large number of thin twigs fastened between two boards securely bound together; the ends of the twigs are trimmed square (see Fig. 331), and a long pole or staff is secured to the end; two ropes are used to manoeuvre it. The longboat or one of the smaller boats is used to work this long broom, scrubbing the hull so as to remove as much as possible of the weed and barnacles. The disadvantage of the hog is that it can tear out the caulking, and so it must be manipulated with care, unless the hull is sheathed with planks (see section 4 of this chapter).

Hog.

Twice a year the ship is caulked inside and out. The planking is scraped and treated with resin in April, and tarred in September. Every two years, in August, a coat of paint is applied to the carved-work and to the upper works.

This therefore, in brief, is the way the vessel is stripped of its stores and maintained in Ordinary, as required by Regulations.

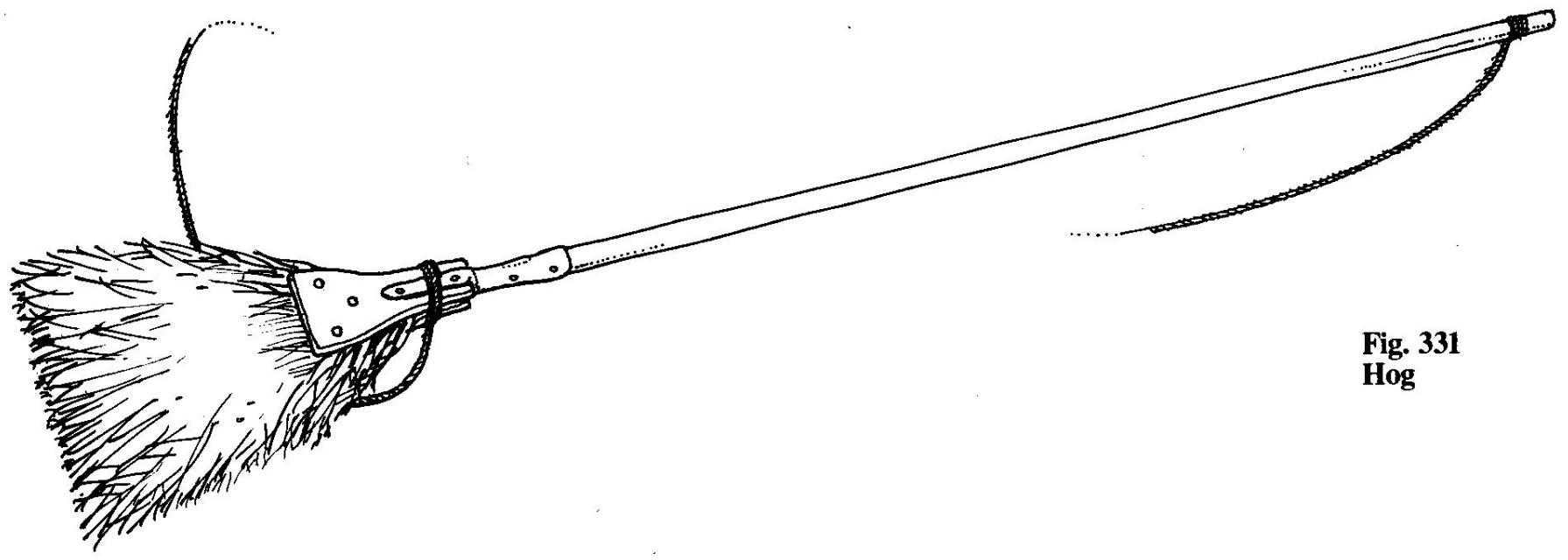


Fig. 331
Hog

2. CAREENING

The object is the maintenance of the underwater hull by renewing the caulking and paying it with a fresh coat of stuff (see Vol. I, pp. 153-4); at the same time the opportunity is taken to inspect and repair if necessary the bottom-planking or to renew the sheathing. This work can be carried out by putting the vessel into dry-dock, or else by hauling her up onto a slip.

However, the most common method is to *heave the ship down on a careen*, heeling her until the keel is out of the water.

Before heaving down, the gundeck port-lids are tightly sealed, blind lids are fitted to the upper deck ports, the gangways are extended inboard by *wash-boards* if they are likely to be under water, and the whole area is tightly caulked. The next task is to fit *spar-shores*, which are long timbers the heels of which are placed on the upper deck, passing through small scuttles cut in the deck-planking of the quarterdeck and forecastle for this purpose; the upper ends of the shores are lashed or seized to the heads of the foremast and mainmast; these shores serve to support the masts. The decks are also shored up beneath the spar-shores, which are *rammed* just before heaving down. The shrouds on the opposite side are well set up, and the masthead tackles are rigged to pendants passed in the case of the mainmast in and out of the two upper deck ports forward of the mast, and in the case of the foremast between the foremost gunport and the hawseholes, several passes being made. The preventer-shrouds are also well set up. Tarpaulins or coats are laid over the spar-shore scuttles.

*Dry-docking was almost invariably the method used in the English Navy for larger ships. See the comments by Blaise Ollivier in the forthcoming book: *Remarks on the Navies of the English and the Dutch, 1737.* [Trans.]

To heave a ship down on a careen.

Wash-boards: here, an extension of the gangway planking at the waist; sometimes they were placed vertically instead.

Spar-shores: shores supporting the masts.

Rammed: using a large block of wood fitted with several handles at the sides and swung by a team of men; the block is called a ***ram*** or ***rammer***. Wedges are driven in under the heels of the shores, and then replaced by ***beddings*** of boards by means of a screw-jack.

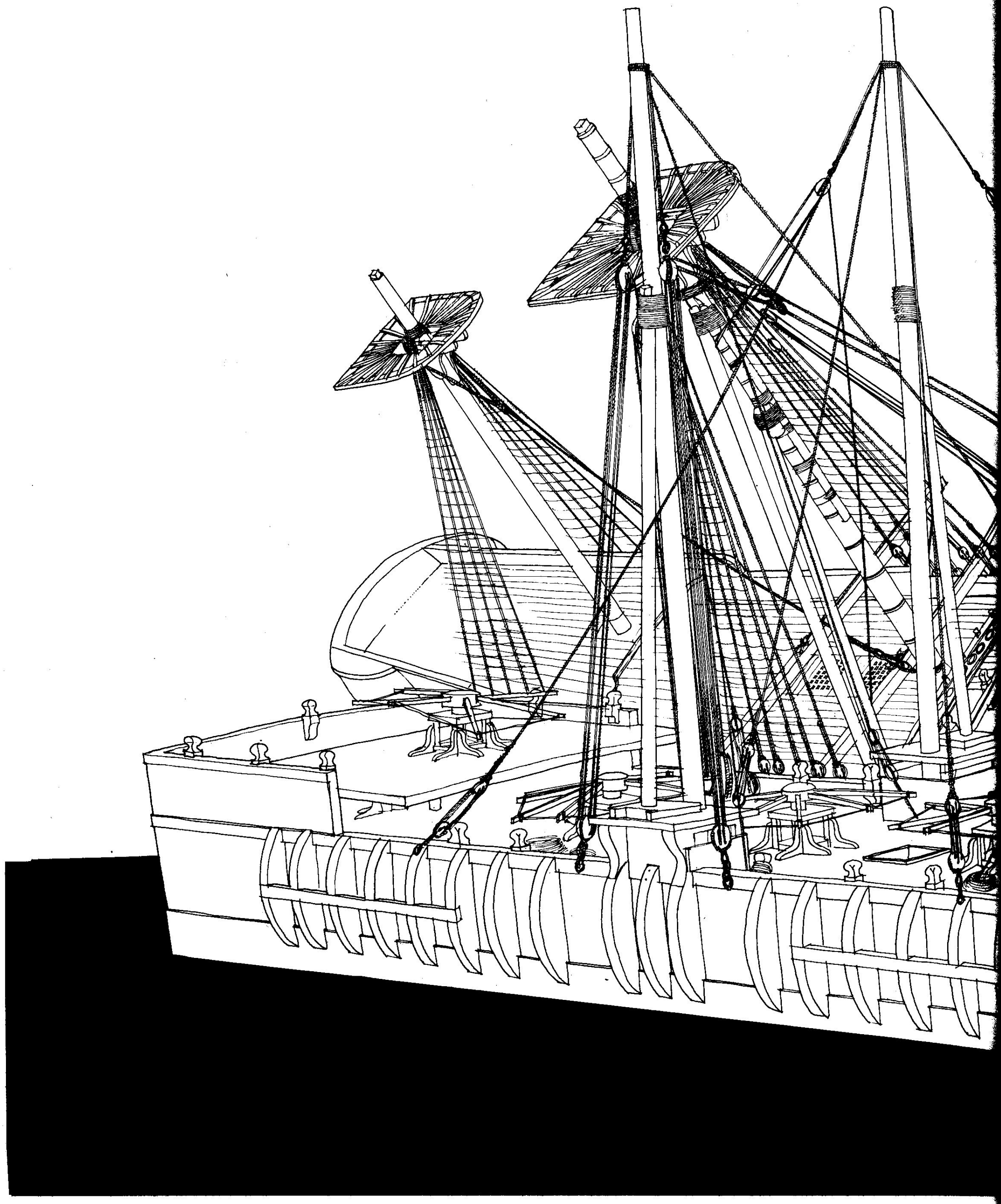
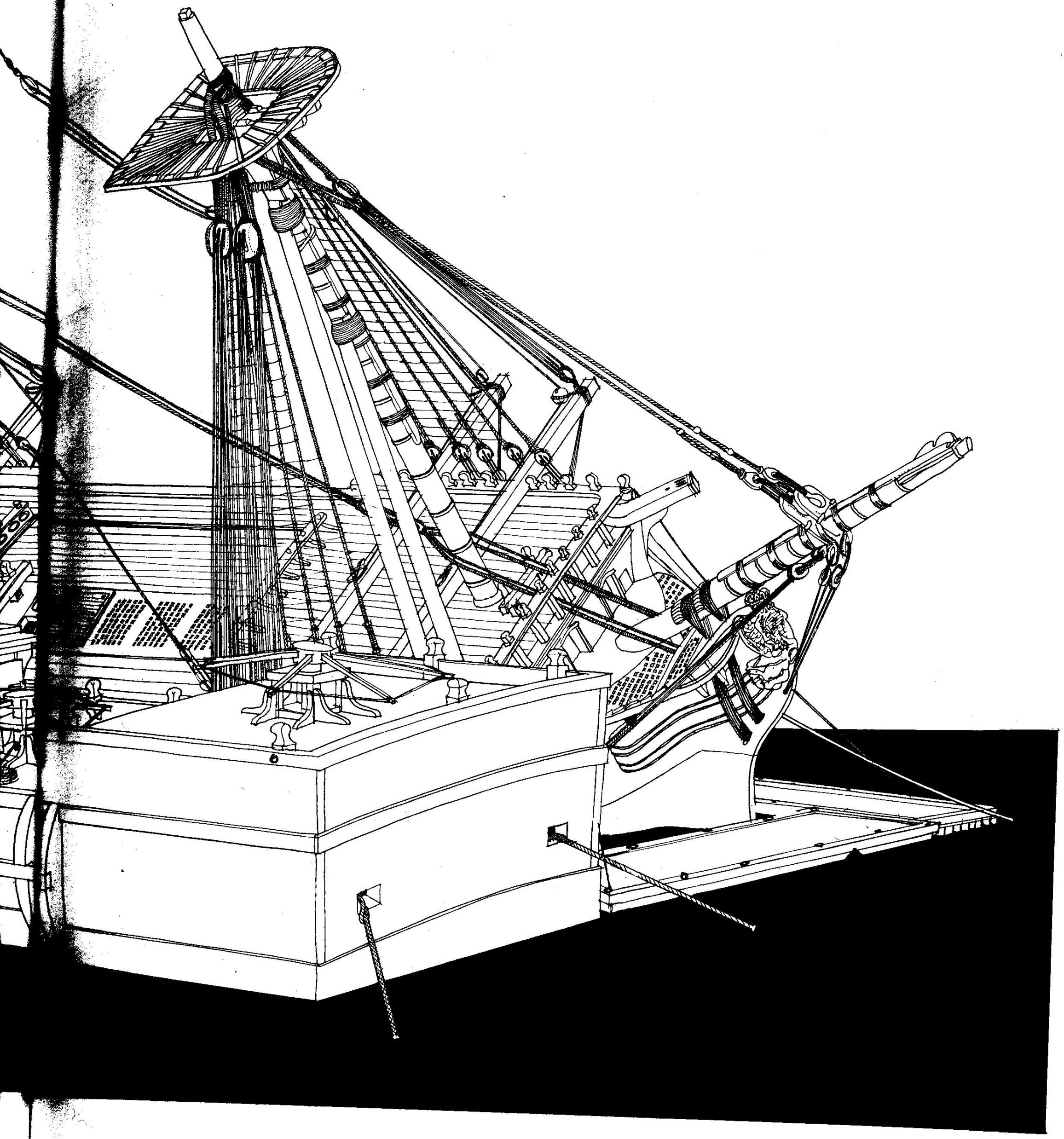


Fig. 332
Heaving Down to a Pontoon

The vessel shown is not our 74, but a 64. This however makes no difference as to the technique of heavin down. This is being carried out using a single pontoon, but sometimes two are used, one for each mast



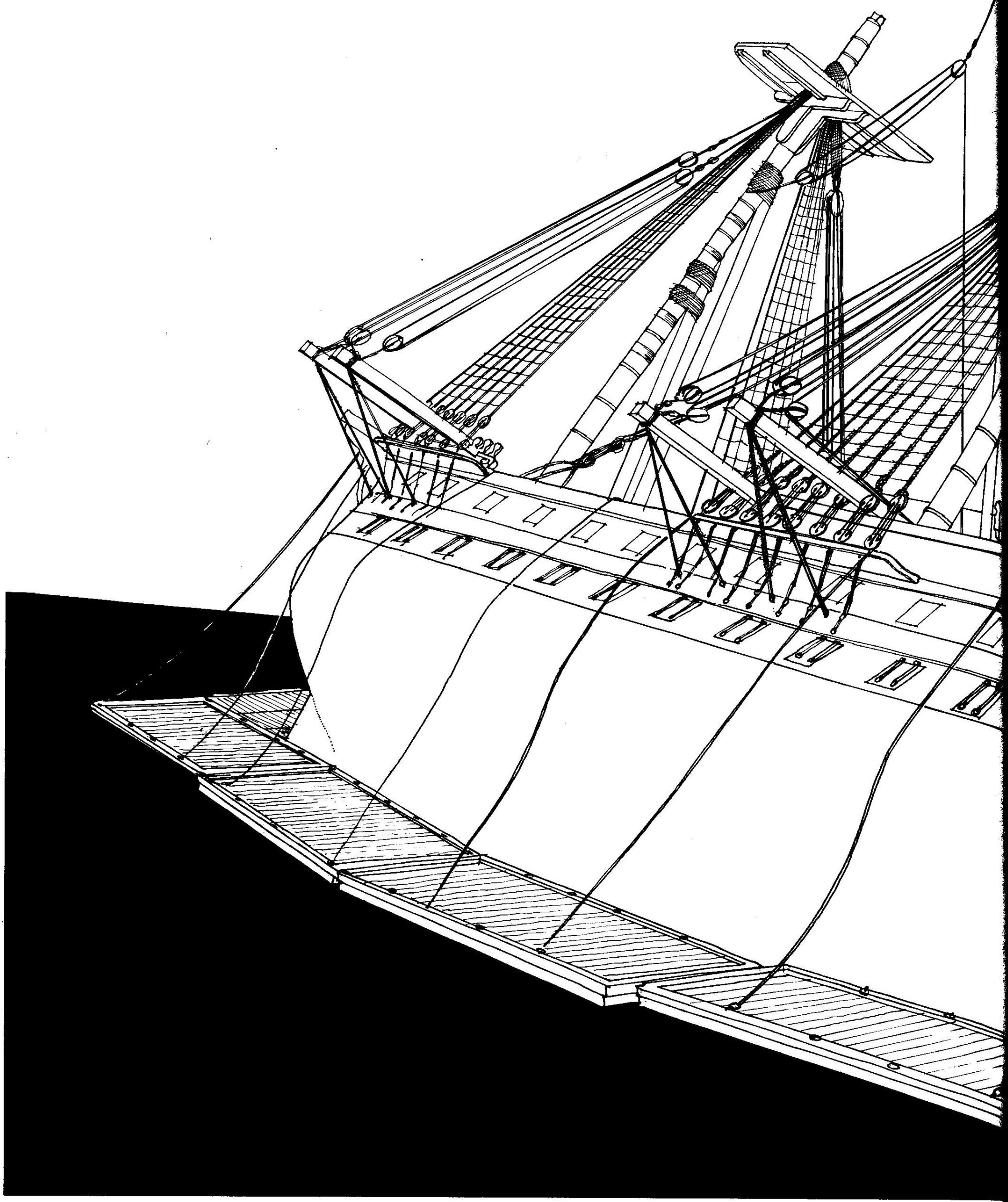
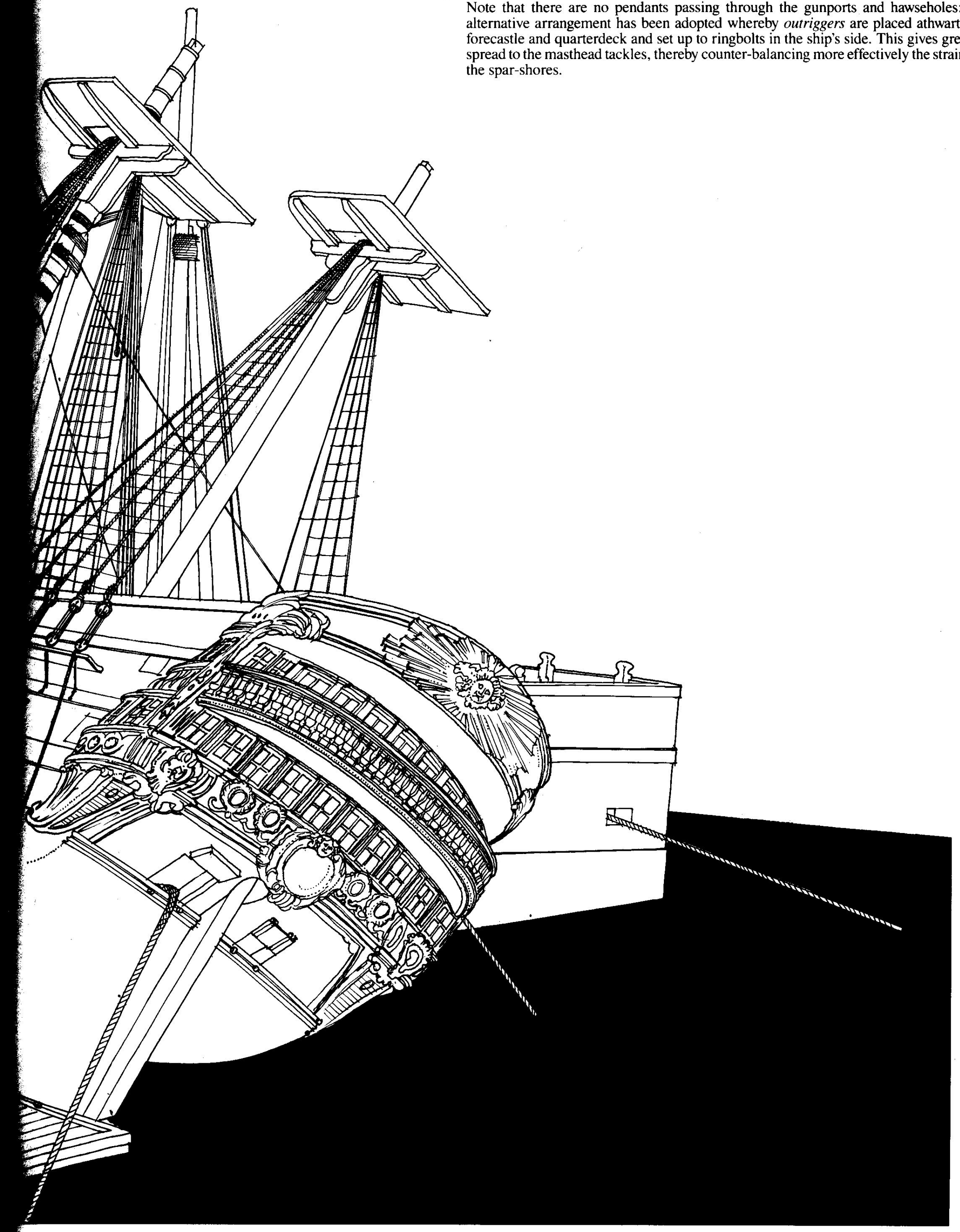


Fig. 333
Heaving Down (seen from the other side)

Note that there are no pendants passing through the gunports and hawseholes: an alternative arrangement has been adopted whereby *outriggers* are placed athwart the forecastle and quarterdeck and set up to ringbolts in the ship's side. This gives greater spread to the masthead tackles, thereby counter-balancing more effectively the strain on the spar-shores.



Everything remaining on board is shifted to the side on which the ship is to be hove down, and the ballast is shifted as well, usually increasing the amount forward, although this depends on the ship's lines. This is so that the keel rises out of the water simultaneously fore and aft, without exerting disproportionate strain on the tackles at the foremast head. The ballast is secured in place by boards carefully cut to cover the whole area, and these boards are crossed by others which serve as a bedding for scantlings which are braced diagonally against the beams. The greatest care is taken to make fast everything remaining on board. Shifting the ballast has the effect of heeling the ship somewhat, calculated so that the heads of the fore- and mainmasts are now more or less vertically over the *careening pontoon*; this is a sort of large decked barge, solidly built, high out of the water, flat-bottomed and with vertical sides. The pontoon is fitted with *righting-sheers* (the purpose of which is explained below), capstans, etc.

Careening-pontoon: a sort of square-sided barge; often the cut-down hulks of old ships are used.

Righting-sheers.

With the vessel already partly heeled, winding-tackles are made fast from the pontoon to the head of the masts where the spar-shores bear, and the falls are rigged to the capstans in the pontoon, which then have only to be walked round for the vessel to be hove down completely.

As a precaution, *righting-tackles* are made fast at the head of the righting-sheers, and these are hooked through several bights of heavy cable passed round the channels. The righting-tackles apply an opposing force to the tackles used for heaving down, and serve to prevent the ship from coming over too fast; they are also used to right the ship if she will not right of her own accord.

Righting-tackles or ***relieving-tackles.***

I should add that if despite all the precautions taken water should leak in, pumps have been moved about on horizontal platforms placed on board.

With the ship hove down, the work of cleaning her is undertaken from *floating stages*, which are sorts of rafts composed of masts lashed together in pairs, covered by several beams, and planked over on top; an oak plank surrounds the edges, fitted with iron rings to which chains are fastened, securing the stages to the ship being careened.

Floating stage: alternatively, they may be made like punts, 2 to 2 1/2 feet deep [65 - 81 cms].

Figures 332 and 333 on the preceding pages illustrate what I have just described.

With the keel hove out, the caulkers are ready to *bream* the hull, i.e. to set fire to bundles of furze, heather or brush held against the planking, so that all the stuff with which the hull was payed previously (see Vol. I, p. 154 and Vol. II, p. 153) is burnt off. The process of breaming hardens the caulking in the seams, cleans the planks and exposes any defects or worm-holes. If the hull has been sheathed with planks, the sheathing is generally removed, unless it is thought sufficient simply to bream the sheathing.

To bream: to burn off the weed and barnacles adhering to the hull.

As a matter of principle, every ship returning from the Americas must be breamed, if only to kill off the worm. In order to determine the extent of the damage caused by these molluscs, the caulkers probe the worm-holes with small wire spikes. If there are not too many, and they are not too deep, they are simply stopped with small plugs; if however they appear to be dangerous, so that the plank is spongy, *furrens* may have to be let in to make good the part cut away, but often the damage is such that part or all of the plank must be stripped and replaced. At the same time, any rotten oakum must be removed, by means of a curved tool called a *rave-hook*; the seams are then re-caulked, but if the oakum is sound it is merely inspected and new oakum added where necessary. In short, the whole underwater hull is restored to its condition as new (see Vol. I, pp. 153-4).

Furrens or ***furrs***: filling-pieces.

Rave-hook: illustrated in Fig. 188, Vol. II.

Breaming the hull is a frightful task, the work being carried out in extreme heat; the caulkers must harden themselves to the task over many years, and indeed they work there with their quite young children in order to accustom them gradually to the scorching flames which none but the caulkers, inured by a lifetime's experience, can stand. To the flames and the smoke comes the added discomfort of water, since pumps must be used to spray the hull with water and prevent the flames from spreading*. In such conditions caulkers die young.

*The bundles of flaming material are applied by means of great iron forks, and planks must be arranged along the upper part of the underwater hull so as to form an obstacle or fire-break, to prevent the flames from reaching the upper works; this fire-break must be kept constantly wet.

In order to careen a ship it is also possible to use sorts of heavy gratings called *grounding-places*, constructed at low tide; the ship whose hull requires attention is hauled over them at high tide, and is left high and dry when the tide falls. The grounding-places are placed next to a wharf; large blocks of wood or fenders are hung from it to support the ship, which is also held fast by cables passed round sheers or bollards sunk in the ground of the wharf for the purpose. This ensures that the ship is left standing upright. The operation is called *grounding* the ship, but it is mainly used for smaller vessels. The hull is breamed from below, rather than on its side as is the case when the vessel is hove down to a careen.

Grounding-place or ***gridiron***.

To ground a ship: in this instance deliberately, but it also applies to accidents.

With a parliament heel the vessel is only heeled over part-way, since weed accumulates more readily at the waterline.

Once the ship has been breamed it is usual to pay the bottom with tallow, moving up progressively from the keel to the waterline as the ship is righted. There is no doubt that ships are faster through the water after tallowing, and for the smaller warships for which speed is important it is good practice to tallow them regularly. The ship's boats may also be tallowed.

3. REPAIRS AND REBUILDING

The term repair can be used in the sense of mending (sails for example), but it has a rather more specific meaning when referring to ships. To be called a "repair", the cost must not exceed half the value of the hull - beyond that it should properly be called a "rebuild"*.

*The definition was more specific in the French Navy than in the English Navy, where repairs were classified as "small", "middling" and "great"; there were also "triennial trimmings", three-yearly "trimming" of the weed, which more often than not were subsequently translated into repairs of varying magnitude. "Great repairs" often amounted effectively to a rebuild. [Trans.]

Thus a repair may be trifling or very considerable, but a further distinction is made according to whether the ship is repaired afloat or in dry-dock. In the first case, the rotten timbers are broken and *shifted* one after the other with new timbers being put in their place, but care is taken to ensure that at all times the ship remains sufficiently whole to keep afloat without leaking. If the gundeck is to be shifted it is only broken after the upper deck has first been shored up against the keelson, while if the upper deck must also be shifted, it is not broken until the gundeck has first been securely fastened with its knees. If the state of the ship is such that it would be too dangerous to break one of the decks completely, only some of the beams are broken at one time, and only when they have been replaced (and freshly kneed if possible) does the work progress to the remainder. If some of the frames are rotten, they are shifted from inside, or from outside: in the first case, the ceiling is broken, then the damaged bend, and once it has been replaced with a new one the next damaged frame is shifted. Clearly if several bends were shifted at once, the integrity of the structure might be affected. The shipwrights who carry out this work are always supplied with pegs and treenails to plug any holes which appear in the planking of the hull after the frame has been broken; any planks which spring must be forced back with *wrain-bolts*, particularly when repairs are carried out below the waterline.

Shifted: removed and changed.

Wrain-bolt: wooden instrument incorporating a threaded bolt and nut, used to draw the planks together.

With the method whereby the frames are shifted from without, the ship is hove down as if for breaming; the hull-planking is broken, and the frames shifted as explained above.

The bottom planking is shifted by heaving down on one side and then on the other, and the ship is also hove down in order to shift the keel, the stem or the sternpost*.

*So far as I am aware, English practice was invariably to carry out such repairs in dock; no doubt the problems long associated with building dry-docks in the French Royal Dockyards (little tide in Toulon, silting in Rochefort, and the combination of violent tides and an unstable bottom in Brest) led the French to develop alternatives. [Trans.]

Repairs carried out to the upper works present no particular problems, other than that care must be taken not to remove too many timbers at once for fear of weakening the structure.

It is possible to shift every timber of a ship while afloat, but however careful the shipwrights are, this method always leads to hogging of the keel, and it is time-consuming and costly.

However, if the ship is hauled up or put into dock, then it can be worked on on land, which is infinitely preferable. In order to haul a ship up onto a slip (see Vol. I, p. 64), a whole range of special equipment is required: first of all, a cradle, similar to that described in Volume I; the cradle is secured under the keel while the ship is afloat, and the ship is then hauled up (with the assistance of the tide, on the Atlantic seaboard at least), by means of a large number of capstans on land to which are rigged the falls of extremely powerful tackles. The blocks have a lengthened shell which is iron-bound, and carry five or six sheaves which are of bronze, the sheave-pins being iron. The ship is thus hauled up by means of these tackles, which are made fast to the upper end of the cradle and to several cables passed round the lower part of the hull. In a few hours the ship is hauled up out of the water*.

*In the case of a 74, up to 14 capstans might be used, rigged to three tackles; more than 2,000 men are required, since even emptied of all her stores a 74 weighs about 1,400 tons [1,369 tonnes].

However, the best method is to use a basin or dry-dock, if one is available, into which the ship can readily be floated. The dock is then closed by means of *caissons*, and the water emptied. Some dry-docks are double, one following the other, some are covered by roofs, and at Toulon a dry-dock has just been completed to the designs of Groignard*, a remarkable achievement considering the size of the works and the fact that there is no more than a foot of difference between high and low tide. All these dockyard installations make fascinating study, all the more so for me since I am an architect by profession, but there is no room for it within the framework of this book; I can only hope that some other author will attempt the task.

Caissons: floating gates constructed like small boats, which are more convenient than those resembling lock gates; caissons were adopted by Groignard when building the dry-dock at Toulon.

*N. Groignard, 1727 - 1798. One of the most distinguished shipwrights of the middle part of the century, he was to combine his work in the Navy with the design of most of the later ships built for the French East India Company. For a more detailed biography, see J. Boudriot: *John Paul Jones and the Bonhomme Richard*, Paris and Annapolis, 1987.

Once in dry-dock the ship is shored up as she was during her building; the first step is to correct her hogging, then to place her on a perfectly even keel. The upper deck is supported by pillars butting against the keelson, the lower deck is broken as required, the breasthooks, riders and sleepers are removed; the deck-clamps and the ceiling planks are broken. The frames are shifted from within as far as the upper futtocks, which are shifted from without, and as each frame is renewed the planks of the hull which are damaged on the inside are sprung, so as to identify them for later when working on the outside of the hull. While all this is going on, the ship is continually checked to ensure that she is level, and adjusted if necessary. The deck-clamps and the strakes of the ceiling are always shifted, since they cannot be removed while the frames are being shifted. The riders, stemson, sternson knee, breasthooks, sleepers and knees of the helm-port transom are used again, provided they are sound. Once the gundeck has been rebuilt, any rotten timbers in the upper deck are shifted, without however breaking it entirely, since the upper deck is generally in good condition even on old ships. With the gundecks repaired, work progresses to the forecastle and quarterdeck, and to the poop. As I have already mentioned, if the cost of the repairs to the hull exceeds half of the original building cost, it is then called a rebuild rather than a repair. There are those who argue against rebuilding when the cost may be as much as three quarters of that of a new hull, but in practice each case is taken on its merits, and a lot depends on the sailing qualities of the ship to be rebuilt: certain particularly successful ships are rebuilt several times over their lives, which amounts to saying that every single timber has been renewed so that nothing remains of the original ship. Thus in extreme cases a rebuild may be to all intents and purposes the same as building anew, but it is not for all that the same as building a new hull, since the original lines are retained, and as far as possible the knees are re-used, since compass-timber is rare and precious.

A rebuild is always carried out on land, and after the explanations given above regarding repairs, it is easy to imagine the way a rebuild is carried out.

4. TYPES OF SHEATHING

You may have wondered why I did not go on to discuss sheathing at the end of Chapter VII. I can only say that in 1780 copper sheathing is far from being in general use*, and it is in any case applied after the ship has been breamed, which is why I have preferred to delay my explanations somewhat until this chapter.

*In the French Navy; in the English Navy the first trials date from an order of October 21st 1761 (frigate *Alarm*), and by 1780 its use was becoming general even on the larger ships, although the problems caused by electrolysis were not resolved until 1783. For a more detailed treatment of this subject, see J. Boudriot: *La Belle Poule*, Paris, 1985.

But before discussing copper sheathing, we should perhaps examine other methods of protecting the underwater hull of our 74. The problem is the ravages wrought by the *worm*, which I have shown life-size in Figure 334 below. The damage can be astonishing in its extent: the worm bores a network of galleries in the timber, destroying it rapidly, the effects being all the more marked in warmer seas with high levels of salinity.

Worm: *teredo navalis*, a marine borer capable of causing prolific damage. Called the ***shipworm***, or commonly simply "the worm".

In order to limit the damage caused by the worm, it is customary to *sheathe* the underwater hull with a second skin of fir planks 1/2″ to 1″ thick. In order to carry out this sheathing of fir, the ship is first hove down and breamed, and the caulking is carefully renewed; then a mixture composed of half pitch-oil and half dry pitch is spread directly onto the hull-planking; on top of this glutinous mixture they apply a layer of coarse paper or of canvas; this is then tarred, and the fir sheathing is nailed* down on top, and caulked and payed with stuff as explained in Chapter VII.

Sheathe: or ***to skin***.

*The nails must not be too long, even if that means that more are required. Fir sheathing is carried out by shipwrights, and not by caulkers.

Sometimes fir sheathing is finished off with nails, common practice on the ships of the Compagnie des Indes*. This filling consists of hammering into the fir sheathing thousands of iron nails with flat circular heads 6 - 8 lines [14 - 18 mm] in diameter. The nails are put in so closely that the heads touch, and the rust spreads to fill the gaps between, so as to provide a thin layer of oxidised iron over the whole underwater hull which is impenetrable to the worm; it has however the disadvantage of encouraging, even more than the planking itself, a proliferation of marine growths and molluscs such as barnacles, which affect the vessel's speed. Furthermore, such sheathings are said to change the ship's lines, and they are never as smooth as the planking of the hull.

*The French East India Company, which disappeared when its Charter was withdrawn in 1769. For further details see J. Boudriot: *Compagnie des Indes, 1720 - 1770*, Paris, 1983.

Filling: the nails used were called ***filling-nails*** or ***clout-nails***.

These problems have led to the search for other ways to protect ships from the worm (to use the expression of the time), and from the growth of weed and barnacles: to the use of sheets of lead*, of tin, and of zinc. I will not attempt here to give a history of metal sheathing; suffice to say that the technique goes back to classical times*.

*Not to be confused with the practice of using a few sheets of lead on different parts of the hull, such as on the stem, or over the seams in the way of the masts, in order to prevent them from working out the oakum under the strain exerted by the shrouds.

However, be that as it may, only a few years ago, in July 1778, the frigate *Iphigénie* was sheathed with sheets of copper, copying the example set by the English* (it should however be said that both the frigate *Belle Poule* and the sloop *Expérience* had been coppered somewhat earlier, but no conclusions had been drawn from the experiment). After the *Iphigénie*, a number of other frigates were coppered (see the list on page 264), but the Navy remains cautious for ships-of-the-line, even though a number of them will be coppered shortly.

*The first French ship to be coppered was the schooner *La Gorée*, destined for service in the Colonies (Senegal): built in Rochefort to the draughts of Chevillard the Younger in 1767, she was coppered the same year, the sheets being fastened with iron nails. The work of coppering is undertaken by caulkers.

The method which I will describe is that adopted for the *Iphigénie*. The caulking is renewed with great care, and all the seams are filled with glazier's putty (oil and whiting). Next a layer of very coarse sackcloth-like canvas* is stuck to the hull by means of a mixture of pitch-oil and tallow.

*Alternatively, a layer of tarpaulin-canvas may be used, which is then coated with two or three coats of Baltic tar applied hot.

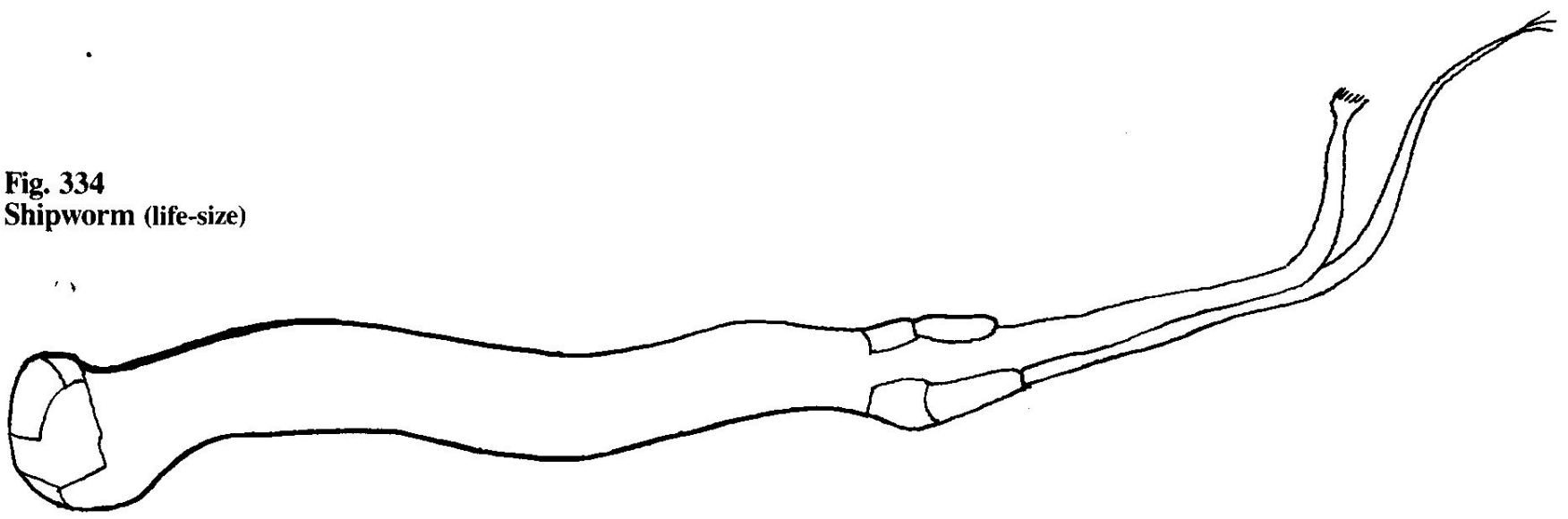
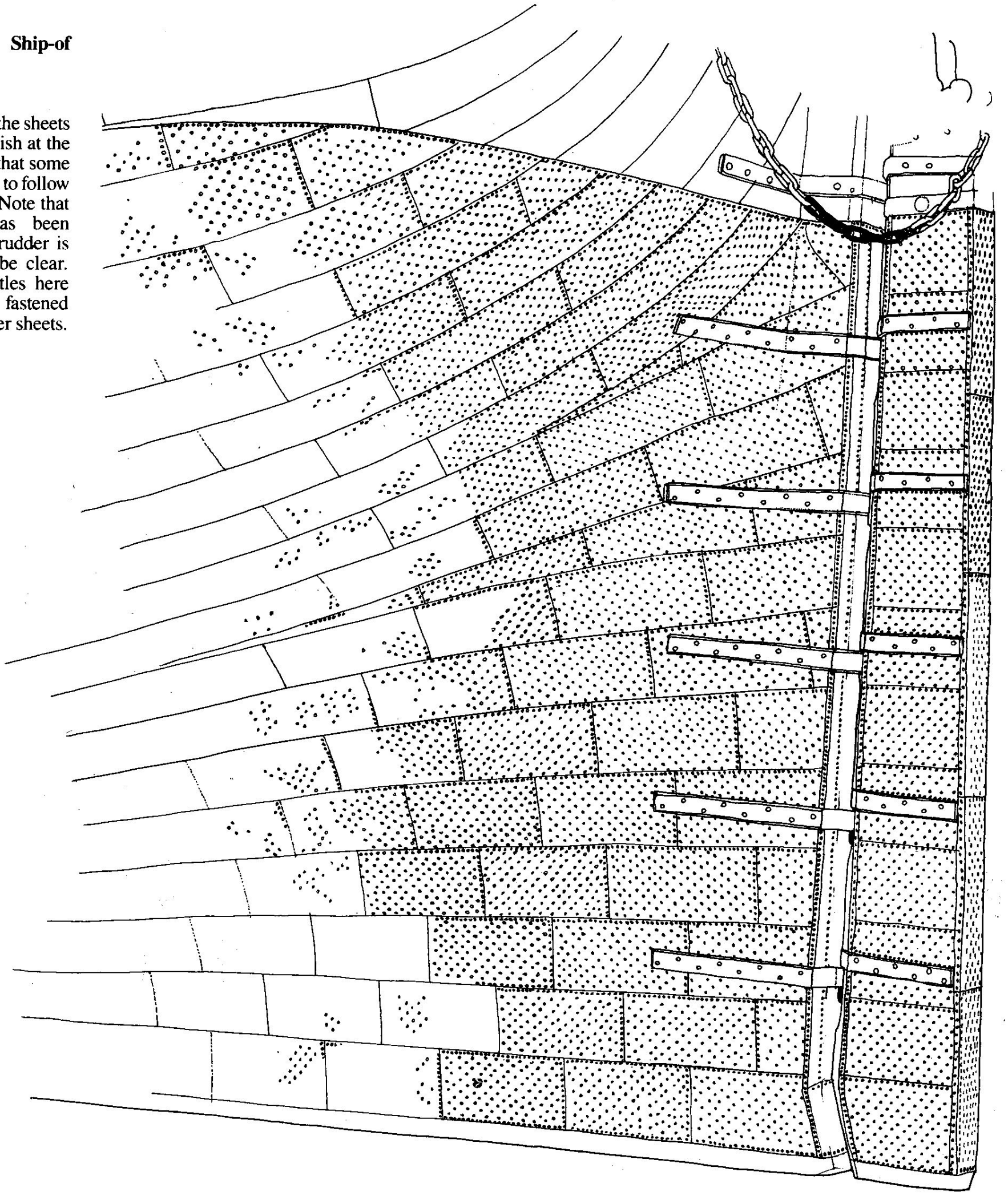


Fig. 334
Shipworm (life-size)

Fig. 335
Coppering of a Ship-of the-Line (sternpost)

This sketch shows how the sheets of copper sheathing finish at the waterline, and the way that some sheets have to be snaped to follow the curves of the hull. Note that the capping strip has been omitted. The way the rudder is coppered should also be clear. The googings and pintles here are of bronze, and are fastened over the top of the copper sheets.



Once the hull has been prepared, the sheets of copper can be applied. In recent years these have been imported from Hamburg, whereas previously they were made at Villedieu in Lower Normandy.

The sheets are 5 feet long [1.63 m] and 18 inches wide [49 cms] , and they are 1/3rd of a line [0.75 mm] thick; each sheet weighs about 14 pounds [6.85 kgs] . The sheets previously used were the same size except that they were 2 inches [54 mm] wider. The copper used is red copper of the highest purity*.

*Some people recommend yellow copper or brass.

The nails used must be no longer than 1 1/4 inches [34 mm] ; they have a circular head 6 - 8 lines [14 - 18 mm] in diameter, which is flat on top and rounded beneath; the shank is square in section. The nails are cast from a mixture of 2/3rds red copper and 1/3rd yellow copper (brass).

Let us now examine how the work is carried out. Using a marking-line and white lead, two parallel lines are drawn round the four sides of the sheet, 3/4″ and 1 1/2″ [20 & 41 mm] in from the edge; next the diagonals are drawn in, and then a series of lines parallel to the diagonals, 3 inches [81 mm] apart (see Fig. 336 below).

With the hull prepared as we have seen, the rudder-irons must be covered with tarred canvas and a sheet of lead, but since the googings and the pintles will rapidly be eaten away by verdigris, it is better to make them of copper, or to plate them with a layer of copper, or else to tin them. It is also considered good practice to cover with tarred canvas and sheets of lead the lower seams in the way of the heel of the mainmast, for a distance of 6 to 8 feet [1.95 - 2.60 m].

Next, the first row of copper sheets is nailed to the keel; the lower edge finishes 2 inches [54 mm] from the bottom of the false keel, since there is no point in coppering the lower face: the sheets would be torn off by the cables while at anchor if they should cross*. The edge of the forward sheet always overlaps the sheet behind by 1 1/2″ [41 mm].

*Alternatively, the bottom of the keel can be coppered and the false keel fastened on top by means of copper nails or staples.

The caulker has a bag suspended in front of him, containing the nails and an iron bradawl with a tempered point; its shank is round and 1/8″ [3.5 mm] in diameter at the point, which is 3/4″ long [20 mm]; there is a collar where the point merges with the shank, the collar being rounded.

With the sheet in position, a first nail is driven in in the middle, and then the other nails follow, working outwards towards the edges, the nails being staggered; each nail is driven in at the point where the diagonal lines cross, and a pilot hole is made with the bradawl, the collar of which forms a hollow to seat the head of the nail. The nails round the edges of the sheet must be 1 1/2″ [41 mm] between centres, and are always driven in along the line which was drawn 3/4″ from the edge.

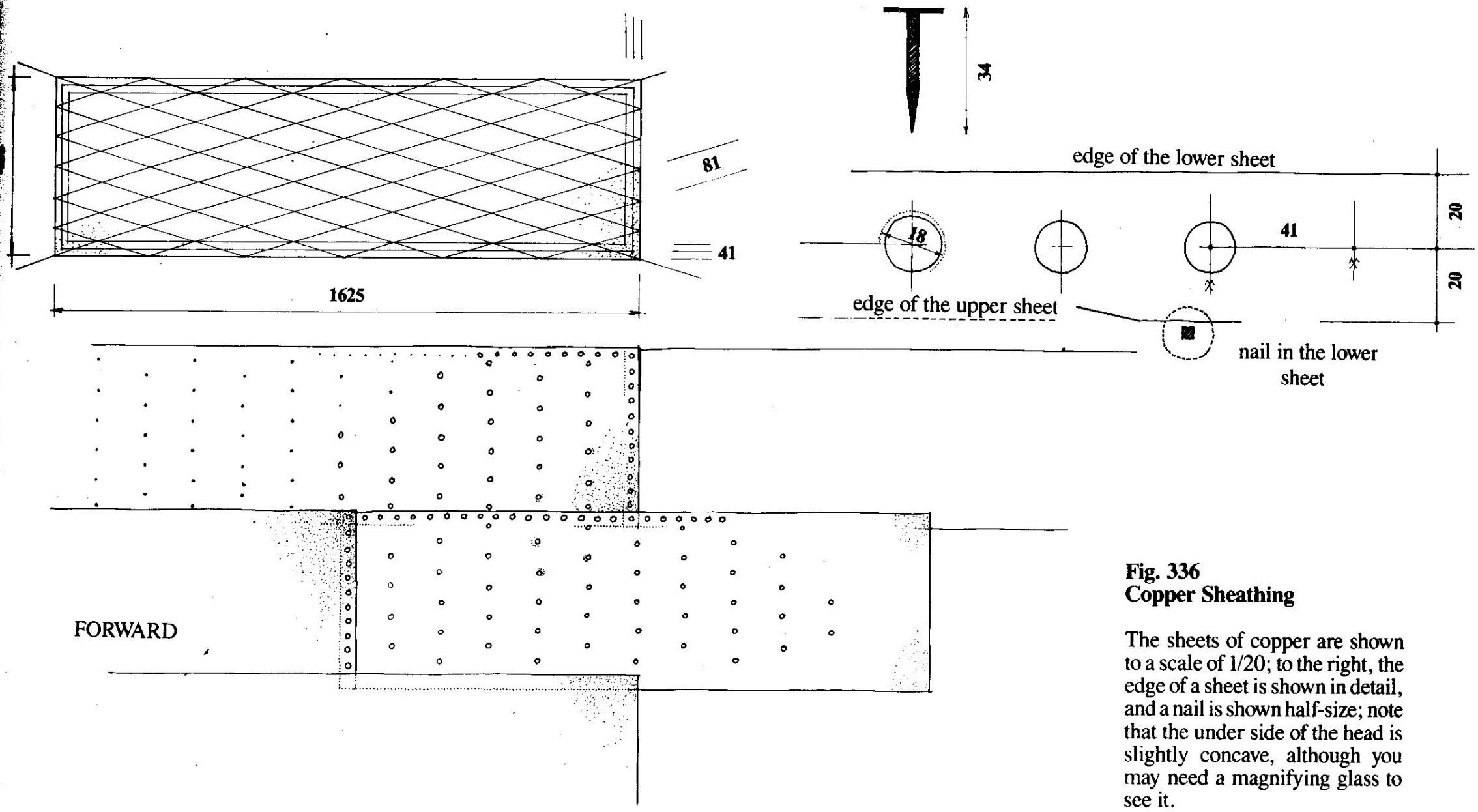


Fig. 336
Copper Sheathing

The sheets of copper are shown to a scale of 1/20; to the right, the edge of a sheet is shown in detail, and a nail is shown half-size; note that the under side of the head is slightly concave, although you may need a magnifying glass to see it.

The second row of sheets must run down 1 1/2″ below the first (the caulkers must take care not to drive in the last nails along the upper edge of the lower sheet until the upper sheet has been slid down into place). See Figure 336.

The hull lines develop in such a way that each row of sheets drops away at bow and stern, and this must be corrected by introducing additional rows of tapered sheets like stealers. See Figures 335 and 337.

A few inches above the waterline, and parallel to it, a line is marked to indicate the top of the coppering, and the last row of sheets must run from bow to stern full-width to finish on this line. A strip of oak is nailed on top with copper nails; this capping strip is rounded and is 7 to 8 inches wide [19 - 21 cms], and 1 1/2″ thick [41 mm].

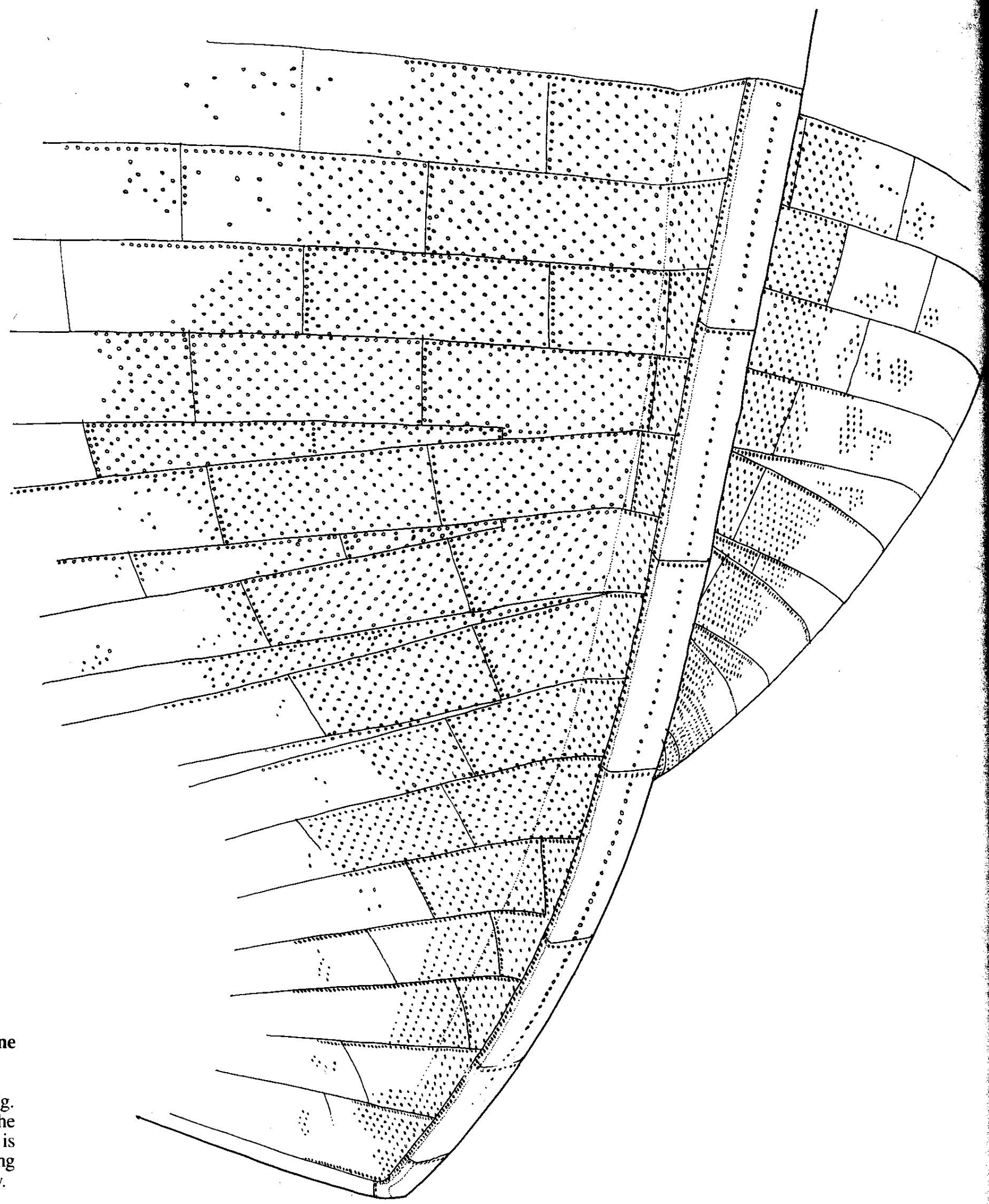


Fig. 337
Coppering of a Ship-of-the-Line (stem)

This drawing complements Fig. 335, and illustrates how the forward face of the stem is coppered. Once again the capping strip has been omitted for clarity.

Coppering must be carried out with great care. The sheets must be free of rolling faults or tears, and the smallest splash of paint, grease or tar are enough to allow the weed and the molluscs to take hold. The sheets must therefore be perfectly clean, for if they are not the *barnacles* will attach themselves, and these have a foot-stalk which is 8 to 10 inches [217 - 271 mm] long. Likewise, if the sheet should be holed, weed, molluscs and worms will find their way in and spread.

Barnacles: pendunculate genus of cirripides, such as may be found on mussel shells.

The coppering of a 74 requires about 1,750 sheets and 3,400 pounds [1,663 kgs] of nails, equal to 1/100th of the vessel's burden.

Copper sheathing may be expected to last five years, but experience has shown that all the ironwork is eaten away. Thus for example in 18 months the rudder irons will lose between 13 and 16 lines [29 - 36 mm] in both width and thickness, while despite the use of protective layers of various sorts the nails and bolts are seriously affected. The only solution to the problem, which is caused by the electrolytic action of the salt water and the copper, is to replace all the ironwork in the underwater part of the hull with bronze*, which significantly increases the cost of copper sheathing, but is absolutely essential, for without it the vessel might literally fall apart.

*Wherever possible substituting treenails for nails or bolts.

———*———

I will conclude this chapter by looking at a few questions regarding the preservation of ships.

It is obvious that the life of a ship is determined by the quality of timber employed, the way it is worked, and then by regular maintenance.

The coastal provinces of France formerly produced timber of the best quality, but for almost the last two centuries* this source of supply has been used up by the dockyards; gradually it has become necessary to look ever farther afield, and at present most shipbuilding timber comes from the centre of the kingdom, or even from its eastern frontiers. The tributaries of the Seine, the Loire, the Garonne and the Rhône allow the timber to be brought down to the great rivers of France, and once floated down to the mouth, the timber is shared out among the Royal Dockyards. Thus all this oak is drawn from fertile, well-watered country, which results in loamy or clayey soils and timber which is fat; ships built of this type of oak cannot be expected to last as long as those built solely from lean timber (see Chapter IV), as was the case during the previous century. Furthermore, the ever-increasing consumption of timber by the Navy results in timber being used which may sometimes be of doubtful quality.

*I write as if it were 1780, and the problem dates back to before 1600.

The state of affairs is such that all the forests between 15 and 20 leagues [72 - 96 kms] of the coast are in need of replanting, but for the meantime all that can be done is to recommend using the leanest timber, felled in the correct manner, and to use barges to transport it, rather than floating it down. Only timber which has been felled for at least two years may be used, building must start in the spring, and ships must be allowed to stand in frame for only one winter; planking and caulking must take place in May or June if possible*. Once the ship has been built, its seams should be neither opened nor caulked between October and April.

*A number of slipways and dry-docks have been covered over in order to protect the timbers from the weather during building.

Provided a ship has been correctly built, premature deterioration is generally due to one of two causes. First of all it may be caused by excessive pitching and rolling, which if violent will destroy the integrity of the ship, making the timbers work, the seams work their oakum out, and cause leaks, particularly in the upper works where the shocks are felt with greater severity. Violent pitching is generally caused by a failure to balance the hull volumes of the bow and the stern (see Chapter II), or else by stepping the foremast too far forward. Violent rolling is caused either by a badly designed underwater hull (too rounded in the floors), or alternatively by masts and spars which are incorrectly proportioned*, or by bad stowage. Hogging of the keel, causing bow and stern to droop, also shortens the life of a ship.

*Thus for example frigates convoying merchant ships are obliged to sail under reduced canvas, which tends to make them too stiff, so that they recover violently when rolling; this is particularly damaging.

Good design goes some way towards remedying these problems, although it must be said that the unavoidable marriage of wood and iron is never sufficiently flexible to hold a ship together properly.

However, the principal cause of destruction of ships is the ambient humidity, which in the absence of adequate ventilation rapidly causes the timber to rot, all the more so if fat timber has been used; paradoxically, ships laid up in Ordinary (especially at Brest) are more subject to rot than ships in commission. It is impossible to ventilate the hold properly. The combination of a certain level of humidity and temperature causes the moisture in the timber to ferment, and rot to set in; great fungi form on the outside of the timbers, drawing out all the moisture, so that the wood becomes first dry* and then friable and weak. This form of rot has a characteristic odour which is foetid and ammoniac.

*This form of rot was to be distinguished some years later by the term ***dry rot***.

So far, despite many attempts, no method has been found to protect timber from the rot. All that can be done is to select oak which is as lean as possible for those parts of the ship which are most at risk (the hawse-pieces for example), to leave ventilation spaces in the timbering, and to pay particular attention to the caulking, ensuring that it is meticulously maintained at all times. Careful attention and continuous maintenance ensure an *average life for a ship-of-the-line of twelve years*; its life may be prolonged by a number of major repairs (see the table on pages 260 - 261), while more than one rebuild may extend it significantly, thereby giving a false impression of longevity to those who are unaware of the true facts; it must be said that ships are infinitely costly and ephemeral in the extreme.

EXPECTED LIFE OF VARIOUS PARTS OF A SHIP

Item	Expected Life (years)	
	In Commission	In Ordinary
Hull	10	15
Copper sheathing	5	10
Masts and spars	8	20
Sails	3	12
Rigging	3	12
Blocks	6	15
Cables	4	12
Pumps	20	24
Casks	8	12
Boats	4	12
Gun-carriages	16	24
Guns	40	50
Anchors, ballast	40	50

*The above figures indicate the theoretical life, and assume constant maintenance with periodic small repairs at an annual cost of approximately 1/100th of the original building cost.

Here are some examples of repairs and rebuilding of certain ships:

Dauphin-Royal (70): Built 1735, rebuilt 1751, rebuilt 1767, great repair 1777.

Le Bizarre (64): Built 1751, rebuilt 1766, rebuilt 1778.

Le Tonnant (80): Built 1743, small repair 1763, middling repair 1770, small repair 1772, repairs to the waterline and upper works in 1776.

Zélé (74): Built 1763, small repair 1769, repair of one third in 1776.

Bourgogne (74): Built 1766, two-thirds rebuilt in 1778.

Protecteur (74): Built 1757, small repair 1764, rebuilt 1772, repair 1778.



SOME GENERAL NOTIONS REGARDING SHIPS OF WAR

LIST OF SHIPS IN THE FRENCH NAVY IN 1780

COST OF BUILDING A 74-GUN SHIP AND OTHER SHIPS OF THE NAVY

SOME GENERAL NO

I thought that it might be interesting to show some simplified draughts of the various types of ships in the French Navy of 1780. These drawings are taken from the original draughts drawn up by the surveyors of the time. They are stark documents, showing only the bare essentials, as was indeed usual at the time: the Regulations of March 25th 1765 specify (in book VII) that draughts should show the sheer, the height of the decks and half decks, the distribution of gunports and the arrangement of the beams, scuttles and hatchways, the rake of stem and sternpost, the positions of the masts, pumps, capstans and bitts.

But before going any further, I should first define briefly the various types of ships.

Let us first of all consider the larger ships, the word "ship" already implying a vessel of some size; they are also called "ships-of-the-line"*, because they are considered to be large enough to take their place in the line of battle, a battle at sea generally being the conflict between two opposing lines.

*The smaller ships of war such as 50's were in practice considered to be much too small for the line of battle, and by the end of the century the same reservations were being expressed for 64's, although some remained in service. [Trans.]

I will not bother to define the two-decker, with which you are now perfectly familiar, but you should remember that there are two-deckers of differing strengths as defined by the number of gunports on the gundeck and the calibre of the guns.

If we add a gundeck we have a three-decker, which carries one more tier of guns than a two-decker. I use the term "tier of guns" to describe an unbroken line running from bow to stern, and thus a three-decker has three tiers of guns, plus the guns carried on the forecastle and quarterdeck.

Anything smaller than a two-decker is not strictly speaking a ship*. If I continue to use the two-decker as my point of reference, a frigate could be defined as a two-decker deprived of its lower gundeck, with therefore only a single tier of guns, to which are generally added a number of guns carried on the forecastle and quarterdeck. If these decks are reduced or removed altogether, the resultant vessel is called a *sloop-of-war**, with only a single tier of guns which is almost entirely exposed.

*Although it may be ***ship-rigged***, i.e. with three masts and square sails.

*Fr. *corvette*; the French word denotes any vessel smaller than a frigate, whereas a ***sloop-of-war*** refers specifically to ship-rigged vessels of that size.

The very smallest vessels are no longer ship-rigged and have only two masts, and these are generally known after their rig: snow, brig, schooner, etc.

Finally, at the very bottom of the list, come those vessels with only one mast, such as cutters. But whether these smaller vessels have one or two masts, their guns are limited to a single tier of small guns on the weather deck.

Among other types, I should also mention gunboats, which are large open boats carrying between one and three heavy guns.

Among the non-fighting ships of the Navy there are the storeships, which are approximately equivalent to frigates, and the transports which are the equivalent of sloops, save that their hull-lines are much fuller, and they carry less sail than their more heavily armed equivalents.

RDING SHIPS OF WAR

In the drawings that follow these pages I have therefore portrayed, at the same scale, five types of ship, seven types of smaller vessel, and two vessels of burthen.

The above remarks should give some idea of the composition of the French Navy during the American War of Independence; however, the Navy is becoming more homogeneous as a matter of deliberate policy, and the number of different types of ship will soon be reduced from five to three: the period of the 64 is coming to an end, and before long no more will be built. No new 50-gun ships have been built for nearly twenty years.

The steps taken to limit the types of ship to three will be accompanied by a further important decision, since the Chevalier de Borda* intends to select a single standard design for each of these three types, and in future all ships will be built to these draughts.

The seventy-four gun ship is destined to become the backbone of the fleet, accompanied by a small number of three-deckers in the role of flagships.

An intermediate category limited to a small number of 80-gun ships is retained, and these have at present the advantage over the 74 of being armed with 24-pdrs on the upper deck; furthermore, they employ timbers in their building which are considered to be too light for a three-decker but too large for a 74.

As far as frigates are concerned, no more 8-pdrs are being built, it having been decided to concentrate on those armed with the heavier 12-pdrs. Plans are afoot to build very powerful frigates armed with 18-pdrs, and in general there is a tendency to build more frigates.

The smaller vessels, for the most part rigged with three masts, are armed with 6-pdrs, but it is planned to increase the size of guns to 8-pdrs now that no more 8-pdr frigates are being built.

A few years prior to the present war, the French Navy started to employ a number of small vessels such as cutters and luggers*, and these appear to be increasing in number. There are also a few snows and gunboats, the latter used primarily for harbour protection and as escorts for convoys hugging the coast.

Of the vessels of burthen, the transports are primarily used to service the inshore squadrons, whereas the storeships are employed farther afield, and more especially on overseas service in the Colonies.

With the help of these explanations and the drawings which follow, together with the text which accompanies them, you will be in a position to recognise all the various types of vessel, and not confuse ships-of-the-line with frigates or frigates with sloops-of-war.

All these various types of vessel are built according to the same principles as those adopted for the timbering of our 74; the internal arrangements must conform to the same requirements, and the rigging to the same needs, so that I can assure you that what you have learnt about the 74 applies equally to all the other types of vessel, however many decks they have, or however they are armed.

Jean-Charles, Chevalier de Borda, 1733 - 1799. Started his career as an engineer officer in the Army, but a fascination for naval science led him to join the Navy as a Captain in 1779. After serving under d'Estaing, he became Inspector of Shipbuilding in 1784. He is regarded as the architect of the French Navy of the 1780's.

*See J. Boudriot: *Cotre Le Cerf 1779-80*, Paris, 1981; and J. Boudriot: *Lougre Le Coureur 1776*, Paris, 1985.

110-GUN SHIP

These ships, described as three-deckers, are intended to be commanded by an Admiral (see Vol. IV). They are stronger than two-deckers, not only from the number and size of their guns, but also from the thickness and height of their sides, important advantages at close quarters. On the other hand they are indifferent sailers (doubtful stability, tendency to roll, unweatherly).

The internal arrangements of three-deckers are similar to those of two-deckers, save that the extra deck gives a second large cabin aft. Three-deckers have their hawseholes between the cheeks of the head, the riding-bitts (of which there are often two pairs) being on the gundeck. The barrels of the main capstan are on the gundeck and middle deck, and a further single-barrelled capstan is sometimes installed on the upper deck between the fifth and sixth gunports forward.

Of the four three-deckers which are building in 1780 (see Table, page 260), three were originally designed to carry 94 guns, but their armament has been increased to 110, including 6 on the forecastle. The *Royal-Louis* was designed from the start to carry 110 guns, of which 16 8-pdrs on the forecastle and quarterdeck.

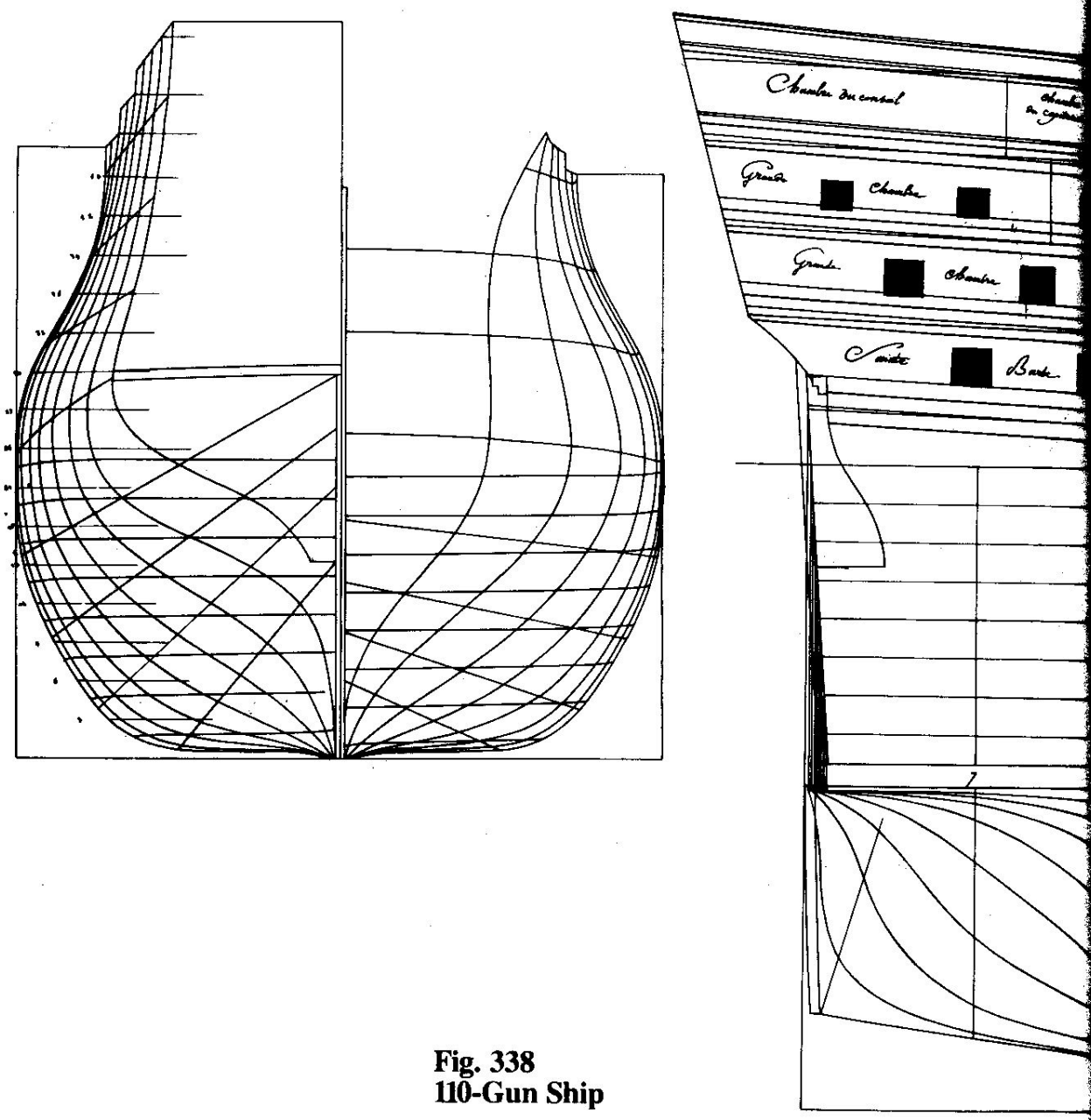


Fig. 338
110-Gun Ship

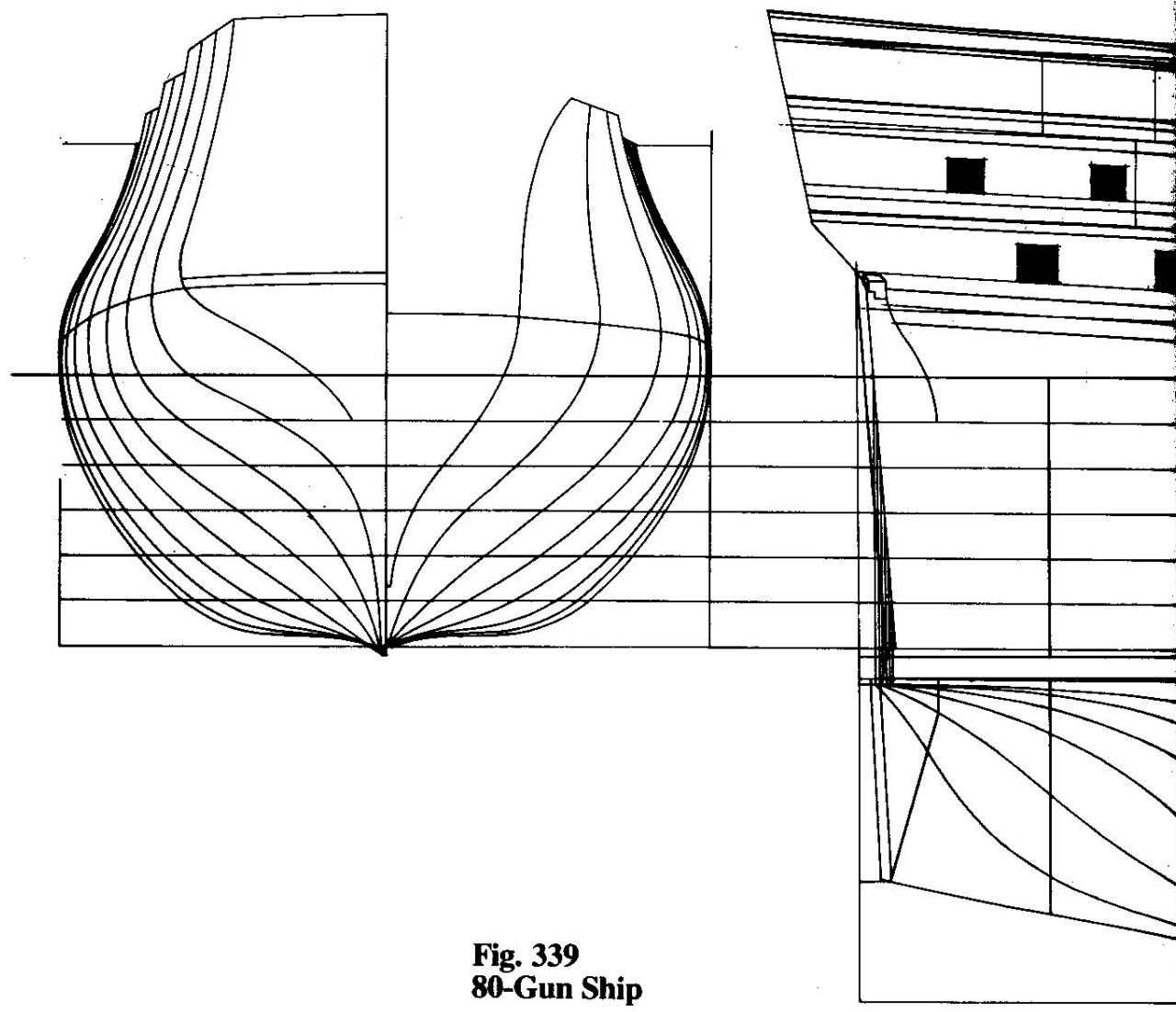
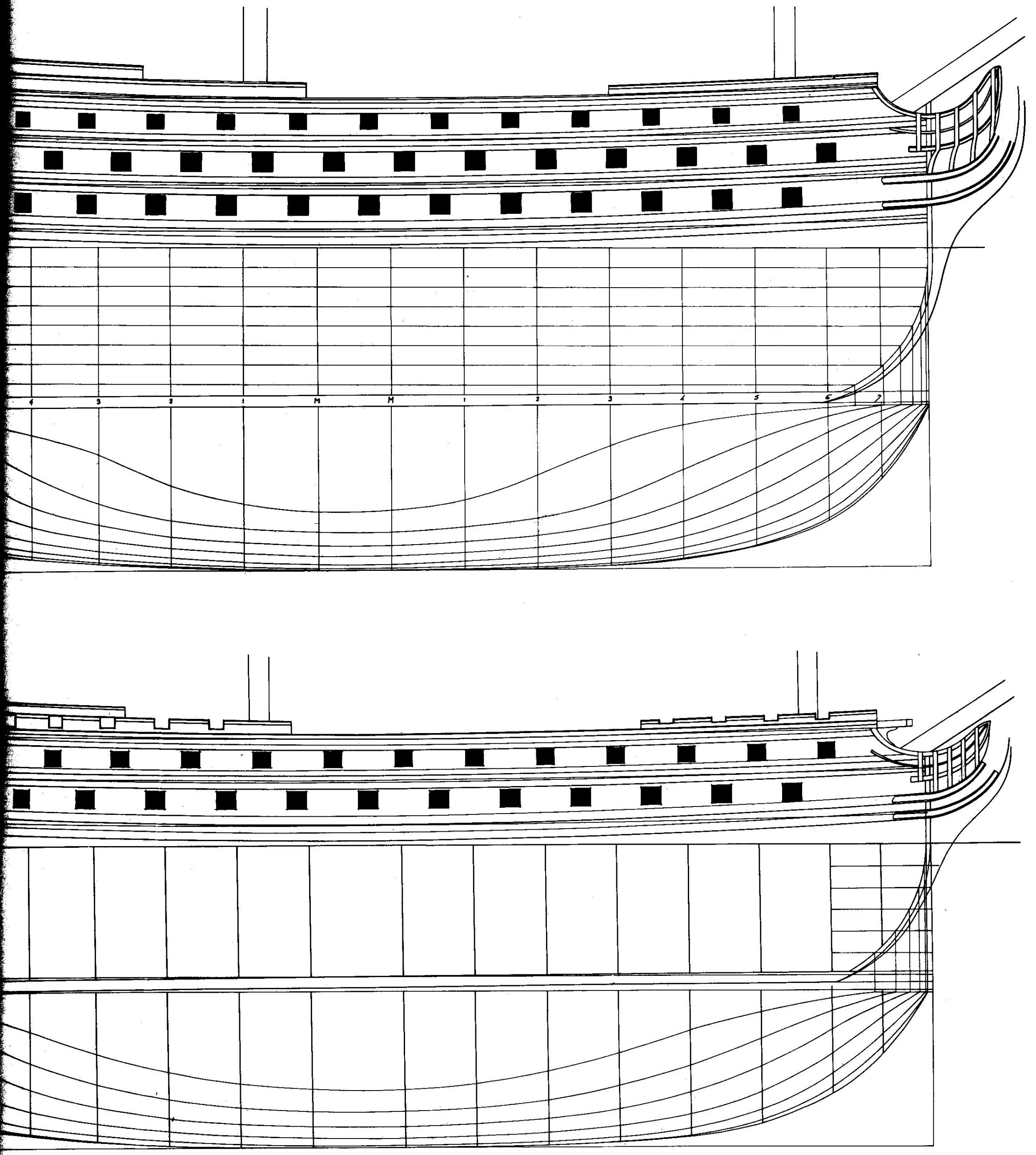


Fig. 339
80-Gun Ship

80-GUN SHIP

Its advantage over a 74-gun ship is not so much its ability to carry an extra gun (36-pdr) on the gundeck, but the fact that the upper deck is armed with 24-pdrs (no more 80's are being built with 18-pdrs on the upper deck).


4
3
2
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7

74-GUN SHIP

The 74 has shown itself to be the optimum compromise between a heavy weight of broadside and good sailing qualities.

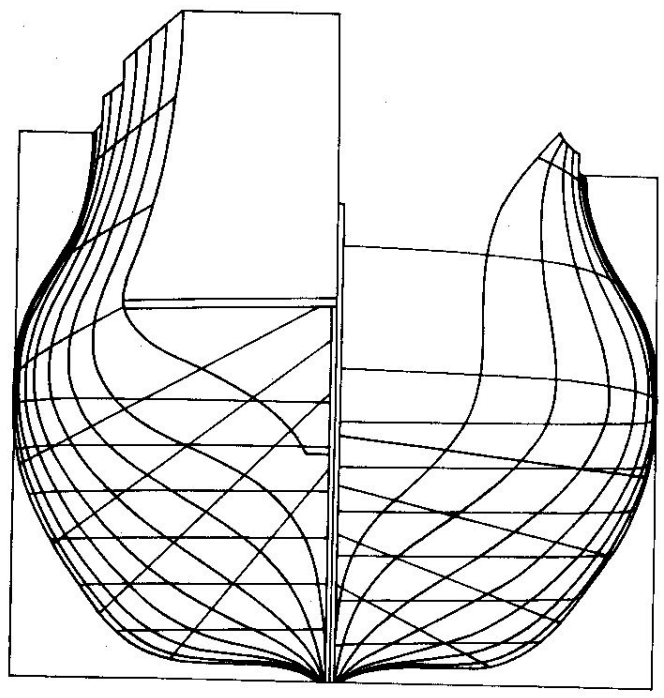


Fig. 340
74-Gun Ship

64-GUN SHIP

This type of ship is too weak; with its lower deck 24-pdrs and upper deck 12's it is outgunned by the 74, and thus no more 64's will be built.

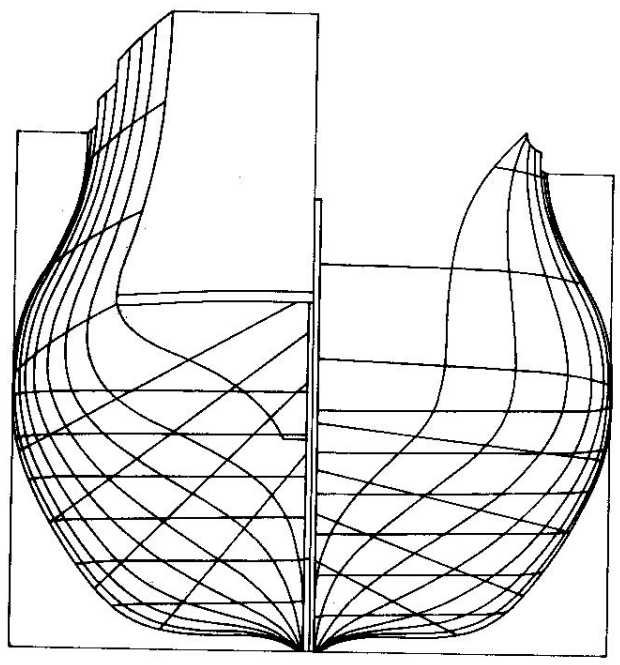


Fig. 341
64-Gun Ship

50-GUN SHIP

The design is by now obsolete, despite the adoption of 24-pdrs on the gundeck; this class of ship was in fact never successful. No more have been built for a long time, and there are now only two left in the French Navy.

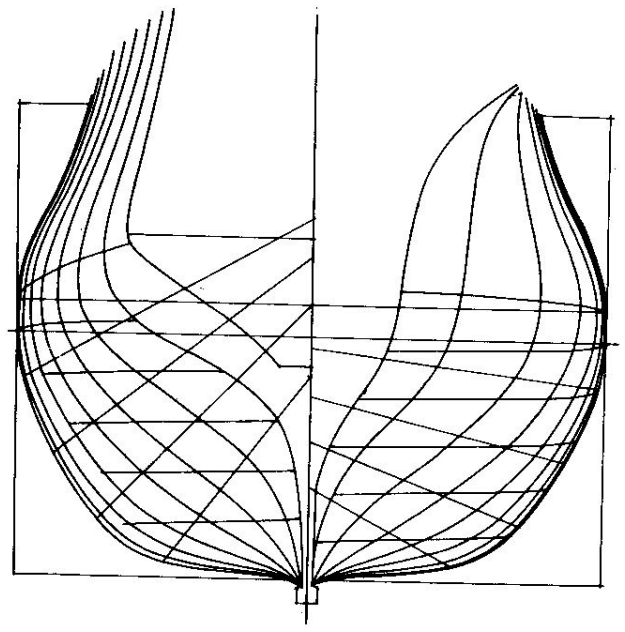


Fig. 342
50-Gun Ship

FRIGATES ARMED WITH 12-PDRS AND 8-PDRS

The internal arrangements of frigates are somewhat different from those of ships.

The hold is set out in the same way, save that the issuing-room is over the after hold and the breadrooms are over the magazine[1].

The orlop is thus entirely clear, the storerooms of most of the warrant officers being replaced by chests. The gunroom is set up at the after end of the orlop, containing the cabins of the Gunner and the Purser. Forward of the gunroom is a further area providing sleeping accommodation for a few more people, and there are three officers' cabins. The ladderway leading to this part of the orlop is situated a little way forward of the mizen-mast, which is stepped on the beams of the orlop.

The remainder of the orlop is reserved for the crew's hammocks, between the main capstan and the foremast. The Bo'sun has a small storeroom right forward in the bows, and if space permits a number of other small storerooms are built for the other warrant officers, in place of chests; these rooms back against the side of the vessel, and extend aft as far as the middle of the main-hatch. There are no carpenter's walks on the orlop of frigates. The great cabin is situated beneath the quarterdeck, and forward of it, to port and starboard, are the Captain's cabin and that of his First Lieutenant. The lower barrel of the main capstan is stepped on the upper deck, where the pumps also discharge; the riding-bitts are towards the bows on the same deck, the hawseholes being about 18 inches above the deck-planking.

There are a number of small deck-cabins for the warrant officers built on the quarterdeck[2].

The galley fires are situated under the forecastle as on ships-of-the-line, and on those frigates equipped with a bakery the bread-oven is placed between the foremast and the step of the bowsprit.

The gangways on 12-pdr frigates are flush with the quarterdeck and forecastle, whereas on those armed with 8-pdrs they are 10 or 12 inches lower. The gangways are in any case extremely narrow, being composed of only two gangboards. There are railings on the outboard side consisting of iron or wooden stanchions and a breastrail.

On 12-pdr frigates the quarterdeck frequently finishes one beam forward of the mainmast[3], whereas in 8-pdr frigates it ends somewhat abaft the mast.

During the last war the quarterdeck and forecastle guns were removed, but in recent years there has been a tendency to reinstate them. For example, a decision dating from September 1778 increased the armament of those frigates carrying 26 12-pdrs. The usual arrangement was to fit 6 6-pdrs (2 on the forecastle) on the larger frigates, and 4 to 6 6-pdrs on frigates armed with 8-pdrs, two of which were once again on the forecastle. The two forecastle guns are primarily intended for saluting, or as chase-guns.

[1]There are only two tiers of casks.
[2]Some Captains manage to get a small poop fitted in place of the deck-cabins.
[3]Not in the case of the example illustrated.

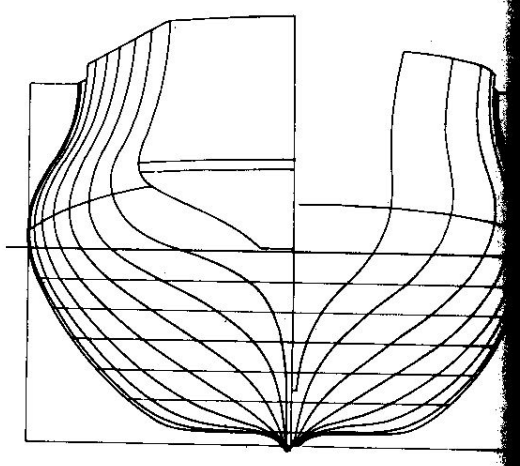


Fig. 343
12-pdr Frigat

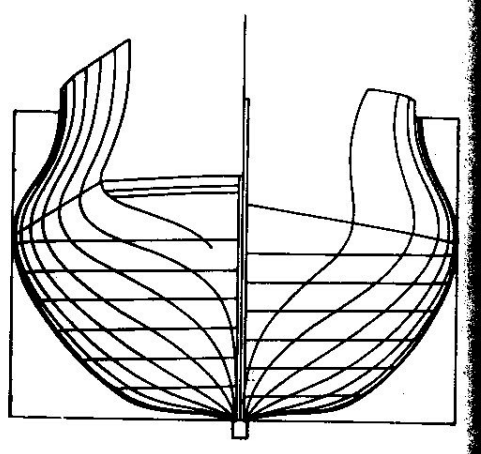


Fig. 344
8-pdr Frigate

SLOOP-OF-WAR (armed with 6-pdrs)

The internal arrangement of sloops is the same as for frigates, the orlop being continuous or only partial (in which case it is completed by flats which can be removed). The headroom is less than four feet below decks, which is in fact about the same as on the 8-pdr frigates. The upper works are as low as possible; there is a small quarterdeck which finishes short of the single-barrelled capstan, and below the quarterdeck is a small cabin for the Captain and two officers' cabins; there are no deck-cabins on the quarterdeck. The forecastle is just long enough to cover the galley fires and occasionally an oven. There are no gangways at the waist on sloops.

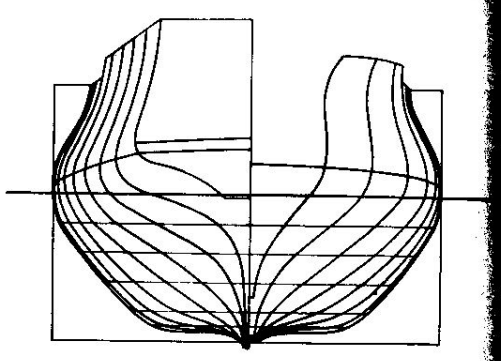


Fig. 345
Sloop-of-War
(armed with 6-pdrs)

GUNBOAT

Small undecked vessel armed with one to three guns on sliding carriages which can fire either forwards or aft. In the Mediterranean they are rigged like galleys, while on the Atlantic seaboard they are schooner or brigantine-rigged.

CUTTER

This type of vessel was adopted by the Navy about ten years ago. They are characterised by a mainsail which is extended by a boom and a gaff. Armed cutters are rigged with a square topsail and topgallant, and several jibs on the bowsprit. A number have been re-rigged as luggers.

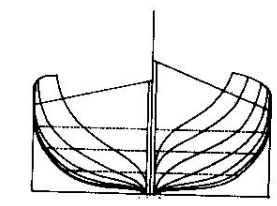
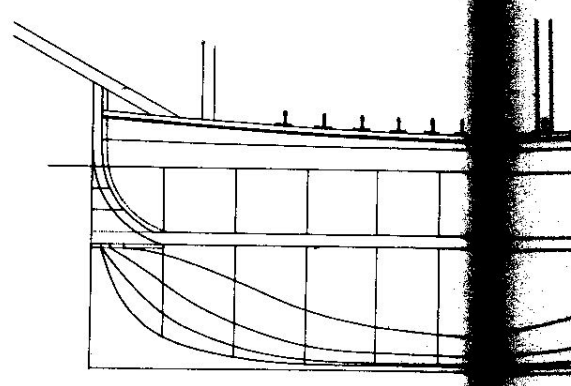


Fig. 347
Gunboat
2 18-pdrs in the eyes
1 18-pdr in the stern



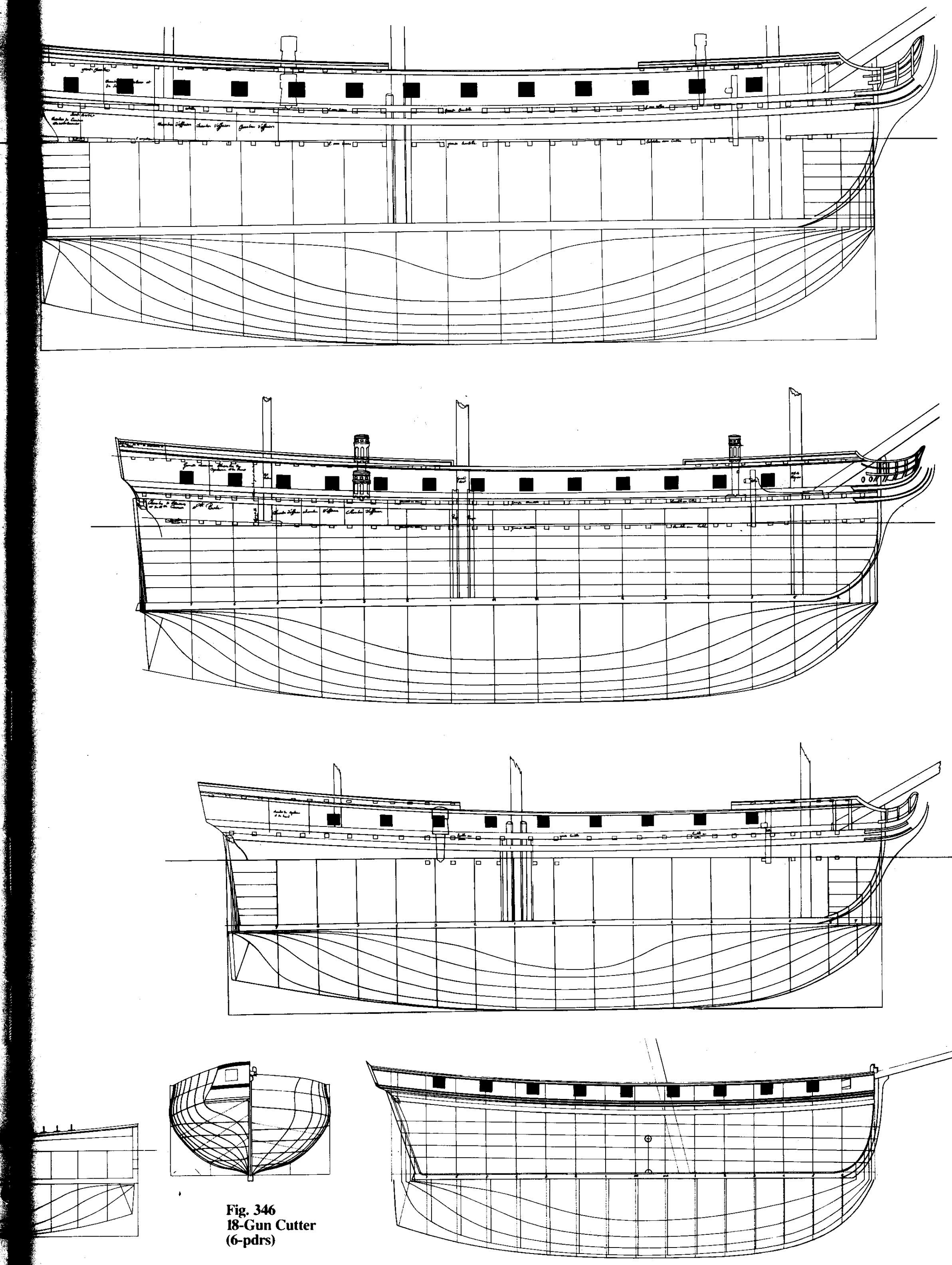


Fig. 346
18-Gun Cutter
(6-pdrs)

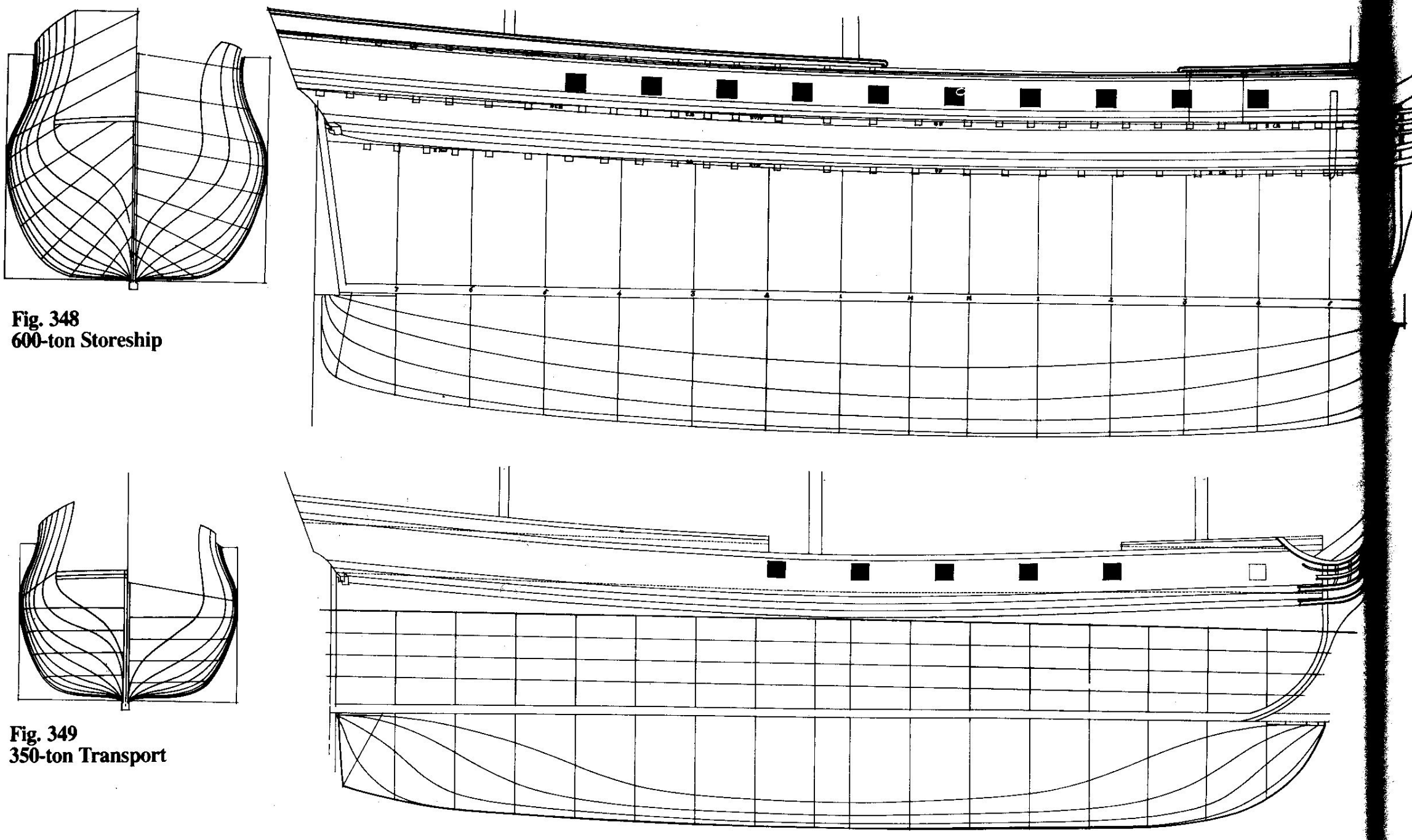


Fig. 348
600-ton Storeship

Fig. 349
350-ton Transport

VESSELS OF BURTHEN

These vessels are of considerable interest in their own right, not least because they provide valuable information concerning merchant ships of the period, of which they are the naval counterparts. Storeships are intended for the longer deep-sea voyages, whereas the transports are essentially for inshore work.

The storeships have an orlop which is close to the waterline, so that their height of gundeck sill is considerable.

The displacement of both storeships and transports is roughly double the burthen in tons. The hold is thus as clear of obstruction as possible, the only bulkheads being those of the water-hold forward and the magazines aft. In the case of the storeships all the other apartments are to be found on the orlop: victuals, issuing-room, storerooms and cable-tier; there is a gunroom in the stern and some of the crew berth on the orlop. Raft-ports may be cut in the side.

The quarterdeck finishes just forward of the mainmast. The officers' quarters are aft following the usual practice, while passenger-cabins may be fitted out beneath the forward end of the quarterdeck, or alternatively some of the crew may sling their hammocks there. The forecastle is arranged as on frigates. In fact, storeships might crudely be described as frigates with a greatly expanded hold; in fact however it is the underwater lines which distinguish the two types of vessel most clearly, the hold of a storeship being larger than that of a frigate by a ratio of 5 to 3, other dimensions being equal. The largest storeships used by the Navy do not exceed 900 tons burthen, while transports vary between 200 and 500 tons (those of 500 tons being sometimes assimilated as storeships). What distinguishes the two types of vessel is the absence of an orlop in the transports: their crew is small enough for everything to be installed beneath the forecastle and quarterdeck. The only exceptions are the water-hold and the magazines, arranged as in the storeships; the pumps are installed in these vessels as in warships.

The armament of both storeships and transports is of small calibre, usually 4- or 6-pdrs, and in peacetime only some of these guns will be mounted.

The size of the crew is determined by the tonnage: 200 tons: 35 men - 300 tons: 45 - 400 tons: 65 - 500 tons: 80 - 600 tons: 100 - 700 tons: 110 - 800 tons: 120 - 900 tons: 160. These are the peacetime complements, which are increased by half in wartime. The vessels have three masts and are rigged to the minimum dimensions appropriate to warships.

DIMENSIONS OF GUNPORTS
(Order of August 4th 1762)

Gunports Calibre	36	24	18	12	8	6	4
Breadth (m)	1.002	975	894	813	704	623	542
Height	921	894	813	731	650	569	488
Sill, lower deck	704	650	569	488	461	433	406
Middle & upper deck		596	542	461	433	406	379
F'castle & q'deck					406	379	
Distance between ports on the lower deck	2.356	2.329	2.275	2.058	1.950	1.842	1.625

*The distance from the stem to the forward side of the first gunport, expressed as a multiple of the distance between ports, is 2 1/4 to 2 1/2; from the after side of the aftermost port to the sternpost, 1 1/2 times the distance between ports.

PRINCIPAL DIMENSIONS AND ARMAMENT OF WARSHIPS

	DIMENSIONS				ARMAMENT								OBSERVATIONS
					1st Battery		2nd Battery		3rd Battery		F'castle		
	Length	Breadth	Depth in Hold	Av. Draught	Guns	Calibre	Guns	Calibre	Guns	Calibre	Guns	Calibre	
Ship of 110-120 Guns	62.30 63.05	16.25 16.57	7.96 8.12	7.80 7.96	32	36	34	24	34	12	18	8	Only the *Royal-Louis* of and its homonym of 1759 had 16 gunports on the lower deck.
Ship of 110 Guns	59.75 60.45	16.25 16.5	7.96 78.12	7.80 7.96	30	36	32	24	32	12	16	8	This armament applies to all the three-decker in service, the three-deckers in service, except the *Ville de Paris.*
Ship of 90 Guns	56.87 *57.52*	15.60 *15.92*	7.15 *7.47*	6.82 *7.15*	30	36	30	24	30	12			There is only one ship armed in this way, the *Ville de Paris.*
Ship of 80 Guns	56.22 59.75	15.27 15.60	7.15 7.47	6.82 7.15	30	36	32 32	18 24			18 18	12 8	The *Duc de Bourgogne*, built in 1751, was the last such ship to be armed with 18-pdrs on the upper deck.
Ship of 74 Guns	52.65 55.90	13.97 14.30	6.50 7.15	6.17 6.82	28 28	36 24	30	18			16	8	The 74 armed with 24-pdrs on the gundeck is the *Astronome*, built as an experiment and draughted in 1757.
Ship of 64 Guns	49.07 50.70	13.00 13.32	6.50 6.66	6.17 6.33	26	24	28 28	12 18			10	8	
Ship of 50 Guns	45.50 46.80	12.67 13.00	6.17 6.50	5.85 6.17	24 24	24 18	26	12					The last 50's to be armed with 18-pdrs were built between 1745 and 1749.
Frigate (12-pdrs)	43.87 44.20	11.05 11.37	5.52 5.68	4.55 4.87	26	12					6	6	
Frigate (8-pdrs)	41.27 41.59	10.40 10.56	5.03 5.36	4.87 4.22	26	8					4	4	
Sloop-of-War (6-pdrs)	30.87 31.19	8.12 8.45	4.22 4.38	3.57 3.73	20	6							
Snow or Brig	27.30 26.00	7.80 6.50	3.73 3.41	3.08 2.76	10	4							
Cutter or Lugger	14.62 24.37	5.20 7.80	2.60 3.57	2.46 3.25	6 14	3 6							
Storeship	46.80 44.20	10.40 9.75	4.87 4.44	5.05 4.67	Burthen 800 tons - Displacement 1,555 tons Burthen 600 tons - Displacement 1,200 tons								
Transport	37.70 34.07	8.45 7.47	3.90 3.73	4.02 3.46	Burthen 400 tons - Displacement 745 tons Burthen 300 tons - Displacement 500 tons								As a rule, transports have no orlop

DISPLACEMENT

Type of Vessel	Weight (in tons of 978 kgs)					Total weight	Wartime Complement
	Hull fully rigged with Anchors	Guns and Ordnance Stores	Crew, Clothing & Effects	Iron and Shingle Ballast	Victuals & related Stores	Ship Fitted out for 6 Months & Boats	
110-Gun Ship	2,469 1/2	496 1/2	221 1/4	380	1,099 3/4	4,666 1/4	1,260 men
90-Gun Ship	2,222 1/2	420 1/4	202	350	1,027 3/4	4,222 3/4	1,070 men
80-Gun Ship	1,868 1/4	378 1/4	182	300	891 1/2	3,620 1/4	940 men
74-Gun Ship	1,498 1/2	307 1/2	143 1/4	250	726 1/4	2,925 1/2	734 men
64-Gun Ship	1,284 1/2	237 3/4	115	180	623 1/4	2,440 3/4	589 men
50-Gun Ship	1,110 1/2	183	90 1/4	150	472	2,005 3/4	430 men
12-pdr Frigate	633 3/4	78 1/2	61	90	292 3/4	1,166	255 men
8-pdr Frigate	533 3/4	54 1/2	45 3/4	80	252	966	220 men
Sloop (20 6-pdrs)	313 3/4	27 3/4	31	36	155 1/2	564	130 men
Sloop (16 6-pdrs)	251 1/2	23 1/4	26 1/4	30	127 1/4	458 1/4	110 men
Cutter or Lugger (12 4-pdrs)	154 3/4	14	19 3/4	25	99	312 1/2	60 men

NAVY LIST 1780

It took a great deal of research to draw up this list, which represents the ships of the French Royal Navy on **January 31st 1780**, and despite my best endeavours there are still some blanks; perhaps chance will complete them one day. I should however make some comments.

Names of Builders: I quote the name of the "designer", but this does not mean that he was always in charge of the actual building; this sometimes gives rise to confusion.

Dimensions: While there is no likelihood of confusion as far as breadth and depth-in-hold are concerned (see Vol. I, pp. 18-19), the same cannot be said of the length, which can be calculated in a variety of ways: "length overall", which is the length from the fore face of the stem to the after face of the sternpost at the point of greatest rake - i.e. the length of the keel (or the touch of the keel) plus the rake of the stem and that of the sternpost. This is in fact the length which I show in the table. However, the length can be measured from rabbet to rabbet (the breadth of the rabbet being ignored), at the level of the waterline; or at the level of the lower sills of the gundeck ports (height of the wing-transom); and some people take the same measurement at the level of the lower deck, which is called the "length on the gundeck"; finally, there is another method which consists of measuring "between perpendiculars" (see Vol. I, p. 18), to which I should add however that if the profile of the stem is not vertical above the waterline, but rather curved, then the perpendicular is the intersection of the line of the gundeck with the rabbet of the stem.

Thus it is inevitable that despite my every endeavour some confusions may have crept in, particularly where I have not had the draughts at my disposal.

Guns: Variations may occur, but in general these are restricted to the forecastle and quarterdeck armament, which is considered as being secondary; sometimes this armament may be reduced or even dispensed with altogether. In principle I have indicated the armament as built.

Rebuilds: I have indicated the dates of any rebuilds, but there are pitfalls to be avoided in distinguishing between complete rebuilds, and new ships built from different draughts where only the name is the same.

I thought it might be useful to indicate also the location of any draughts or other relevant manuscripts where they exist; such documents are vital, and allow a detailed study of French naval architecture; the list which I give is far from definitive, and I hope to add to it little by little*.

While there are many comments which might be made in conjunction with this table, I believe that in the context of this book that is impossible.

*I have taken advantage of this revised English edition to make a number of corrections and additions which have come to light since I originally drew up the table.

SHIPS-OF-THE-LINE

Guns	Name	Launched	Built at	Designer	Length	Breadth	Depth-in-Hold	Guns: Lower Deck No	Lower Deck Cal	Middle Deck No	Middle Deck Cal	Upper Deck No	Upper Deck Cal	Q'deck F'castle No	Q'deck F'castle Cal	Remarks
110	**Invincible**	1780*	Rochefort	Clairin-Deslauriers	59.80	16,08	7.80	30	36	32	24	32	12	16	8	Draughts MM. Report AR.
110	**Majestueux**	1780*	Toulon	J.M.B. Coulomb	60.12	16.25	8.12	30	36	32	24	32	12	16	8	See draughts of *Terrible*.
110	**Royal-Louis**	1780*	Brest	Guignace	60.12	16.25	8.12	30	36	32	24	32	12	16	8	Draughts MM. Report AR.
110	**Terrible**	1780*	Toulon	J.M.B. Coulomb	60.66	16.25	8.12	30	36	32	24	32	12	16	8	Draughts MM. AT. Report AR.
100	**Bretagne**	1766	Brest	Groignard	63.37	16.57	8.28	30	36	32	24	32	12	6	6	Draughts and Report MM. Rebuilt 1777.
90	**Ville de Paris**	1764	Rochefort	Clairin-Deslauriers	57.52	15.76	7.36	30	36	32	24	28	12			Draughts JB. Report AN. Rebuilt 3/4 1778-9.
80	**Auguste**	1778	Brest	Guignace	57.85	15.76		30	36	32	24			18	8	Draughts MM (fragmentary).
80	**Couronne**	1766	Brest	Groignard	61.88	14.95	7.47	30	36	32	24			18	8	Draughts RDA. MM. Complete rebuild 1777.
80	**Duc de Bourgogne**	1751	Rochefort	Clairin-Deslauriers	57.09	14.62	7.31	30	36	32	18			18	8	Draughts RDA. Report AN. Rebuilt 3/4 1779.
80	**Languedoc**	1766	Toulon	J.M.B. Coulomb	61.10	15.76	7.52	30	36	32	24			18	8	Draughts AT.
80	**St-Esprit**	1765	Brest	Joseph Ollivier	59.89	15.76	7.55	30	36	32	24			18	8	Report AR and Tables MM*. Draughts JB. Complete rebuild 1777.
80	**Tonnant**	1743	Toulon	François Coulomb	54.92	14.30	7.23	30	36	32	18			18	8	Draughts AT. Report AR. 1/2 rebuilt 1770. To be broken.
80	**Triomphant**	1779	Toulon	J.M.B. Coulomb	59.74	15.60	7.71	30	36	32	24			18	8	Draughts At. Report AT.
74	**Actif**	1767	Brest	Joseph Ollivier	55.09	13.96	6.65	28	36	30	18			16	8	Report AN.
74	**Annibal**	1778	Brest	Sané	55.25	14.30	6.98	28	36	30	18			16	8	Draughts MM.
74	**Argonaute**	1781*	Rochefort	Clairin-Deslauriers	55.25	14.30	6.98	28	36	30	18			16	8	Draughts MM.
74	**Bien-Aimé**	1769	Lorient	Groignard	55.25	14.13	6.82	28	36	30	18			16	8	Draughts SHM.
74	**Bourgogne**	1766	Toulon	Pomet	54.60	14.13	6.98	28	36	30	18			16	8	Draughts AT. Rebuilt 2/3 1777.
74	**Brave**	1781*	Rochefort	Clairin-Deslauriers	55.25	14.30	6.98	28	36	30	18			16	8	

Guns	Name	Launched	Built at	Designer	Length	Breadth	Depth-in-Hold	Guns								Remarks
								Lower Deck		Middle Deck		Upper Deck		Q'deck F'castle		
								No	Cal	No	Cal	No	Cal	No	Cal	
74	**César**	1768	Toulon	J.M.B. Coulomb	54.60	13.97	6.82	28	36			30	18	16	8	Draughts MM.
74	**Citoyen**	1763	Brest	Joseph Ollivier	55.09	13.96	6.65	28	36			30	18	16	8	Report AN. Tables MM*.
74	**Conquérant**	1765	Brest	Joseph Ollivier	55.09	13.96	6.65	28	36			30	18	16	8	Report AN. Tables MM*. Rebuilt 1777.
74	**Destin**	1770	Toulon	J.M.B. Coulomb	54.60	14.13	6.82	28	36			30	18	16	8	See draughts of the *César*.
74	**Diadème**	1756	Brest	J.-Luc Coulomb	54.60	14.13	6.66	28	36			30	18	16	8	Report AN. Rebuilt 1778.
74	**Fendant**	1772	Rochefort	Groignard	53.30	14.30	7.15	28	36			30	18	16	8	Draughts AR.
74	**Glorieux**	1756	Rochefort	Clairin-Deslauriers	52.97	13.97	6.50	28	36			30	18	16	8	Report R. Rebuilt 1777.
74	**Guerrier**	1753	Toulon	J.-Luc Coulomb	53.30	13.97	6.66	28	36			30	18	16	8	Draughts AT. Report AR. and AT.
74	**Hector**	1752	Toulon	Pierre-Blaise Coulomb	53.30	13.97	6.66	28	36			30	18	16	8	Draughts AT. 1/2 rebuilt 1768.
74	**Hercule**	1778	Rochefort	Clairin-Deslauriers	55.25	14.30	7.15	28	36			30	18	16	8	
74	**Héros**	1778	Toulon	J.M.B. Coulomb	54.54	14.13	6.82	28	36			30	18	16	8	Draughts MM. and AT.
74	**Illustre**	1781*	Rochefort	Chevillard the Younger	52.15	13.00	6.66	28	36			30	18	16	8	Draughts AR. (partial). Report AR.
74	**Intrépide**	1747	Brest	Blaise Ollivier	53.62	13.97	6.50	28	36			30	18	16	8	Draughts RDA. Report AN. Rebuilt 1775.
74	**Magnanime**	1779	Rochefort	Chevillard the Younger				28	36			30	18	16	8	
74	**Magnifique**	1749	Brest	J.-Luc Coulomb	54.27	13.97	6.50	28	36			30	18	16	8	Rebuilt 1773.
74	**Marseillais**	1766	Toulon	Chapelle	54.27	14.13	6.82	28	36			30	18	16	8	Draughts AT. Report AR. Rebuilt 1776.
74	**Minotaure**	1757	Brest	Geffroy	53.95	14.13	6.66	28	36			30	18	16	8	To be broken.
74	**Neptune**	1778	Brest	Lamothe	54.76	14.30	7.15	28	36			30	18			Draughts MM.
74	**Northumberland**	1779*	Brest	Sané	55.25	14.30	6.98	28	36			30	18	16	8	Draughts MM.
74	**Orient**	1756	Lorient	Groignard	56.55	14.30	6.66	28	36			30	18	16	8	Reports AR. and AN. 3/4 rebuilt 1777.
74	**Palmier**	1776	Brest	Joseph Ollivier	55.09	13.96	6.65	28	36			30	18	16	8	Tables MM.*
74	**Pluton**	1778	Rochefort	Clairin-Deslauriers	55.25	14.30	6.82	28	36			30	18	16	8	Draughts, Tables MM.*
74	**Protecteur**	1757	Toulon	Pomet	53.30	14.13	6.98	28	36			30	18	16	8	Report AR. Rebuilt 1772.
74	**Robuste**	1758	Lorient	Groignard	53.62	14.40	7.09	28	36			30	18	16	8	Report AN. Rebuilt 1778.
74	**Sceptre**	1780*	Brest	Lamothe the Elder	55.52	14.38	6.98	28	36			30	18	16	8	Tables MM*. Draughts JB.
74	**Scipion**	1778	Rochefort	Clairin-Deslauriers	55.25	14.30	7.15	28	36			30	18	16	8	
74	**Souverain**	1757	Toulon	Pomet	53.30	14.13	6.98	28	36			30	18	16	8	Report AR. 3/4 rebuilt 1779.
74	**Victoire**	1770	Lorient	Groignard	55.25	14.30	6.74	28	36			30	18	16	8	Draughts AT.
74	**Zélé**	1763	Toulon	J.M.B. Coulomb	55.25	14.13	6.74	28	36			30	18	16	8	Draughts AT. MM.
74	**Zodiaque**	1767	Brest	J.-Luc Coulomb	55.25	14.13	6.74	28	36			30	18	16	8	
70	**Dauphin-Royal**	1735	Brest	Blaise Ollivier	51.18	14.21	6.66	26	36			28	18	16	8	Darughts RDA. Report AN. and AR. Rebuilt 1767.
64	**Actionnaire**	1771	Lorient	Groignard	49.69	13.32	6.66	26	24			28	12	10	8	See draughts *Réfléchi* MM.
64	**Alexandre**	1771	Brest	Joseph Ollivier	50.74	13.23	6.27	26	24			28	12	10	8	See draughts *Prothée*. Report AN. Tables MM*.
64	**Artésien**	1765	Brest	Joseph Ollivier	50.74	13.23	6.27	26	24			28	12	10	8	Draughts SHM. Report AR and Tables MM*. Rebuilt 1777.
64	**Ajax**			former English East Indiaman				26	24			28	12	10	8	Report AR.
64	**Bizarre**	1751	Brest	J.-Luc Coulomb	49.64	13.21	6.14	26	24			28	12	10	8	Draughts JB. RDA. Reports AR. and AN. Rebuilt 1778.
64	**Brillant**	1774	Brest	Groignard	51.02	13.16	6.50	26	24			28	12	10	8	Draughts MM.
64	**Caton**	1770	Toulon	J.M.B. Coulomb	50.70	13.16	6.39	26	24			28	12	10	8	
64	**Eveillé**	1772	Brest	Joseph Ollivier	50.74	13.23	6.27	26	24			28	12	10	8	Draughts RDA. Tables MM*.
64	**Fantasque**	1758	Toulon	Chapelle	49.07	13.16	6.33	26	24			28	12	10	8	Draught AT. 2/3 rebuilt 1768.
64	**Hardi**	1748	Rochefort	Morineau	49.07	13.37	6.50	26	24			28	12	10	8	Report AT. Rebuilt 1772.
64	**Indien**	1768	Lorient	Groignard				26	24			28	12	10	8	
64	**Jason**	1779	Toulon	J.M.B. Coulomb	51.02	13.16	6.39	26	24			28	12	10	8	Draughts AT.
64	**Lion**	1751	Toulon	J.-Luc Coulomb	49.07	13.00	6.33	26	24			28	12	10	8	Draughts AT. 2/3 rebuilt 1769.
64	**Provence**	1763	Toulon	Gauthier	49.72	13.16	6.39	26	24			28	12	10	8	Draughts AT. Reports T. and R. 2/3 rebuilt 1774.
64	**Prothée**	1772	Brest	Joseph Ollivier	50.74	13.23	6.27	26	24			28	12	10	6	Draughts NMM. Report AN. Tables MM*.
64	**Réfléchi**	1772	Rochefort	Groignard	49.69	13.32	6.66	26	24			28	12	10	8	Draughts MM.
64	**Sévère**	1774	Lorient					26	24			28	12	10	8	
64	**Solitaire**	1774	Brest	Groignard	49.72	13.32	6.66	26	24			28	12	10	8	Draughts MM.
64	**Sphinx**	1776	Brest	Joseph Ollivier	49.07	13.32	6.66	26	24			28	12	10	8	Report AN.
64	**Triton**	1747	Toulon	François Coulomb	51.51	13.00	6.17	26	24			28	12	10	8	Report AR. Rebuilt 1776.
64	**Union**	1763	Brest	Geffroy	50.70	13.16	6.50	26	24			28	12	10	8	Report AN. Condemned.
64	**Vaillant**	1753	Toulon	Pomet	49.07	13.16	6.39	26	24			28	12	10	8	Draughts AT. 1/2 rebuilt 1770.
64	**Vengeur**	1765	Lorient	Groignard	51.67	13.48	6.82	26	24			28	12	10	8	Draughts RDA. Rebuilt 1766.
60	**St-Michel**	1741	Brest	Hélie	46.66	12.78	5.90	24	24			26	12	14	6	Draughts RDA. Reports AR. and AN. Rebuilt 1777.
56	**Flamand**	1763	Bordeaux	Groignard	49.56	13.48	6.33	24	36			26	18	6	6	Draughts MM.
50	**Amphion**	1748	Brest	J.-Luc Coulomb	47.45	12.51	5.63	24	24			26	12			Draughts RDA. Report AN. Rebuilt 1770.
50	**Fier**	1746	Toulon	Chapelle	48.75	12.45	5.52	24	18			26	12			Report AR. and AN. Rebuilt 1769.
50	**Sagittaire**	1761	Toulon	J.M.B. Coulomb	47.77	12.78	6.01	24	24			26	12			

12-PDR FRIGATES

Guns	Name	Launched	Built at	Designer	Length	Breadth	Depth-in-Hold	Guns: Gundeck No	Gundeck Cal	Q'deck F'castle No	Q'deck F'castle Cal	Remarks
32	**Amazone**	1778	St-Malo	Guignace	43.55	11.21	5.68	26	12	6	6	
32	**Amphitrite**	1767	Bordeaux	Guignace	43.22	11.21	5.68	26	12	6	6	Draughts AR. (partial). Report AN.
32	**Andromaque**	1777	Brest	Lamothe the Elder	43.87	11.21	5.68	26	12	6	6	Report AR.
32	**Astrée**	1780*	Brest	Lamothe the Elder	43.87	11.18	5.85	26	12	6	6	Report SHM.
32	**Atalante**	1767	Toulon	J.-L. Coulomb	45.52	11.56	5.79	26	12	6	6	Report AR.
32	**Aurore**	1769	Rochefort	Chevillard the Younger	41.60	10.83	5.52	26	12	8	6	Draughts RDA. Report AR.
32	**Belle Poule**	1765	Bordeaux	Guignace	43.22	11.21	5.68	26	12	6	6	Draught R. (partial). Draughts NMM. Report AN.
32	**Bellone**	1778	St-Malo	Guignace	43.55	11.21	5.68	26	12	6	6	Report AR.
32	**Blanche**	1766	Le Havre	Ginoux	42.25	11.05	5.55	26	12	6	6	Report AN.
32	**Boudeuse**	1766	Nantes	Raffeau	40.95	10.72	5.36	26	12	6	6	Reports AT. and AN. Rebuilt 1776.
38	**Capricieuse**	1779	Lorient	Segondat	44.20	11.21	5.68	28	12	10	6	
34	**Cérès**	1779	Rochefort	Bombelle	44.20	11.21	5.68	28	12	6	6	Report AR.
32	**Charmante**	1777	Rochefort	Chevillard the Younger	44.20	11.21	5.68	26	12	6	6	Tables SHM*. Draughts MM.
32	**Chimère**	1758	Toulon	J.M.B. Coulomb	44.20	11.56	5.79	26	12	6	6	
34	**Concorde**	1777	Rochefort	Chevillard the Elder	44.20	11.21	5.74	28	12	6	6	Draughts AR (partial). Draughts NMM. Tables SHM*.
32	**Courageuse**	1778	Rochefort	Chevillard the Elder	44.20	11.21	5.74	26	12	6	6	Draughts AR (partial).
32	**Cybèle**	1767	Lorient	Groignard	42.25	11.05	3.90	26	12	6	6	Ex *Triton*. Taken into the Navy 1769.
32	**Dédaigneuse**	1766	Bordeaux	Guignace	43.22	11.21	5.68	26	12	6	6	Draughts AR (partial). Report AN.
34	**Diane**	1779	St-Malo	Sané	43.71	11.25	5.76	28	12	6	6	Ex *Minerve*.
32	**Emeraude**	1779	St-Malo	Sané	43.55	11.21	5.68	26	12	6	6	
32	**Engageante**	1766	Toulon	Estienne	43.55	11.51	5.79	26	12	6	6	Draughts AT.
32	**Fée**	1779*	Rochefort	Chevillard the Elder	44.20	11.21	5.74	26	12	6	6	Draught AR (partial).
32	**Fine**	1778	St-Malo	Sané	43.71	11.25	5.76	26	12	6	6	
32	**Fortunée**	1777	Brest	Forfait				26	12	6	6	
38	**Friponne**	1779*	Lorient	Segondat	44.20	11.21	5.68	28	12	10	6	Report AT.
32	**Galathée**	1779	Rochefort	Haran	45.52	11.21	5.68	26	12	6	6	Draughts AR.
32	**Gentille**	1778	St-Malo	Guignace	43.55	11.21	5.68	26	12	6	6	
32	**Gloire**	1778	St-Malo	Guignace	43.55	11.21	5.68	26	12	6	6	
24	**Gracieuse**	1750	Toulon	Chapelle the Younger	40.30	10.73	5.36	24	12			AT.
32	**Hermione**	1779	Rochefort	Chevillard the Elder	44.20	11.21	5.74	26	12	6	6	Draught AR (partial).
32	**Inconstante**	1766	Le Havre	Ginoux	42.25	11.05	5.55	26	12	6	6	Report AN.
34	**Indiscrète**	1767	Nantes	Raffeau	42.25	10.72	5.36	28	12	6	6	Report AN.
32	**Iphigénie**	1777	Lorient	Guignace	43.55	11.21	5.68	26	12	6	6	
32	**Junon**	1778	Rochefort	Chevillard the Younger	44.20	11.21	5.68	26	12	6	6	Tables SHM*. Draughts MM.
32	**Lutine**	1779	Toulon	J.M.B. Coulomb	44.20	11.53	5.82	26	12	6	6	Report AT.
32	**Magicienne**	1777	Toulon	J.M.B. Coulomb	44.20	11.20	5.79	26	12	6	6	Draughts NMM.
32	**Médée**	1778	St-Malo	Guignace	43.55	11.21	5.68	26	12	6	6	Report AR.
34	**Néréïde**	1779	St-Malo	Sané	43.71	11.25	5.76	28	12	6	6	Report AR.
32	**Nymphe**	1777	Brest	Lamothe the Elder	44.20	11.37	5.68	26	12	6	6	Draughts NMM.
32	**Précieuse**	1778	Toulon	J.M.B. Coulomb	44.20	11.21	5.79	26	12	6	6	Report AT.
32	**Railleuse**	1778	Rochefort	Haran	44.53	11.21	5.68	26	12	6	6	
30	**Renommée**	1767	Brest	Groignard	47.12	11.21	5.68	30	12			Tables MM*. Rebuilt 1774.
32	**Résolue**	1778	St-Malo	Guignace	43.55	11.21	5.68	26	12	6	6	
34	**Sensible**	1767	Nantes	Raffeau	42.25	10.72	5.36	28	12	6	6	Reports AT. and AN.
32	**Sérieuse**	1779	Toulon	J.M.B. Coulomb	44.20	11.53	5.82	26	12	6	6	Report AT.
32	**Sultane**	1765	Toulon	Doumet	42.25	11.05	5.63	26	12	6	6	Report AT.
32	**Surveillante**	1778	Lorient	Guignace	43.55	11.21	5.68	26	12	6	6	Report AR.
32	**Sybille**	1777	Brest	Sané	44.53	11.21	5.68	26	12	6	6	
30	**Terpsichore**	1763	Nantes	Groignard	46.63	11.05	5.63	30	12			Report AN.
32	**Tourterelle**	1770	Bordeaux	Guignace	43.22	11.21	5.68	26	12	6	6	Draught AR (partial).
32	**Vénus**	1780*	St-Malo	Sané	43.71	11.25	5.76	26	12	6	6	Tables BSH*.

8-PDR FRIGATES

30	**Aigrette**	1756	Le Havre	Ginoux	40.30	10.31	5.20	26	8	4	4	Report AR.
32	**Aimable**	1776	Toulon	Groignard	40.30	10.40	5.52	26	8	6	4	Draughts NMM.
32	**Alcmène**	1774	Toulon	Groignard	40.30	10.40	5.52	26	8	6	4	Draughts NMM.
30	**Diligente**	1761	Lorient	Groignard	39.97	10.07	5.20	26	8	4	4	Rebuilt 1774. Report AR.
32	**Flore**	1769	Brest	Groignard	41.60	10.56	5.30	26	8	6	4	Draughts AT.Report AT.
26	**Mignonne**	1768	Toulon	Saucillon	39.65	10.40	5.11	26	8			Draughts AT. Report AT.
26	**Pléiade**	1755	Toulon	J.M.B. Coulomb	39.00	9.69	5.14	26	8			Draughts AT.

SLOOPS-OF-WAR

Guns	Name	Launched	Built at	Designer	Length	Breadth	Depth-in-Hold	Guns		Remarks
								No	Cal	
20	**Coquette**	1779	Toulon	J.M.B. Coulomb	38.67	9.91	5.03	20	8	
16	**Etourdie**	1762	Nantes	Merchant builder	34.77	8.45	4.33	16	6	Armed ship. Report AN.
18	**Flèche**	1768	Toulon	Chapelle the Younger	35.10	8.93	4.44	18	6	Report AT.
20	**Naïade**	1779	Toulon	J.M.B. Coulomb	38.67	9.91	5.03	20	8	
16	**Perle**	1768	Brest	Lamothe	32.50	8.45	4.22	16	6	Report AN.
20	**Rossignol**	1767	Brest	Joseph Ollivier	32.98	9.10	4.22	20	6	Reports AR. and AN. Tables MM*.
18	**Sardine**	1771	Toulon	Broquier	34.45	8.77	4.30	18	6	Report AT.
20	**Subtile**	1777	Rochefort	Haran	35.75	9.12	4.71	20	6	Draught AR (partial).
14	**Sylphide**	1763	Nantes	Raffeau	29.90	7.96	3.73	14	4	Report AR.

LATEEN-RIGGED BARK

18	**L'Eclair**	1771	Toulon	Doumet-Revest	33.99	8.77	3.90	18	6	Draughts MM.

XEBECS

20	**Caméléon**	1762	Toulon	Saucillon	37.37	8.77	3.25	20	8	Draughts RDA.
20	**Séduisant**	1762	Toulon	Estienne	37.37	9.15	3.25	20	8	Draughts AT.

LUGGERS

10	**Chasseur**	1776	Dunkirk	Denÿs	23.88	6.66	3.41	10	4	Draughts MM.
18	**Chevreuil**	1778	St-Malo	Denÿs	26.27	8.45	3.72	18	6	
6	**Espiègle**	1773	Dunkirk	Denÿs	14.67	5.20	2.60	6	3	
18	**Hussard**	1779	St-Malo	Denÿs	26.27	8.45	3.72	18	6	

CUTTERS

18	**Cerf**	1779	St-Malo	Denÿs	26.27	8.45	3.72	18	6	
6	**Furet**	1771	Bordeaux	Guignace	14.78	6.28	2.35	6	3	
18	**Levrette**	1779	Dunkirk	Denÿs	26.27	8.45	3.72	18	6	
6	**Milan**	1771	Bordeaux	Guignace	14.78	6.28	2.35	6	3	
6	**Moucheron**	1771	St-Malo	Groignard	14.62	6.82	2.92	6	3	
14	**Serpent**	1779	Dunkirk	Denÿs	24.37	7.80	3.57	14	6	Draughts MM.

GUNBOATS

3	**Cyclope**	1779	Rochefort	Haran	19.50	5.36	1.95	3	18	Draughts MM.
3	**Embuscade**	1779	Rochefort	Haran	19.50	5.36	1.95	3	18	Draughts MM.
3	**Impudente**	1779	Rochefort	Haran	19.50	5.36	1.95	3	18	Draughts MM.
1	**Levrette**	1778	St-Malo	Chevillard the Elder	19.66	4.27	1.76	1	24	
1	**Méfiante**	1778	St-Malo	Chevillard the Elder	19.66	4.27	1.76	1	24	
3	**Mégère**	1779	Rochefort	Haran	19.50	5.36	1.95	3	18	Draughts MM.
3	**Nantaise**	1779	Rochefort	Haran	19.50	5.36	1.95	3	18	Draughts MM.
3	**Panthère**	1779	Rochefort	Haran	19.50	5.36	1.95	3	18	Draughts MM.
3	**Rusée**	1779	Brest	Geffroy	26.00	5.52	1.70	3	24	
3	**Vautour**	1779	Lorient	Geffroy	26.00	5.52	1.70	3	24	
3	**Violente**	1778	Brest	Geffroy	26.00	5.52	1.70	3	24	

SNOWS

10	**Curieuse**	1776	Le Havre	Ginoux	26.00	6.50	3.41	10	4	Draughts MM.
12	**Ecureuil**	1768	Nantes	Luc Coulomb	31.52	7.80	3.90	12	4	
10	**Favorite**	1776	Le Havre	Ginoux	26.00	6.50	3.41	10	4	Draughts MM.
4	**Lunette**	1765	Brest	Lamothe	29.90	8.12	3.90	4	24	Report AN. Rebuilt 1776.
14	**Serin**	1770	Rochefort	Chevillard the Elder	32.17	8.45	4.11	14	6	

BRIG

16	**Hirondelle**	1762	Nantes	Merchant builder	27.62	7.80	3.84	16	6	

SCHOONER

Name	Launched	Built at	Designer	Length	Breadth	Depth-in-Hold	Guns		Remarks
							No	Cal	
Afrique	1767	Rochefort	Chevillard the Younger				8	4	

BOMBS (armed with 2 12-inch mortars)

Etna	1754	Toulon	Chapelle the Elder	26.32	8.12	3.57	8	6	Draughts AT.
Salamandre	1754	Toulon	J.M.B. Coulomb	26.32	8.12	3.62	8	8	Draughts AT.
Tempête	1727	Toulon	François Coulomb	26.00	8.12	3.54	8	6	

STORESHIPS AND TRANSPORTS

Name	Launched	Built at	Designer	Length	Breadth	Depth-in-Hold	Guns		Tons	Remarks
							No	Cal		
Barbue	1777	Le Havre	Ginoux	36.77	8.12	4.55	8	8	350	
Boussole	1775	Le Havre	Ginoux	38.10	8.45	3.52	18	6	450	Draughts MM.
Compas	1779	Le Havre	Ginoux	38.10	8.45	3.52	18	6	450	Draughts MM.
Courtier		Lorient		32.98	9.10	4.38			420	Ex *Cte Menou*.
Ecluse	1764	Le Havre	Ginoux						450	Report AR.
Esturgeon	1746	Brest	Geffroy the Elder	35.42	6.55	3.46	10	4	360	Rebuilt 1770.
Etoile	1759	Nantes		33.80	8.99	4.22	20	8	450	Report AR.
Guyanne	1778	Le Havre	Ginoux				24	8		Report AR.
Ile de France	1766	Ile de France								
Marie										
Ménagère	1775	Rochefort	Clairin-Deslauriers	46.80	10.56	4.36	28	8	650	Draughts MM and AR. Report AR.
Paysanne	1779	Bayonne	Ginoux	36.77	8.12	4.55	8	8	350	
Pluvier	1776	Rochefort	Ginoux	36.77	8.12	4.55	8	8	350	Report AR.
Porteuse	1765	Brest	Segondat	33.80	8.12	4.06	18	6	400	
Postillon	1780*									
Pourvoyeuse	1772	Lorient	Boux	50.05	12.75	4.44	26	18	128	Draughts MM.
Saumon	1776	Rochefort	Ginoux	36.77	8.12	4.55	8	8	350	Report AR.
Tamponne	1766	Bayonne	Ginoux	36.72	8.12	4.22	10	6	350	Draughts MM.
Truite	1776	Le Havre	Ginoux	36.77	8.12	4.55	8	8	350	Report AR.
Villageoise	1779	Bayonne	Ginoux	36.77	8.12	4.55	8	8	350	

The *Boussole* and the *Compas* are considered as sloops. The *Pléuvier* and the *Saumon* have been fitted out as bombs. The *Pourvoyeuse* is a flush-decked storeship.

LIST OF VESSELS COPPERED AT 31.1.1780

Amazone	November 1778
Bellone	January 1780
Charmante	1779
Concorde	April 1779
Courageuse	September 1779
Diane	December 1779
Gentille	December 1778
Gloire	June 1779
Iphigénie	July 1778
Médée	October 1779
Néréîde	November 1779
Surveillante	May 1779

All the above vessels are 12-pdr frigates, and as yet no ships-of-the-line have been coppered. However, the *Ajax*, *Annibal*, *Bizarre*, *Prothée* and *Réfléchi* have all been sheathed with nails (filled).

To this long list of warships and ships of burthen should be added a whole variety of service vessels. I will do no more than mention them briefly.

Rochefort has two decked lighters for transporting timber, the *César* and the *Ours*; further open lighters are used for transporting guns and water to the ships in Aix Roads: these are the *Singe, Mule, Fontaine* and *Perrine*. There are three yachts - the *Saint-Louis, Rochefort* and *Camille* - for transporting powder and biscuit; and three schooners, the *Avant-Garde, Ambulante* and *Artésienne*, are used in the Dockyard service.

Lorient uses four chasse-marées, of which two are armed guarda-costas for the protection of Belle-Ile. These are the *Bellislois* and the *Oiseau*.

Brest uses little 30-ton chasse-marées as coasters and to serve the needs of the Dockyard and the roadstead. These are the *Turbot, Cormoran, Faucon, Epervier, Marie-Françoise*, Grondin and *Félicité*.

The lists for Toulon show 7 gunboats, but do not give their names; there are also a number of tartans and feluccas.

The Dockyard service inside the harbour calls for all kinds of vessels such as decked and open lighters, flat-bottomed barges, dump-barges, small river lighters; ordinary barges, horse-drawn and towed; ordinary pontoons and careening pontoons; dredgers; pump-boats, flat-boats, floating cisterns, floating caissons, pitch-boats and pitch-lighters, floating stages, graduated ballast-lighters, etc.; and large numbers of small cutters and pulling boats. In addition there are the hulks used as inner and outer guardships and as receiving-ships, and at Toulon there are even five galleys still serving as prison-hulks.

To conclude, I should make it clear that I have omitted from this list a number of captured English ships; these prizes, numbering perhaps twenty in all, are only sloops, cutters and storeships.

In the above tables I have made use of the following abbreviations when indicating the location of draughts or reports:

MM:	Musée de la Marine in Paris.
AR:	Archives of the Port of Rochefort.
AT:	Archives of the Port of Toulon.
AN:	Archives Nationales (Naval section, series D).
RDA:	Royal Danish Archives, Copenhagen.
NMM:	National Maritime Museum, Greenwich, London.
JB:	Author's private collection.
SHM:	Service Historique de la Marine.

Apart from the draughts I have referred in particular to documents of two kinds: "de-commissioning" reports, made out by the Captain at the end of a commission and if conscientiously filled out providing considerable information about the ship's sailing qualities, stowage, masts and spars, etc. I show a typical example of such a report in Volume IV (pp. 356-8). The other kind of document consists of the various essentially numerical tables listed on page 36 of Volume I – Tables of Dimensions, Scantlings etc. These are indicated above by an asterisk.

– If the year of launching is followed by an asterisk, this indicates that the ship is still building.

– In the case of some of the draughts preserved at the National Maritime Museum, it should be noted that frequently these show the ships in their later "anglicized" form, following rebuilds or repairs in English Dockyards, rather than "as captured".

– Most of the draughts marked MM are in fact from the Archives Nationales (Series D, Navy), deposited at the Musée de la Marine.



SEVENTY-FOUR GUN SHIP

Cost of building, rigging, and fitting out with powder and shot, victuals, and other stores. Cost of commissioning and de-commissioning. (1778 values).

It occurred to me that some readers might be interested in some figures regarding the cost of building our 74. I mentioned the subject at the beginning of Volume I, and I must confess that I had intended to give a detailed Schedule of Costs, but on reflection I decided to confine myself to the principal cost headings, and if that is insufficient there will be opportunity enough in Volume IV.

The cost of a 74, nearly one million *livres**1, is of no great relevance until seen within the context of the overall budget of the Navy, since the figure takes no account of the running costs of the Dockyard, the depreciation and maintenance of the dockyard installations, quite apart from anything else. However, there are so many other items buried in the "capital cost to the Nation" that even a crude estimate of the real cost would be impossible to calculate.

It is perhaps better to try to situate what one million *livres* spent on labour and raw materials represents in the context of industrial production of the time. And comparisons such as the following are easy to make: the cost of a 74-gun ship is equivalent to the amount needed to feed and clothe four thousand families for a year (but of course some of the cost goes to doing just that, for the families of the Dockyard artificers).

BREAKDOWN OF EXPENDITURE

Timber.....	Oak, 4 categories: 80,500 cubic feet[2] at an average price of 48 sols Fir, Baltic and French: 15,000 cubic feet at an average price of 32 sols:	217,200 livres
Ironwork.....	Unworked, including knees[3]: 130,000 pounds at an average price of 20 livres per quintal[4]:	6,000 livres
Nails.....	Various. Cost of supply only. 62,500 pounds at an average price of 37 livres 15 sols per quintal:	23,594 livres
Labour.....	For the hull only, and the working of all the materials going into its building:	98,500 livres
Cost of the Hull.....	Complete and ready for launching, materials and labour combined:	365,294 livres
Masts.....	Including spares and fittings (tops, trestletrees etc.); including labour:	52,349 livres
Rigging.....	Cables, cablets, spares and all other items of cordage: 200,000 pounds, at an average of 36 livres per quintal:	72,000 livres
Blocks.....	Of all kinds, complete with sheaves and iron straps:	9,659 livres
Sails.....	Two complete suits ready for bending, and sundry other items of sailcloth: 18,500 ells[5], at an average of 45 livres per ell:	41,625 livres

Anchors[6].....	Total weight : 27,734 pounds. Cost, inclusive of stocks:	21,416 livres 10 sols
Boats.....	Longboat, cutter, barge; ready for rigging:	1,940 livres
Casks	For wine and water:	29,329 livres
Ordnance.....	Guns with their carriages; powder, shot, other projectiles, guncrews' implements. Complete and ready for use:	125,081 livres
Colours.....	Quintin (flax) canvas etc., 550 ells at 1 livre 18 sols per ell, including manufacture: Bunting: 2,000 ells at 14 sols 1 denier per ell:	1,045 livres 1,408 livres
Top-armour and Waist-cloths.....	Serge: 143 ells at 11 livres 15 sols per ell:	1,680 livres 5 sols
Labour.....	Seamen, caulkers, artisans etc., to rig, bream and fit out the ship for commission: 9,000 man days:	9,240 livres
Ballast[7].....	Kentledge: 60 tons, at 8 livres per quintal:	9,600 livres
Warrant Officers' Stores	As per Regulations, and for 6 months at sea:	15,800 livres
Victuals.....	Officers: 14,300 livres Crew: 99,074 livres Total for 6 months at sea:	113,374 livres
Conduct money[8]....	For crew:	4,160 livres
Half-pay	For 2 weeks during fitting out:	7,861 livres
Pay	Number of men mustered (including officers): 763 2 months' pay:	26,638 livres
Total cost of a 74 fitted out for 6 months:		**909,499 livres 15 sols**
Laying up and 4 months' pay at end of commission:		53,276 livres
Conduct money for crew returning home[8]:		4,160 livres
Total cost of a new 74, after 6 months' commission:		**966,935 livres 15 sols**

[1]The French *livre*, like the English pound, was divided into twenty *sols* each of 12 *deniers*. To avoid confusion with English pounds, shillings and pence (£.s.d) and also with pounds weight, I have not attempted to translate. At this time there were about 25 *livres* to the sterling. [Trans.]

[2]1 French cubic foot equals 1.215 English cubic feet, or 0.0343 cubic metres.

[3]These are iron knees substituted for timber knees which are becoming harder and harder to find.

[4]1 French quintal = 100 pounds = 48.9 kgs.

[5]1 French ell = 1.188 metres

[6]The anchors of our 74 weigh only 23,800 pounds.

[7]Shingle and scrap iron ballast not included.

[8]See Volume IV, page 21.

LABOUR REQUIRED TO BUILD A 74-GUN SHIP

	Man Days	Cost per Day (1778)
Quartermen (shipwrights)	1,122	32 - 46 sols
Shipwrights	37,929	13 - 30 sols
Apprentice-shipwrights	3,254	5 - 12 sols
Quartermen (auger-men)	474	32 - 40 sols
Auger-man	8,578	20 - 30 sols
Grinders and tool-sharpeners	952	12 - 16 sols
Convict labour (extra rations)	20,566	2 sols 6 deniers
Warders (guarding convicts)	267	26 sols
Smiths[1]	7,921	28 - 30 sols
Block-makers (to cut sheave-holes)	28	30 sols
Painters	167	20 sols
Quartermen (caulkers)	296	38 - 40 sols
Caulkers	5,479	14 - 28 sols
Apprentice-caulkers	546	5 - 10 sols
Journeymen (sorting timber)	3,756	15 - 18 sols
Waggon-teams[2]	606	8 livres
Carpenters and joiners	1,421	20 - 30 sols
Apprentice-joiners	130	14 - 16 sols
Locksmiths etc	94	28 - 30 sols
Warrant-officers[3]	120	25 - 28 sols
Seamen	1,178	18 - 20 sols
Bricklayers (ovens, galley fires)	120	28 - 30 sols
Others, to assist with launching	562	20 - 22 sols
Total days	**95,566**	

[1]Part of the smiths' work is to forge the knees used to substitute for scarce timber knees.
[2]To transport loads within the Dockyard.
[3]To oversee the lashings of the bilgeways (see Vol. I p. 73) and the raising of the stem and stern-frame.

- The design and execution of the carved-work is estimated at a cost of 1,694 livres.
- The workmen enter the Dockyard in summer at 5.00 a.m. (after roll-call), and leave at 7.00 in the evening. In winter, they start work at 7.00 and finish at sunset. In summer they have half an hour's break in the morning and afternoon.
- As a rough indication of the worth of a day's wages, one pound [489 grs] of wheat flour cost 5 sols in Rochefort in 1778-80 (flour 50% wholemeal).

PRICES OF VARIOUS SUPPLIES
(1778)

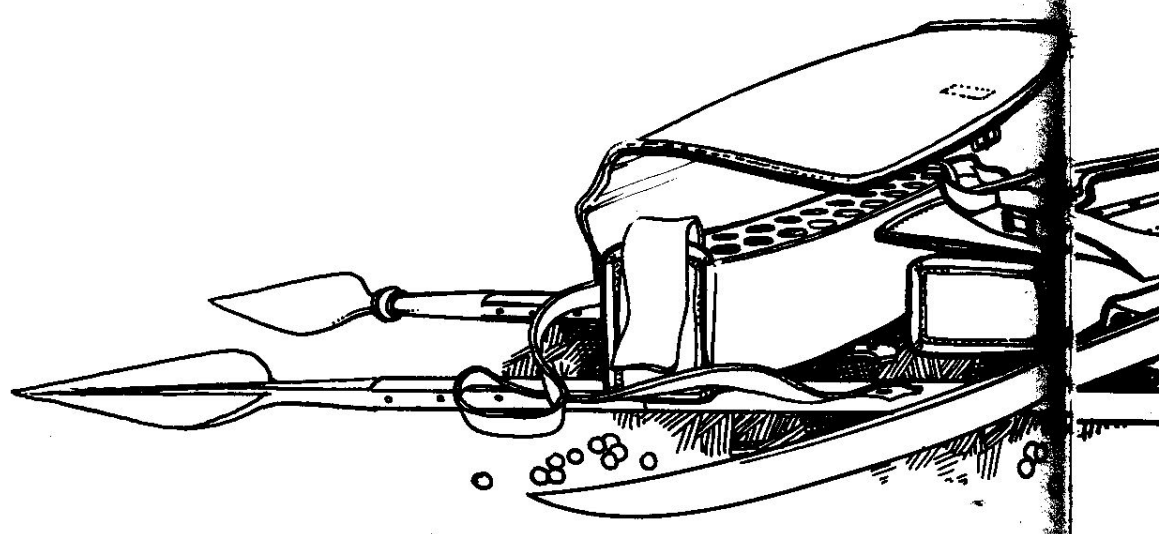
Sawyers work	7 1/2 deniers per square foot
Oak, first grade	57 sols per cubic foot
Oak, second grade	52 sols per cubic foot
Oak, third grade	47 sols per cubic foot
Oak, fourth grade	42 sols per cubic foot
Fir plank	40 sols per cubic foot
Common fir	20 sols per cubic foot
Elm (baulks)	38 sols per cubic foot
New iron, worked	38 livres per quintal
Reworked iron	18 livres per quintal
Spikes (7 - 18 inch)	28 livres 8s 3d per quintal
Nails (4 - 6 inch)	28 livres 18s 3d per quintal
Nails (3 1/2 inch)	35 livres per quintal
Rope, first grade hemp	42 livres per quintal
Rope, second grade hemp	36 livres per quintal
Tallow	51 livres 10s per quintal
Stockholm tar	7 livres 10s per quintal
Red and yellow ochre	15 livres per bucket of 30 pounds
Lamp-black	17 livres per bucket of 30 pounds
Azure blue	10 livres per pound
Baltic pitch	12 livres per quintal
Bayonne pitch	10 livres per quintal
Sulphur	16 livres per quintal
Oakum	2s 1d per pound
Lead (in sheet)	451 livres per ton
Glass lights	12 sols per square foot
Worked bronze (by the pound)	42 - 50 sols per pound
Triple-thread canvas, 1st grade	2 livres 10s per ell
Double-thread canvas, 1st grade	2 livres 10s per ell
Single mélis canvas	2 livres per ell
Lining canvas	1 livre 16s per ell
Guns (cast iron)	20 livres per quintal
Shot (36-pdr)	101 livres 10s per quintal
Bar-shot (36-pdr)	141 livres per thousand pounds
Powder	8 sols per pound
Sling-muskets	25 livres each
Pistols	13 livres 5s each
Cutlasses	3 livres 5s each
Anchors (average price)	12s 6d per pound
Tun*	90 livres each
Double-puncheon*	67 livres 10s each
Butt*	45 livres each
Hogshead*	22 livres 10s each
Copper nails	55 sols per pound
Sheathing copper	40 sols per pound

*See note Vol. II p. 108. [Trans.]

COST OF VARIOUS SIZES

	116 Guns	100 Guns	90 Guns
Hull, fitted out inside, painted, lights glazed, all ironwork etc	650,200	587,200	527,700
Masts and spars, including spares, ready worked and complete with all ironwork	97,500	90,070	83,300
Ropes, cables, spares, standing and running rigging, and those used while building	100,800	93,600	84,960
Blocks, including their sheaves and iron straps	18,015	17,558	13,201
Sails, 2 suits plus spares, labour and other canvas	54,180	51,450	48,300
Anchors, complete with stocks	38,279	36,669	33,463
Boats: longboat, cutter and barge	2,200	2,140	2,080
Casks for 6 months' wine and 4 months' water	67,420	60,270	43,864
Guns, small arms, powder and shot and all guncrews' implements	191,211	173,639	162,746
Colours (flax canvas)	1,520	1,440	1,368
Colours (bunting)	2,148	2,112	2,028
Waist and quarter-cloths, top-armour	2,702	2,300	2,001
Labour for making up the rigging; rigging, loading and storing the ship	12,000	11,440	10,680
Ballast of kentledge	16,000	14,400	12,800
Warrant-officers' stores	26,200	23,440	20,600
Total cost of the hull, fully fitted-out	**1,290,175**	**1,167,529**	**1,049,092**
Crew's victuals and officers' stores	198,644	183,278	166,951
Conduct-money for crew from their homes to the port	6,355	6,285	5,854
Half-pay for the men for 2 weeks while fitting out	13,985	12,588	11,125
Pay of crew and officers, and officers' table-money	44,632	40,207	34,320
Cost of vessel new when fitted out for six months at sea	**1,533,791**	**1,409,888**	**1,267,342**
Four months' pay on laying up	89,264	80,414	68,640
Conduct-money for the crew from the port where paid off to their homes	6,355	6,289	5,854
Total cost of a new ship after a commission lasting six months	**1,649,410**	**1,496,587**	**1,341,836**

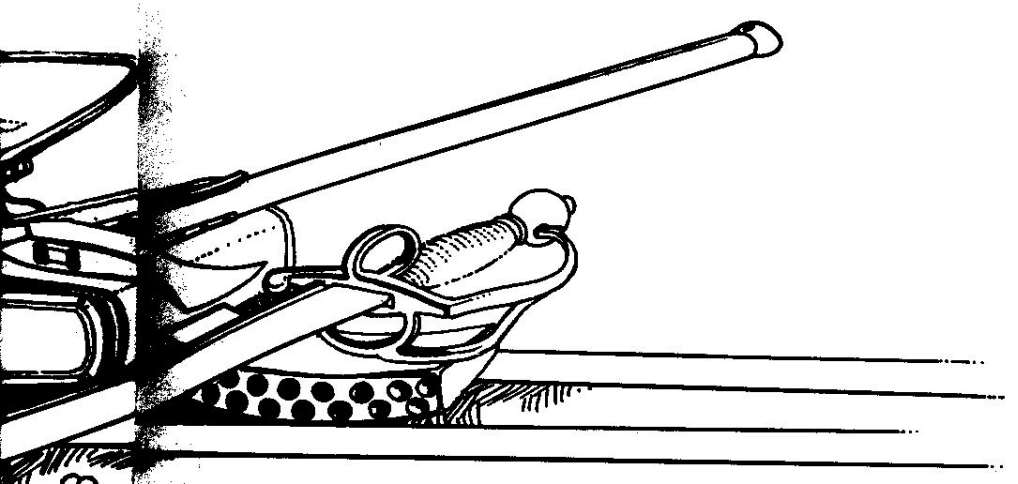
All figures in livres, which in some cases I have rounded to take account of odd deniers; these I have not shown, to save space.



ZES

OF NAVAL VESSEL (1778)

80 Guns	74 Guns	64 Guns	50 Guns 24 12-pdr	30 Guns 26 12-pdr	30 Guns 26 8-pdrs	20 Guns 6-pdrs	16 Guns 6-pdrs	10 Guns 4-pdrs
484,850	365,294	305,101	254,710	153,200	130,375	105,500	72,000	48,900
67,995	52,349	38,400	28,310	18,100	15,390	13,880	8,995	6,002
82,800	72,000	59,400	46,800	37,440	30,960	22,320	16,492	13,140
12,819	9,659	9,659	8,264	5,077	4,459	2,280	1,805	1,330
46,305	41,625	33,600	24,000	21,700	18,603	16,068	15,195	11,001
32,378	21,416	18,338	15,060	12,525	10,375	5,614	4,737	2,367
2,020	1,940	1,786	1,348	1,475	1,368	900	812	720
39,424	29,329	22,625	18,990	10,404	9,630	5,654	5,314	2,562
146,886	125,081	86,056	62,693	29,823	21,688	9,536	8,184	4,261
1,254	1,045	988	788	1,522	456	256	224	105
1,932	1,408	1,153	901	1,696	450	366	315	263
1,845	1,680	1,574	1,527	1,351	1,175	1,116	1,057	963
9,960	9,240	8,420	7,360	5,340	4,620	3,460	2,600	2,032
11,200	9,600	8,000	6,400	4,800	4,000	3,200	2,880	2,400
18,500	15,800	10,800	8,200	3,600	5,000	4,180	3,110	2,600
960,168	**757,466**	**605,701**	**485,372**	**308,035**	**268,349**	**194,331**	**143,581**	**102,166**
151,105	113,374	87,715	65,502	44,857	40,476	27,954	24,024	18,528
5,154	4,160	3,360	2,640	1,482	1,280	802	680	480
9,764	7,861	5,940	4,328	3,204	2,687	1,631	1,306	778
30,469	26,638	19,461	15,735	10,771	9,570	7,075	5,956	4,486
1,156,660	**909,499**	**722,177**	**573,567**	**368,349**	**312,362**	**231,793**	**175,547**	**122,438**
60,958	53,276	38,922	31,490	21,542	19,140	14,650	11,930	8,932
5,154	4,160	3,360	2,640	1,482	1,280	803	680	480
1,222,772	**966,935**	**764,459**	**607,697**	**391,373**	**332,782**	**237,249**	**188,157**	**131,850**



That concludes my description of our 74, which needed three volumes to complete. I hope that I have succeeded in explaining the general principles, and in illustrating their application by means of the examples chosen; I am conscious that the number is considerable, but I wished to omit nothing. And as proof of our joint fascination with the subject, you have accompanied me throughout these first three volumes, becoming all the time more familiar with the secrets of shipbuilding in the "great age of sail" by means of this long description of our seventy-four.

In the fourth and final volume I am not changing the subject, but rather extending it further, as I examine the make-up of the crew and their life on board - an important human aspect if our ship is not to remain a large but empty machine. Then our 74 will set sail and go into action, and we will be able to imagine a typical commission in wartime - in some ways the practical application aimed to make our theoretical knowledge less abstract. Thus we will discover the day-to-day life of a ship of two centuries ago. This therefore is the task which I have set myself in Volume IV, in order to conclude what might almost be described as the history of a seventy-four gun ship.

J.B.



VOCABULARY OF NAUTICAL TERMS USED IN THIS VOLUME

Each term is followed by one or more numbers corresponding to the page-numbering. Where the number is in bold type, this means that on that page there is a detailed explanation of the term. If the page number is only shown in ordinary type, this is because I have given only a brief and temporary explanation in order that the reader should not be held up while reading the text, and that a detailed explanation will follow in the last volume.

There will be a a general Vocabulary at the end of Volume IV, with a key to the page numbers and the drawings most relevant to the particular term.

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