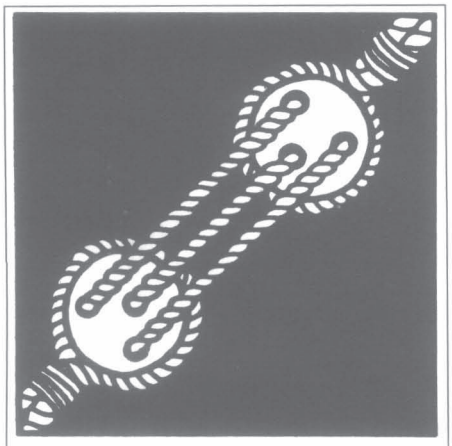


Standing rigging

Introduction
Standing rigging rope sizes
Gammoning · Bumkin
shrouds · Outrigger guys
Bobstay · Bowsprit shrouds
Head stay · Loading gear
Burtons · Shrouds · Backstays
Stays · Sprit topmast backstay
Jibboom rigging

The term "standing rigging" covers all the ropes of a ship which serve to support the masts forward, aft and laterally. There are certain fundamental lines of development which can be observed in the design of the standing rigging through the centuries.

Until the middle of the 15th century the standing rigging was fairly simple; the ship carried just what it really needed. In the second half of the 15th century and in particular the whole of the 16th and the early part of the 17th century the standing rigging grew enormously complicated, and this complexity far outstripped the ships' requirements. We have to remember that the renaissance was not only a return to the consciousness of ancient times, but was also the first stage of an era of technology. New technical possibilities were deliberately indulged, with up to 16 pairs of shrouds per mast, double and triple crows feet on the mizen stay, fore topmast stay and backstay, lateen top and topgallant sails plus mizen and jigger masts, even when the ships were so over-rigged that their efficiency suffered markedly. In the 17th century this confused jungle of ropework was cleared up again under the leadership of Holland, Britain and France, and the standing rigging was again reduced to what was really necessary and useful.

In spite of the constant growth in mast heights and sail areas, the number of ropes did not increase in the 18th century, except for the stays. Instead the individual ropes of the standing rigging grew thicker and thicker. In the latter part of the 19th century, the hemp ropes used until that time finally became inadequate for the extremely tall-rigged ships, and it became standard practice to use steel wire rope for all or part of the standing rigging.

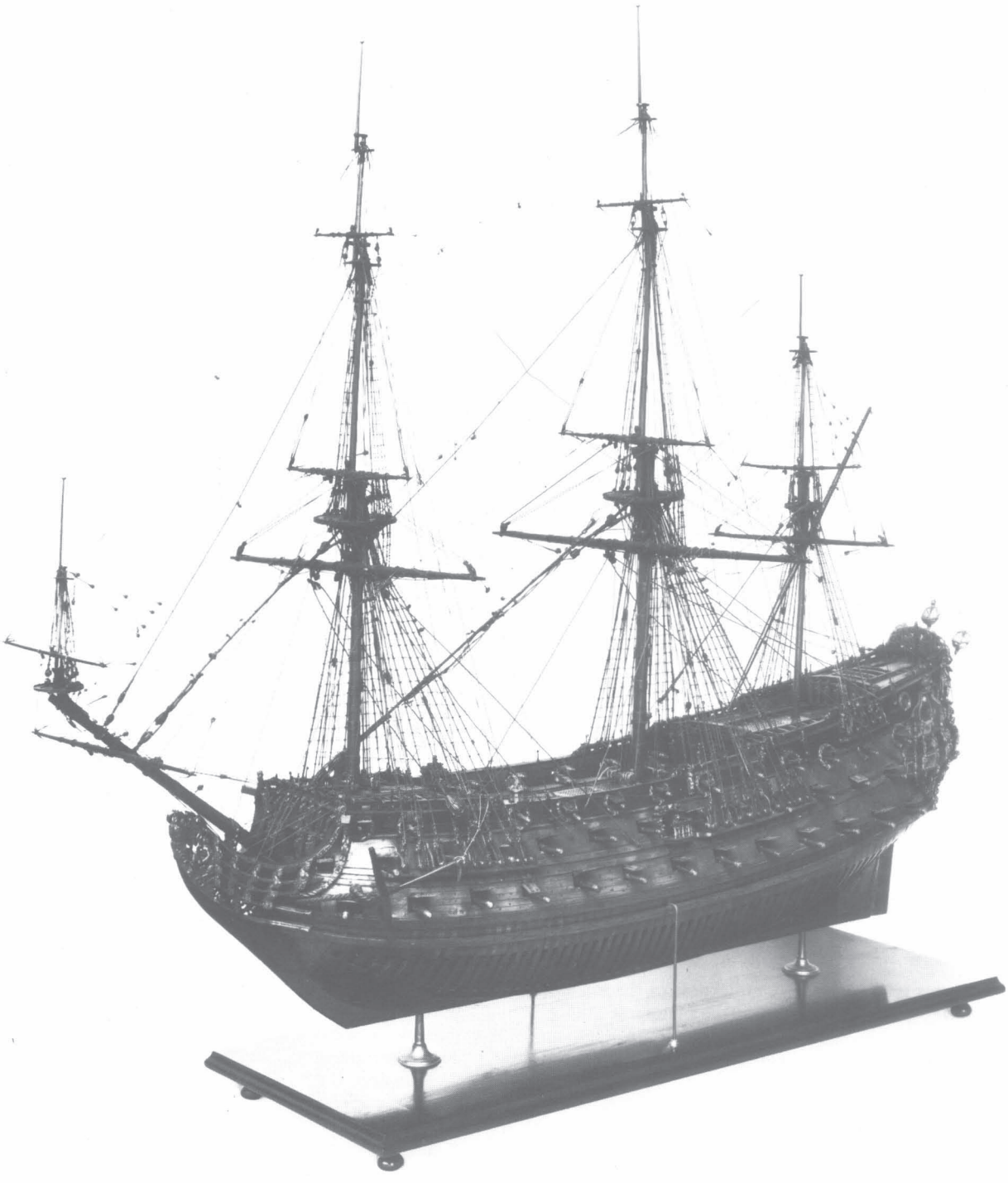
When fitting the standing rigging, work proceeds from the bow towards the stern, and from the bottom towards the top; in the case of shrouds and backstays individual ropes are fitted alternately to starboard then to port. This means: bowsprit gammoning – bobstay – bowsprit shrouds – fore tackle pendants – fore shrouds (starboard – port etc.) – forestay tackle pendants – main shrouds – mainstay – mizen burton pendants – mizen shrouds – mizen stay – fore topmast shrouds – fore topmast stay – main topmast shrouds – etc. etc.

As in full-size practice, the fitting of the standing rigging is a rather complicated matter on a period model – not so much because of the fiddly nature of the ropes, but because in every section a whole series of ropes have to be fitted at exactly the right tension to balance each other out.

The whole standing rigging system is based on the principle of tension and counter-tension, i.e. not only must each rope be pulled tight (that is, they must be under a certain amount of tension), but you have also to consider every other rope which exerts a pull in the opposite direction. An example might illustrate this principle: the shrouds pull the mast back towards the stern. If the shrouds are set up and tensioned, the mast assumes a slight curve towards the stern. If we now try to compensate for this by setting a corresponding amount of tension in the stay, the first pairs of shrouds will inevitably fall slack. For this reason it is of the utmost importance to leave all the lines and tackles of the standing rigging temporarily fixed until all the standing rigging has been fitted; then the tension of each component can be matched to the others, and the whole system balanced out.

Do allow yourself plenty of time for this. Masts that are curved or even bent by incorrect or asymmetrical tension look just as awful as loose shrouds, backstays or stays.

When the whole of the standing rigging has been fitted and balanced, the lines and tackles can be permanently fixed, the excess ends cut off, the crowsfeet attached to the main and fore stays, and the shrouds rattled down.



Admiralty model of the English three-decker St. Michael *of 1669*

Standing rigging sizes

Bowsprit and jib boom	16th/17th century	18th century	19th century hemp	19th century steel
Bowsprit				
Bowsprit gammoning	40%	40%		chain
Bobstay (single)	80%	80%	80%	chain
Lanyard	30%	30%	30%	
Bobstay (multiple)		46%	70%	chain
Lanyard		20%	30%	
Bowsprit shroud	25%	46%	50%	chain
Lanyard	10%	20%	25%	
Head stay	16%			
Lanyard	8%			
Sprit topmast				
Shrouds	16%	16%		
Lanyard	8%	8%		
Backstay	20%	20%		
Lanyard	10%	10%		
Jib				
Martingale stay		30%	60%	chain
Outer martingale stay		20%	55%	chain
Martingale backstay		20%	55%	20%
Outer jib boom guy		8%	53%	20%

The figures given refer to the thickness of the main stay, 0.166% of the diameter of the mainmast at the deck (100%).
These values are a guideline only, and national variations have not been taken into account.

In the case of a mainstay made of steel rope, the figures in the table are still based on the use of hemp rope but could be reduced for steel by about 33%.

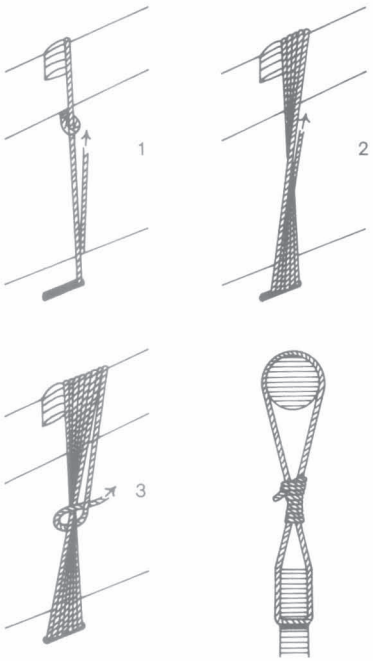
Foremast	16th/17th century	18th century	19th century hemp	19th century steel
Lower mast				
Fore tackle pendants	40%	58%		
Tackles	20%	28%		
Shrouds	40%	58%	100%	44%
Lanyards	20%	30%	50%	
Stay	80%	90%	100%	44%
Lanyard	25%	30%	50%	
Preventer stay		60%	80%	35%
Lanyard		20%	40%	
Topmast				
Burton pendants	20%	30%		
Tackles	10%	15%		
Futtock staves	40%	58%		
Futtock shrouds	18%	20%		stave
Topmast shrouds	20%	30%	62%	31%
Lanyards	10%	15%	31%	
Backstays	20%	38%	88%	38%
Lanyards	10%	20%	44%	
Topmast stay	40%	48%	88%	38%
Lanyard	18%	20%	44%	
Topmast preventer stay		37%	62%	31%
Lanyard		18%	31%	
Topgallant mast				
Futtock staves	20%	30%		
Futtock shrouds	15%	15%		stave
Topgallant shrouds	16%	16%	50%	25%
Lanyards	8%	8%	25%	
Backstays	16%	21%	66%	33%
Lanyards	8%	10%	33%	
Topgallant stay	20%	21%	53%	26%
Royal backstays	8%	10%	40%	20%
Lanyards	4%	5%	20%	
Royal stay	10%	12%	34%	17%

	19th century	
ry	hemp	steel
%	100%	44%
%	50%	
%	100%	44%
%	50%	
%	80%	35%
%	40%	
%		
%		
%		
%		stave
%	62%	31%
%	31%	
%	88%	38%
%	44%	
%	88%	38%
%	44%	
%	62%	31%
%	31%	
%		
%		stave
%	50%	25%
%	25%	
%	66%	33%
%	33%	
%	53%	26%
%	40%	20%
%	20%	
%	34%	17%

Mainmast	16th/17th century	18th century	19th century hemp	19th century steel
Lower mast				
Main tackle pendants	50%	60%		
Tackles	25%	30%		
Shrouds	50%	62%	100%	44%
Lanyards	25%	30%	50%	
Stay	100%	100%	100%	44%
Stay collar	75%	92%		
Lanyard	30%	30%	50%	
Preventer stay		60%	100%	44%
Preventer stay collar		60%		
Lanyard		23%	50%	
Topmast				
Burton pendants	25%	34%		
Tackles	13%	17%		
Futtock staves	50%	62%		
Futtock shrouds	20%	20%		stave
Topmast shrouds	25%	33%	62%	31%
Lanyards	13%	17%	31%	
Backstays	25%	42%	88%	38%
Lanyards	12%	20%	44%	
Topmast stay	50%	51%	88%	38%
Lanyard	20%	21%	44%	
Topmast preventer stay		37%	62%	31%
Lanyard		18%	31%	
Topgallant mast				
Futtock staves	25%	33%		
Futtock shrouds	15%	17%		stave
Topgallant shrouds	16%	17%	50%	25%
Lanyard	8%	8%	25%	
Backstays	16%	22%	66%	33%
Lanyards	8%	10%	25%	
Topgallant stay	20%	25%	56%	28%
Royal backstays	8%	10%	40%	16%
Lanyards	4%	5%	20%	
Royal stay	10%	13%	37%	14%

Mizen mast	16th/17th century	18th century	19th century hemp	19th century steel
Lower mast				
Burton pendants	25%	40%		
Tackles	13%	20%		
Shrouds	25%	40%	75%	35%
Lanyards	13%	20%	37%	
Stay	40%	52%	88%	38%
Lanyard	20%	23%	44%	
Topmast				
Futtock staves	25%	40%		
Futtock shrouds	15%	17%		stave
Topmast shrouds	16%	22%	56%	28%
Lanyards	8%	11%	28%	
Backstays	16%	30%	56%	28%
Lanyards	8%	15%	28%	
Topmast stay	20%	28%	60%	30%
Lanyard	10%	14%	30%	
Topgallant backstays	8%	15%	52%	26%
Lanyards	4%	7%	26%	
Topgallant stay	10%	14%	47%	23%
Other ropes				
Stay tackle pendants	58%	58%	60%	
Guys	40%	40%	50%	
Tackles	20%	20%	25%	
Bumkin shrouds		16%	20%	
Lanyards		8%	10%	
Outrigger guys	16%			
Lanyard	8%			

Bowsprit gammoning



Sequence of the bowsprit gammoning

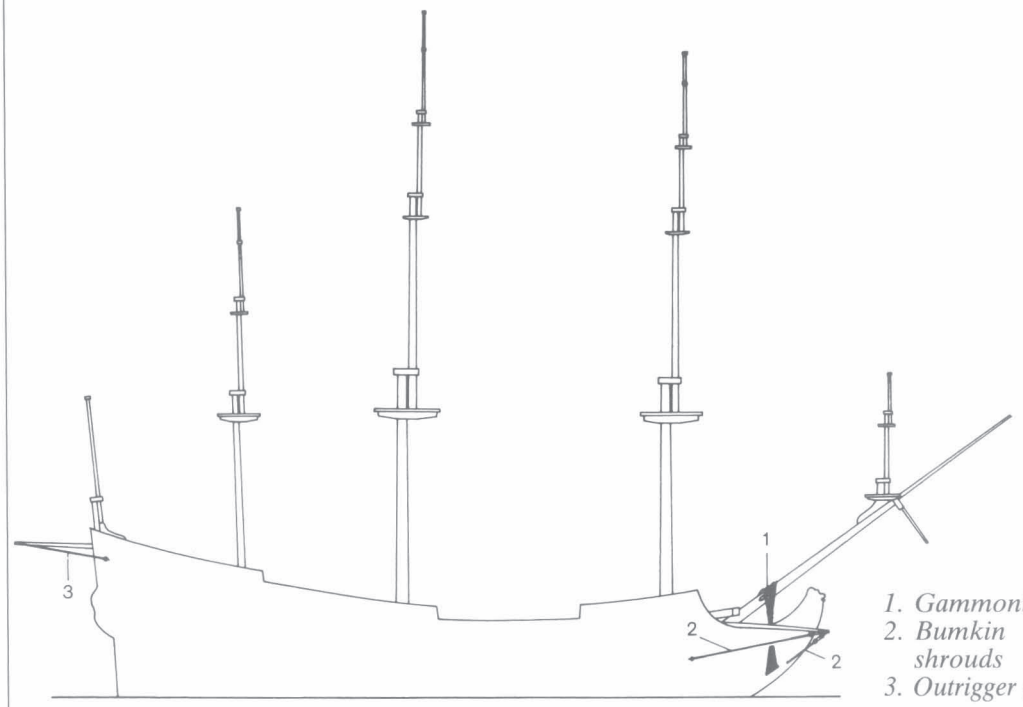
Until into the late 17th century the gammoning was the only standing rigging on the bowsprit, and in all cases it is the first rope to be attached when fitting the rigging.
Smaller ships mostly carried only one gammoning, and larger ships two. Until the beginning of the 17th century it was passed round the still very flat knee of the head, while on larger ships it ran through a heavy cleat on the beakhead platform. (see HEAD). After this time it ran through one or two slots in the knee of the head (sometimes also the gammoning knee); the arrangement should be shown on your plans.
The bowsprit gammoning was looped over the bowsprit, passed down to the knee of the head, through the gammoning hole, up again to the bowsprit and over it, back to the gammoning hole again etc., the whole repeated eight to eleven times. Note here that the rope always crossed over in the middle, that is, each new turn on the bowsprit was *in front of* the previous turn, and at the gammoning hole, was *behind* the previous turn (towards the stern).
The last turn was passed over the bowsprit to the middle of the gammoning, taken round the gammoning eight to ten times, and made fast. To prevent the bowsprit gammoning sliding, three to five thumb cleats were fitted to the bowsprit. They were slightly thicker than the rope, and as long as the gammoning itself on the bowsprit until the 18th century, slightly shorter in the 18th and 19th centuries.
In the 19th century (roughly from 1830) the bowsprit gammoning consisted of chains rather than ropes in many cases. In the late 19th century the gammoning largely disappeared, and completely disappeared on larger ships; smaller vessels continued to use it, especially in the Mediterranean.
In the 17th and 18th centuries a special block, the gammon lashing or rack block, was seized to the gammoning; this was a special block through which a part of the running rigging reeved; more detail on this in the chapter RUNNING RIGGING.

Bumkin shrouds

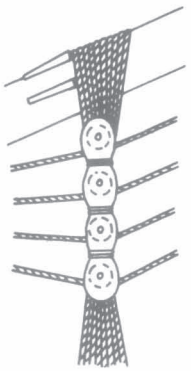
From the 18th century onward, the fore tacks were no longer taken through the knee of the head, but through blocks at the head of the bumkin. The bumkin itself was stayed by two bumkin shrouds, which prevented it bending upwards when under tension.
The forward shroud was led through a hole in the knee of the head and fixed to the bumkins to starboard and port. More often the shroud was fixed to a ring bolt on the knee of the head. The after shroud was made fast to a ring bolt in the hull. The bumkin shrouds were set up with a combination of blocks or deadeyes, and less often with hearts, and the tackle made fast to the bumkin shroud.

Outrigger guys

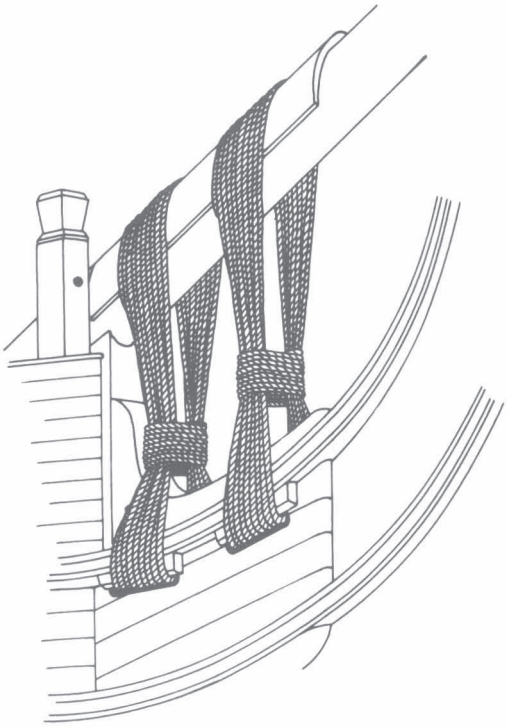
If the mizen or jigger was situated so far aft that the leech of the mizen or jigger sail projected out over the stern of the ship, as was often the case from the 15th to the early 17th century, an outrigger had to be fitted to take the sail's sheet. This outrigger in turn was supported by two guys, leading downwards at an angle on both sides.
A spliced eye in the outrigger guys was fitted over the end of the outrigger, and the other end fixed to ring bolts to starboard and port. Tensioning arrangements with blocks and deadeyes were extremely rare in the case of these guys.



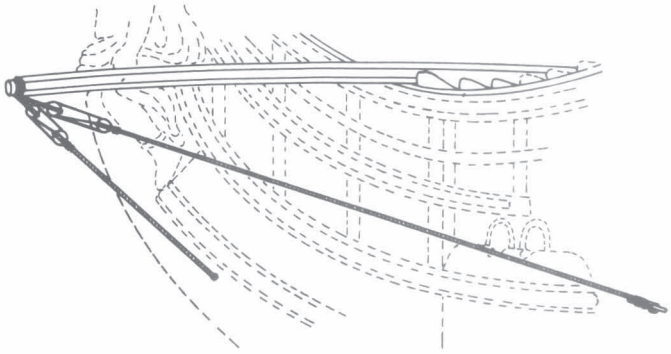
1. Gammoning
2. Bumkin shrouds
3. Outrigger guys



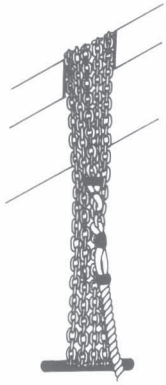
Gammon lashing or rack block



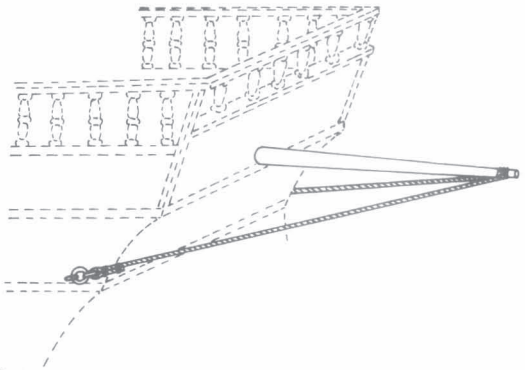
Double bowsprit gammoning. Single or double rope lashing until into the 19th century



Bumkin shrouds, 18th/19th century



Chain gammoning, 19th century



Outrigger guys, 15th to 17th century

The Bobstay

Around 1690 the bobstay began to appear, the purpose of which was to absorb the tension of the fore stay and the fore topmast stay. The bobstay was a French invention. A block was stropped to the knee of the head and a second one to the bowsprit, which was prevented from sliding by several thumb cleats. The blocks were linked by a tackle, which belayed to a cleat on the bowsprit, on the stem, or on the forecastle.

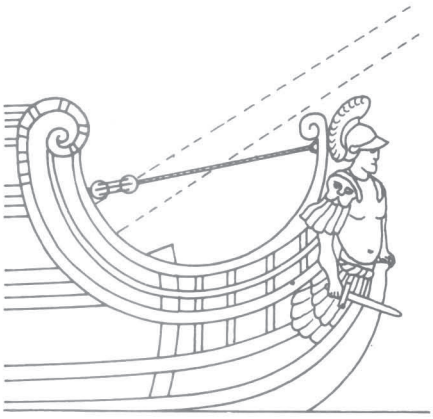
As early as 1695 the British followed the French example. In this case the bobstay was doubled over its full length, reeved at its lower end through the hole in the knee of the head, was spliced together at its upper end, and a deadeye was seized into it. The two parts were seized together in several places. A second deadeye was stropped to the bowsprit, and the bobstay was set up with a deadeye lanyard exactly as described for setting up the shrouds. This form was adopted by the French and the rest of the Continental shipbuilders by the beginning of the 18th century.

Until about 1850 the bobstay remained very largely unchanged, only the number of them being increased: around 1700 there were two, around 1740 three, and around 1770 a cap bobstay was fitted to the bowsprit cap.

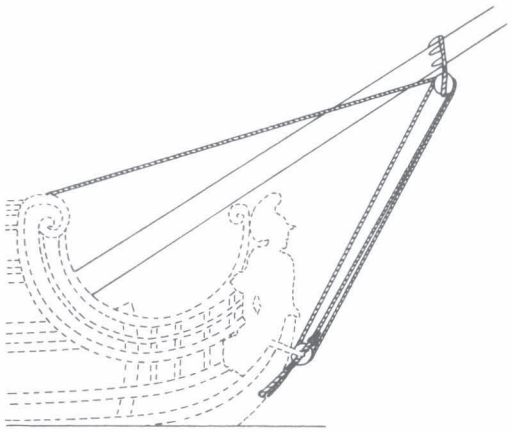
The bobstays were tensioned with deadeyes, although from 1750 on hearts were used more and more on the Continent. After 1850 the bobstays – now usually fitted singly again – were made from chains, and set up with hearts or rigging screws (see also JIB RIGGING).

The Bowsprit shroud

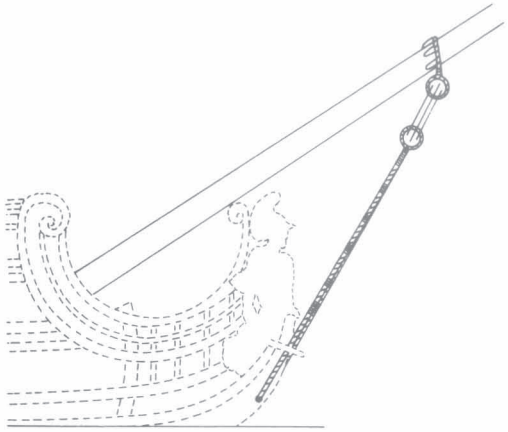
From 1710 on the bowsprit was given lateral support with one or two pairs of shrouds. The bowsprit shrouds were fixed to the hull sides to starboard and port on eye bolts, and were initially set up with blocks, but soon after with deadeyes (Continental) or hearts (British, and from about 1770 also Continental). As with the bobstays chains were used for the bowsprit shrouds from about 1850, which were set up with hearts or rigging screws.



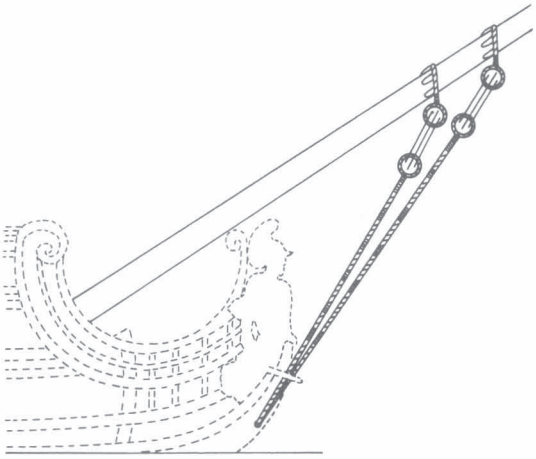
Head Stay. Fixed to an eye or ring bolt on the head, and set up to port and starboard on the forecastle bulkhead with deadeyes. Appeared around 1680, and disappeared again in 1720



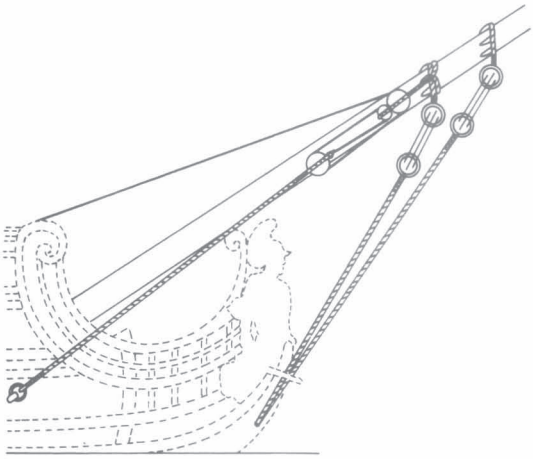
1. Bobstay, French 1690



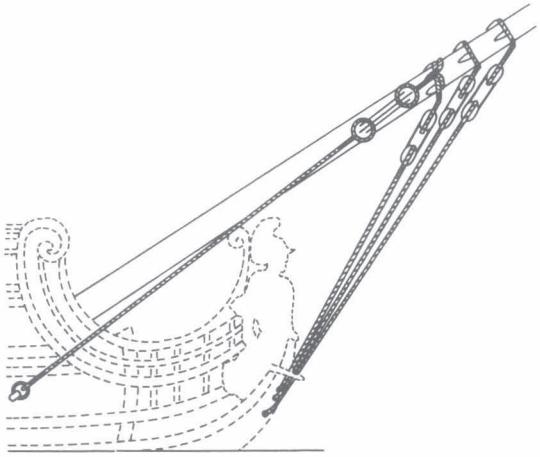
2. Bobstay, English 1695



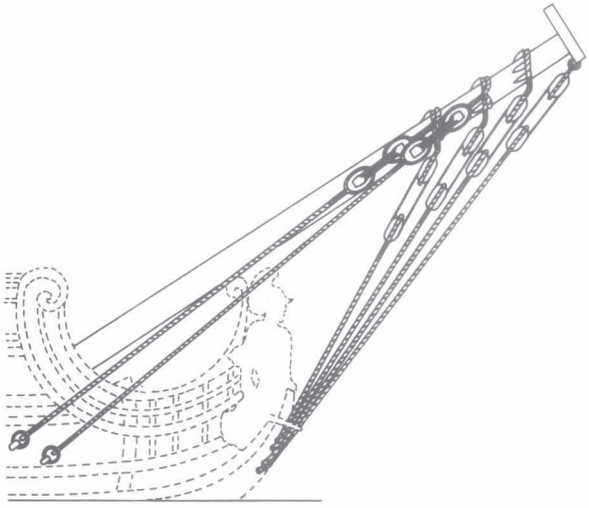
3. Bobstays, 1700



4. Bobstays and bowsprit shrouds, 1720

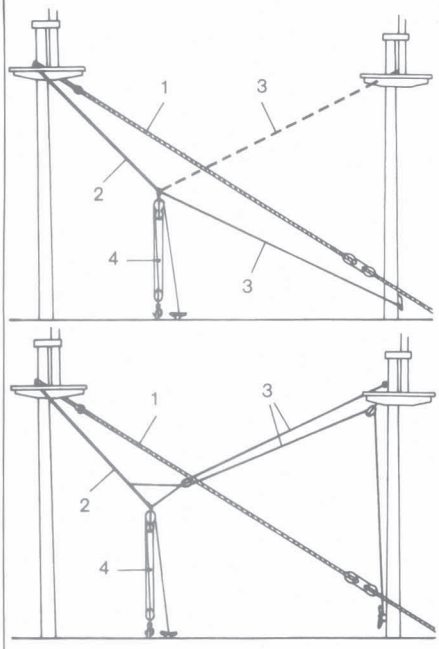


5. Bobstays and bowsprit shrouds, 1740

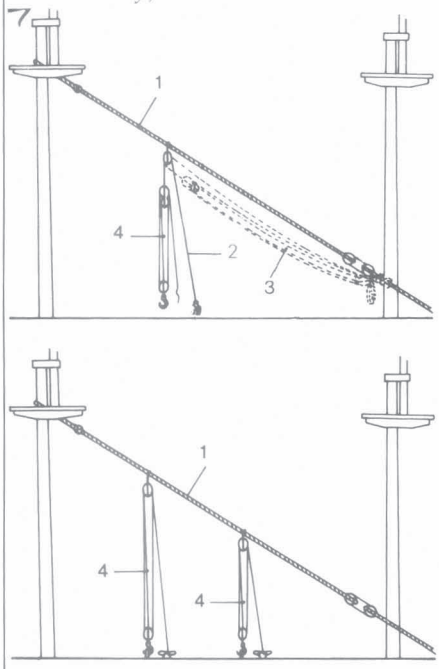


6. Bobstays and bowsprit shrouds, 1770

Loading tackles



Garnet tackle (before 1730)
1. Mainstay; 2. Pendant;
3. Guy; 4. Tackle

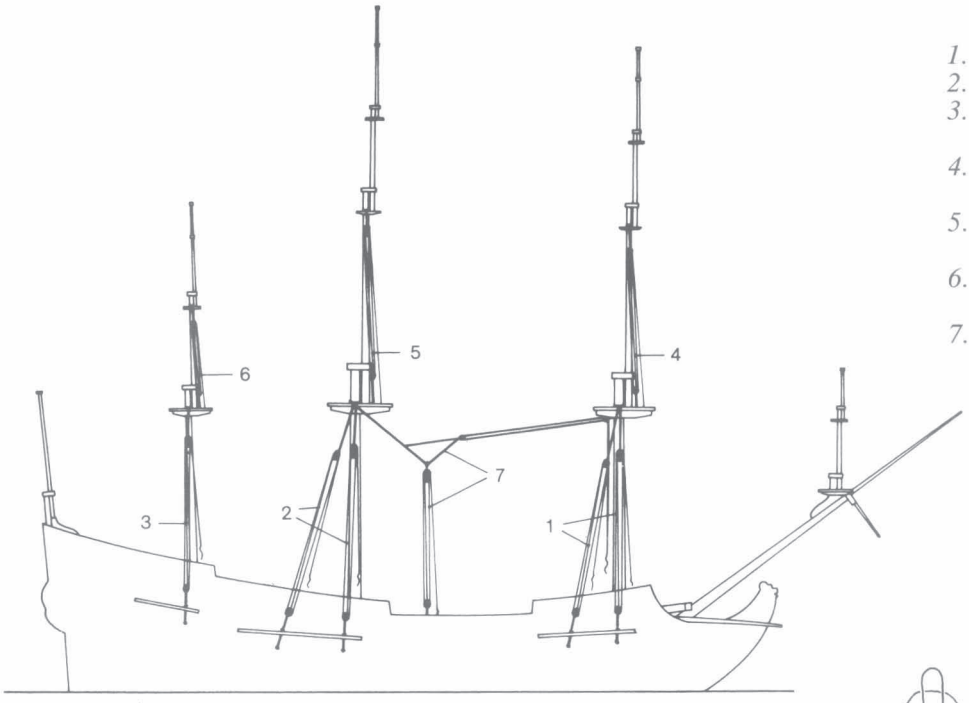


Stay tackle (after 1730)
1. Mainstay; 2. Runner;
3. Secured position; 4. Tackles

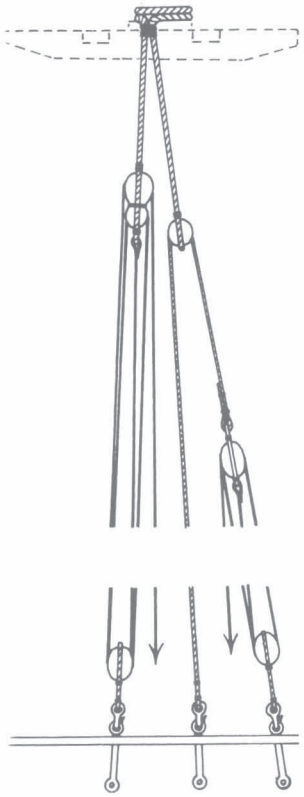
Various forms of tackles were used for moving loads, for tightening deadeye lanyards when setting up the shrouds, and for moving the ships' boats.

Lower mast tackles (Foretackle, maintackle and mizen burton tackle)
The lower mast tackles appeared in the course of the 16th century, initially on the mainmast and the foremast. A seized eye in the bight of a rope was fitted over the masthead of the main and fore lower masts below the shrouds, first to starboard then to port (more details on this in the chapter THE SHROUDS), so that on both sides two pendants hung down. A fiddle or double block was then spliced into the aftermost pendant at half to two thirds mast height, the mast tackle reeving through it. The foremost pendant was one foot shorter and was fitted with a single block for a runner.
In the single block form the runner reeved through the block, and was spliced into the upper block of the mast tackle. The standing end was fastened to an eyebolt in the deck. In the double block form a further double block completed the tackle. Hooks were stropped to the lower blocks, which were engaged in rings on the channel when the tackles were not in use. These rings were very frequently fitted with a small chain plate. The running part of the tackle belayed inboard on a belaying pin. By 1720 at the latest the pendants were served, as were the strops round the blocks and hooks.
Except on small ships the main and foremasts always carried double mast tackles. The mizen mast usually carried only one tackle called a burton on each side, which was fitted round the masthead with a spliced eye. Burton tackles were also carried on the main and fore topmasts in British ships as early as the very early 17th century, although only one on each side, and of correspondingly smaller dimensions, but on the Continent these only appeared from the last quarter of the 17th century. Burton tackles on the mizen topmasts were only carried by a few large ships prior to 1650 after which date they became extinct.

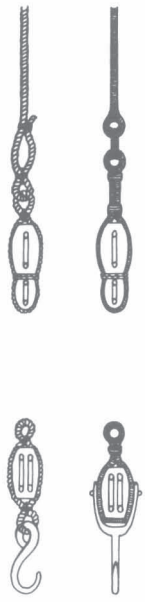
Garnet and stay tackles
The garnet tackle also appeared in the 16th century, and was still in use in the 19th century. Garnet tackles were usually double, and only smaller ships carried a single garnet tackle with a spliced eye.
The pendant of the garnet tackle was fitted with a cut splice, a lashed eye or a horseshoe splice, which was shipped over the shrouds on the main masthead in British ships, and in ships rigged after the British pattern. On Continental ships the pendant was in the form of a stay, but had no mouse; instead it had a seized eye as on the double shrouds, which was laid round the main masthead (see also SHROUDS AND STAYS).
Take care here. Although already discussed, the garnet tackle is the last part of the standing rigging to be fitted. The guy was fixed to the foremast or to the fore top with a seized eye.
A fiddle block was suspended between these two ropes, and formed a tackle with a lower hook block. The stay where the tackle was secured directly to the mainstay (drawing bottom left) came into use around the middle of the 18th century. When not in use the hook of the stay tackle was engaged in a ring on deck.



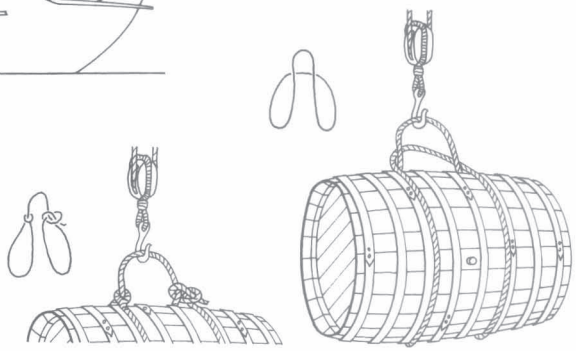
1. *Fore tackles*
2. *Main tackles*
3. *Mizen burton tackles*
4. *Fore topmast burton tackle*
5. *Main topmast burton tackle*
6. *Mizen topmast burton tackle*
7. *Garnet tackle*



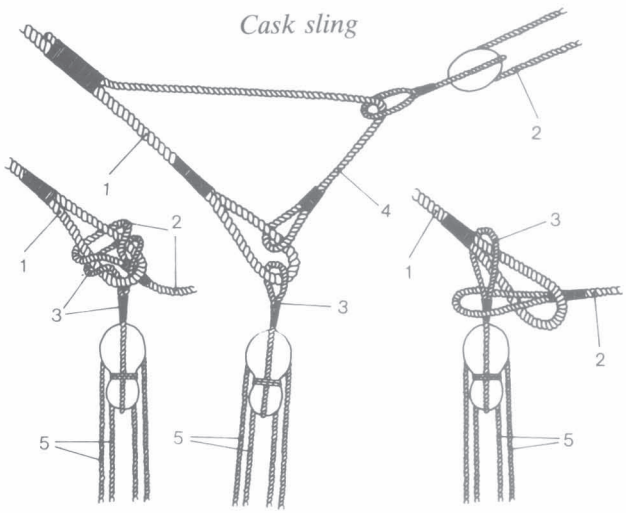
Fore and Main tackles, mizen burton tackle: Left: with two fold purchase; Right: with runner and tackle



Fore and Main tackles, mizen burton tackle: Strops. Left: Method used before about 1720. Right: Method used from about 1720 onward

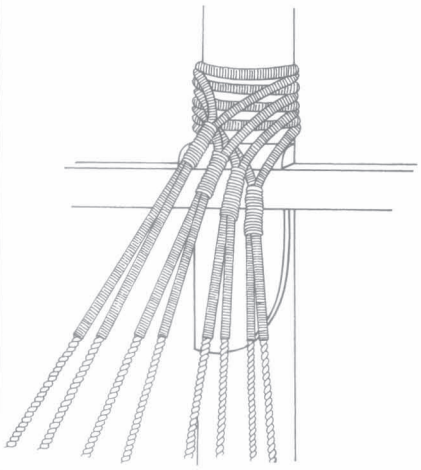


Cask sling

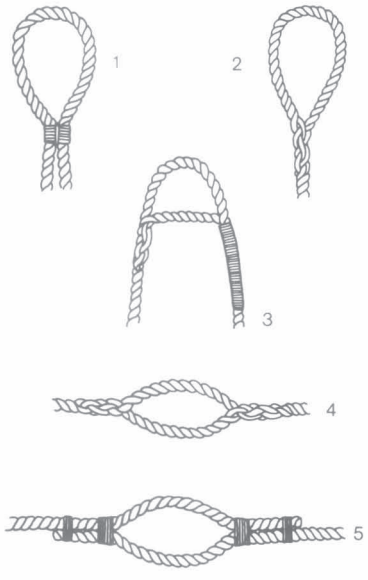


Garnet tackle: Suspension of the upper block. 1. Pendant; 2. Guy; 3. Block strop; 4. Span; 5. Tackle

Shrouds



Sequence of shrouds



Eyes for shrouds and backstays: 1. Seized eye for double shrouds and backstays; 2. Spliced eye for single shrouds and backstays; 3. Horseshoe splice for double backstays; 4. Cut splice, and 5. Seized eye for single shrouds and backstays

The purpose of the shrouds was to provide the mast with lateral and after support. Until part way into the 14th century an average of one to three pairs of shrouds had proved adequate, but in the 15th and 16th centuries the number of pairs of shrouds increased by leaps and bounds. A dozen pairs of shrouds (one pair always counted as starboard – port) on the main mast was almost the rule, and 16 pairs was not exceptional, many ships carrying as many as 18 to 20 pairs. At the beginning of the 17th century this great mass of rope began to be reduced again to a more sensible amount. On large ships the number of pairs of shrouds on the mainmast varied from 9 to 11, on the foremast 8 to 10, on the mizen mast 4 to 6. On small ships the main mast had 6 or 7, the fore mast 5 or 6, the mizen mast 2 to 4 pairs. These figures remained the same until the 20th century.

Shrouds gang

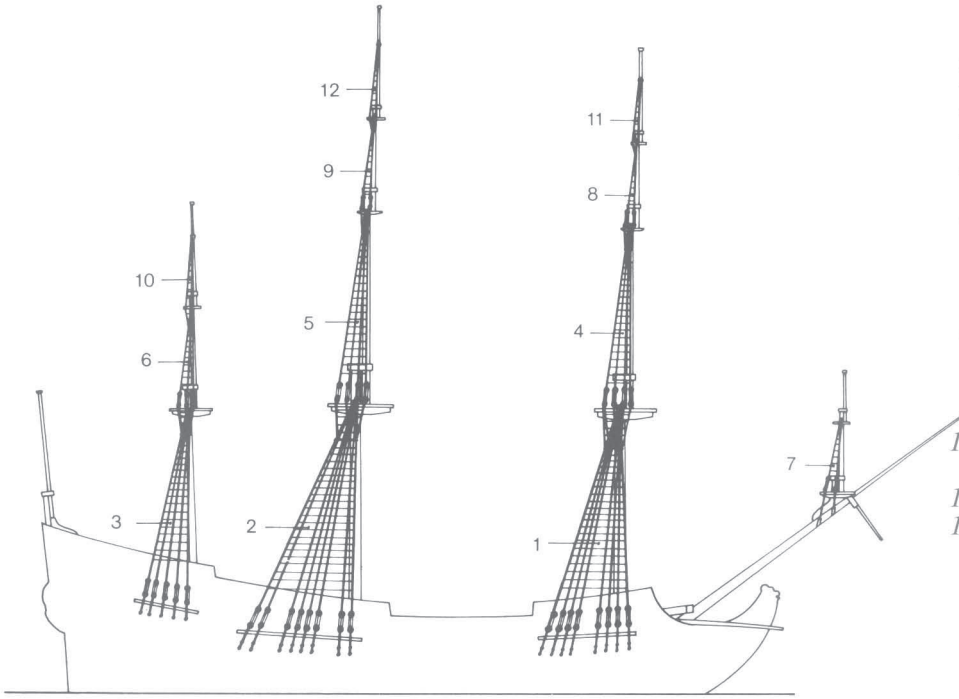
In each case two shrouds formed a gang. This means that an eye was seized in to the middle of a rope of well over double the distance from channel to masthead. The eye was very slightly larger than the girth of the masthead, over which it was fitted and crossed over in such a way that the two ropes of the gang came down together on the same side – alternately starboard and port. The foremost gang was always on the starboard side. If there was an odd number of pairs of shrouds the last pair was either fitted singly with eye splices, or was doubled over the masthead with a horseshoe splice, cut splice or seized eye, in which case the one rope led downwards to starboard, the other to port.

Shrouds

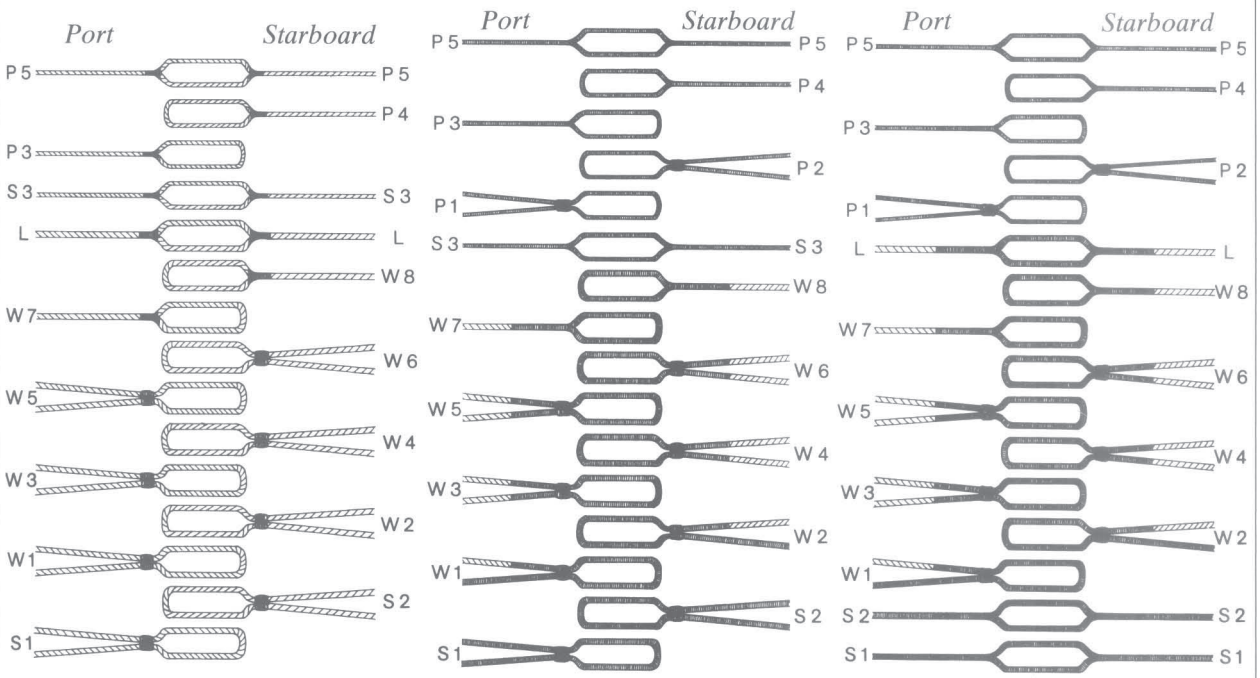
In the second half of the 16th century the use of opposite laid ropes for the starboard and larboard shrouds was introduced although this practice never became universal. Right-handed shrouds were used for the larboard side, and left-handed shrouds on the starboard side.
The shrouds themselves were also wormed at the latest by the second half of the 16th century. The foremost shroud of each mast was wormed, parcelled and served from the first half of the 16th century on. From the middle of the 16th century in England, and from around 1680 on the Continent, the eye round the masthead was also served, initially as far as the seizing, but soon right down to just below the futtock stave. Serving at the lower end of the shroud, where it enclosed the deadeyes or the thimble of the rigging screw, first appeared during the 19th century.
The best sequence for the model maker is to make the shrouds first, that is to worm and serve them, and then fix them all over the masthead. The loose ends dangling down can be left hanging freely for the time being.

Turning in the deadeyes

Deadeyes were turned into the lower end of the shrouds, by means of which the shrouds were set up. The upper deadeyes should all be in a straight line parallel to the channels – this is easier advised than accomplished! For this reason all the seizings and deadeye lanyards are fixed temporarily at first; don't cut the rope ends short at this stage. Bear in mind what I said at the beginning of this chapter: the ropes should not be permanently fixed until the tension of all the shrouds, stays and backstays has been matched; the ropes can then be cut to the correct length.
Here is a little "wrinkle" which will undoubtedly make this job easier for you: set up only the first and last pairs of shrouds of the mast initially, and be sure that they are exactly an equal distance from



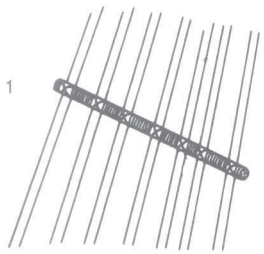
1. *Fore shrouds*
2. *Main shrouds*
3. *Mizen shrouds*
4. *Fore topmast shrouds*
5. *Main topmast shrouds*
6. *Mizen topmast shrouds*
7. *Sprit topmast shrouds*
8. *Fore topgallant shrouds*
9. *Main topgallant shrouds*
10. *Mizen topgallant shrouds*
11. *Fore royal shrouds*
12. *Main royal shrouds*

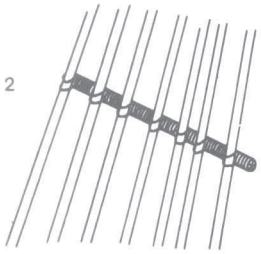


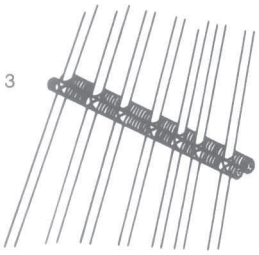
16th century *17-18th century, Continental* *17-18th century, British*

Sequence of ropes at the masthead:
Lower masthead: S1,2: Foretackle, Main tackle or Mizen burton tackle pendants, W1-6; pairs of shrouds, W7, 8: single shrouds or swifters (when number of shrouds was odd), L: Garnet pendant – Main mast only before 1730.
Topmast head: S1: Burton pendants – Fore and Main masts only, shrouds – as for lower shrouds, P1, 2: pairs of standing backstays, P3, 4: shifting backstays, single, P5: shifting backstays, cut splice

Shrouds







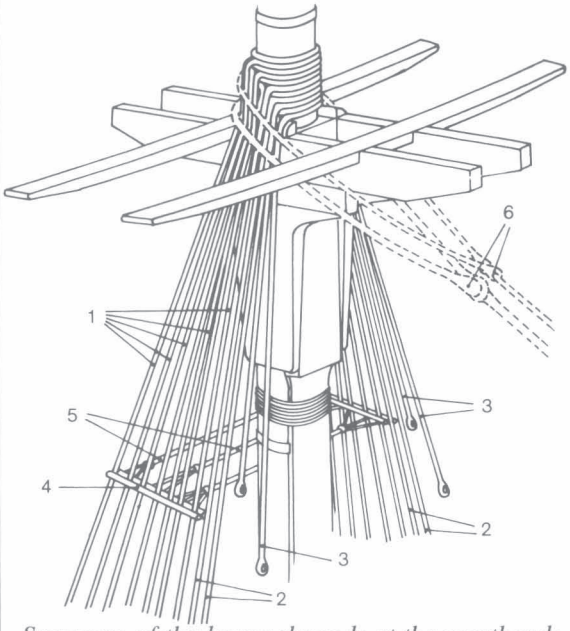
Futtock stave:
1. Single, outside the shrouds
2. Single, inside the shrouds
3. Double, both sides of the shrouds

the channels. Now attach the mast stay and balance the tensions – this will not be the final setting, but any final alteration will be minimal. Now tie a thin guide batten above the first and last deadeyes – on ships after the middle of the 19th century the sheer pole assumes this task – and you will be able to align the remaining deadeyes with this batten without too much trouble. The deadeyes are turned in as follows: the shroud is passed round the deadeye, the short end crossing inboard of the standing part and the two parts seized together at the cross with a throat seizing. A further two round seizings secure the two parts together, the end being whipped and capped with canvas to keep the wet out.
If the shrouds are right-handed the short end is to the right of the standing part when viewed from inboard and vice versa. Consequently, with all shrouds right-handed the short end will be forward on the larboard side and aft on the starboard side; if all the shrouds are left-handed then the short end will be aft on the larboard side and forward on the starboard side. When the larboard shrouds are laid right-handed and the starboard shrouds left-handed, as previously mentioned, then all the short ends are forward.

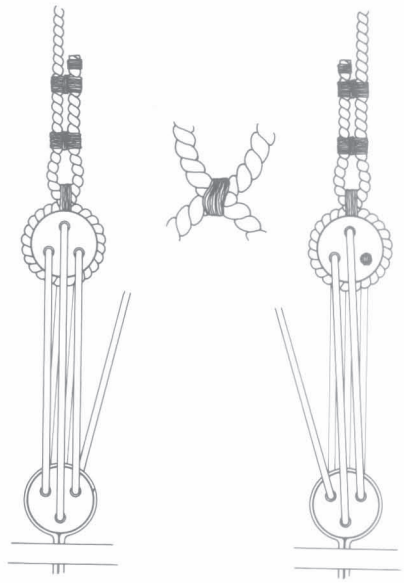
The lanyards
The shrouds were set up by means of lanyards reeved through the deadeyes. The lanyard began with a stopper knot, on the inboard side of the outer hole of the upper deadeye, which was opposite the short end of the shroud.
N.B. When setting up the lanyard, never finish first the one side and then the other side, but always work alternately from starboard to port. For safety's sake, also check regularly with a small plumb bob that the mast has not moved from the vertical position on the centreline. The lanyard reeves through the deadeyes, as shown in the illustration, that is, always from inboard to outboard between the upper deadeye and the shroud, half hitching it round the two parts of the shrouds and expending the rest of the lanyard with turns round both parts and stopping the end; it is a good idea to secure the end of the lanyard in its place with a drop of glue.

The futtock stave
The futtock stave is a served piece of rope (sometimes, in the 16th and 17th centuries, a wooden spar or metal rod) which was seized to the shrouds the same distance below the upperside of the trestle trees as the underside of the cap was above the trestletrees. Generally the futtock stave was seized to the outside of the shrouds, but sometimes it was fitted inside or even double (inside and outside).

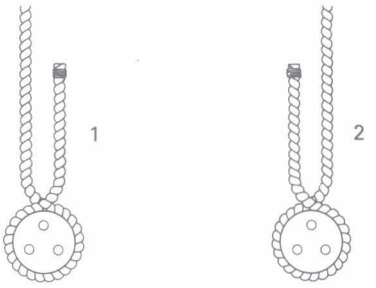
The futtock shrouds
The futtock plates of the topmast deadeyes were secured by the futtock shrouds. These were connected to the futtock plates by hooks, turned round the futtock stave, and seized to the shroud in three places. On Dutch ships of the 17th century double futtock shrouds also appeared.
From about the middle of the 18th century the futtock shrouds were occasionally seized to the futtock stave. From about 1830 on iron bars began to be used for the futtock shrouds. They were shackled to an iron band on the mast directly below the mast cheeks, and made the futtock stave obsolete. On large ships the topgallant futtock shrouds were made in the same way; on smaller ships they consisted of a served strop, with thimbles seized into the ends, through which the shackles passed.



Sequence of the lower shrouds at the masthead:
1. Shrouds; 2. Single shrouds or swifters;
3. Fore tackle, Main tackle or Mizen burton tackle pendants; 4. Futtock stave;
5. Catharpins; 6. Stays

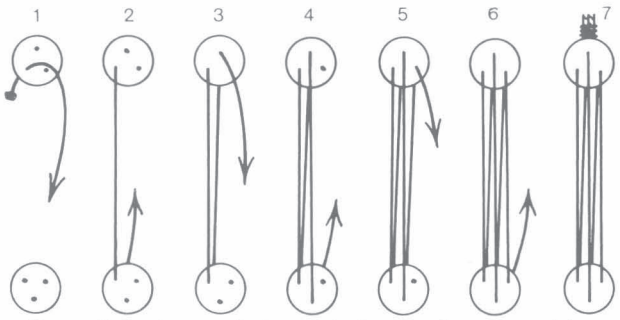


Lanyard: left from outboard, right from inboard. Enlarged sketch in the middle: the seizing above the upper deadeye. Note that it is vertical, and not horizontal like the two upper seizings, as shown on poor plans and models.

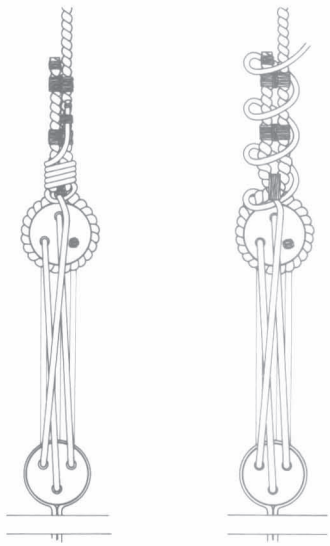


Shrouds laid in opposite directions:
1. Laid right;
2. Laid left

Shroud seizing and lead of the lanyard, seen from inboard

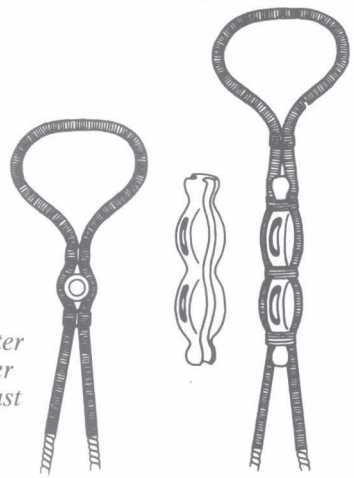


Run of the lanyard through the deadeyes – cable laid shrouds seen from outboard

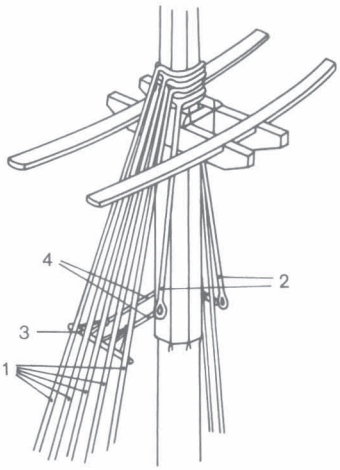


Run of the lanyard, seen from inboard. The lanyard is pulled through between deadeye and shroud, back under itself with a half hitch, then expended with round turns around the shroud and stopped to it.

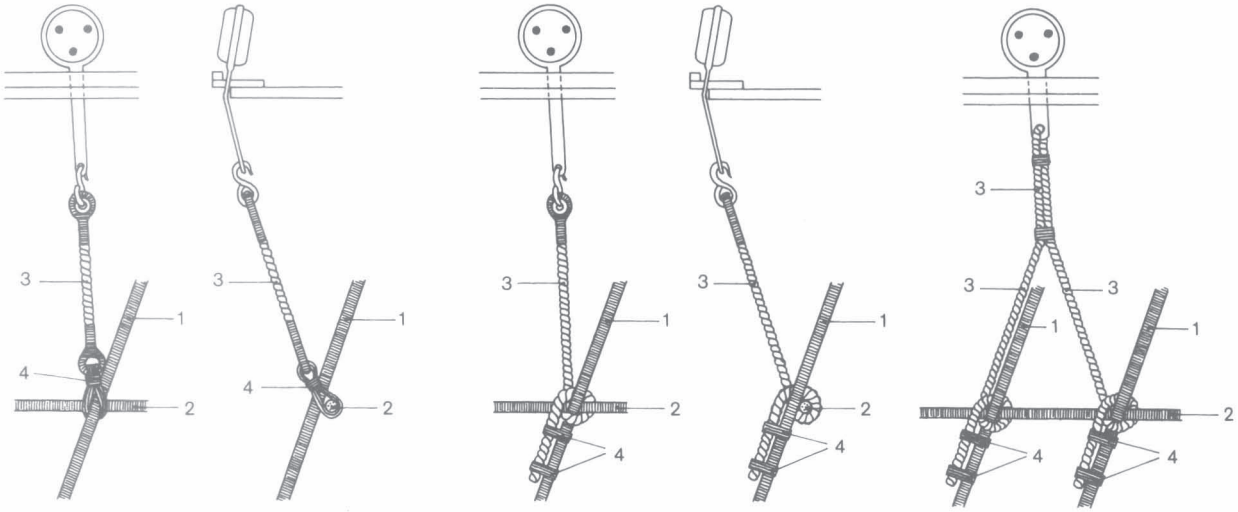
Shrouds



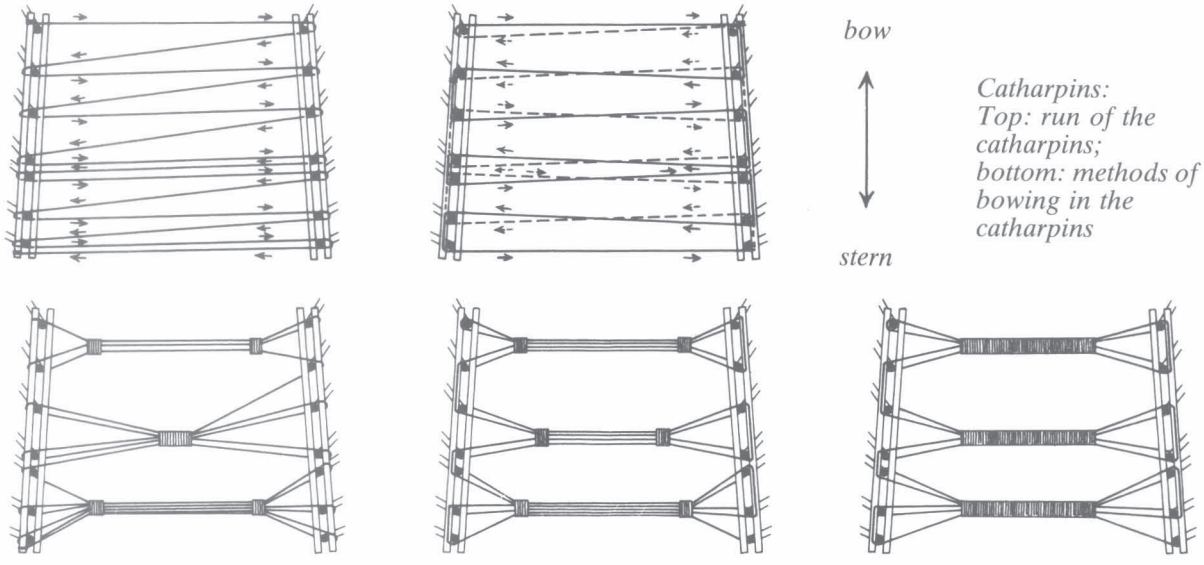
Lashing of a thimble and a sister block in the upper part of the topmast shrouds



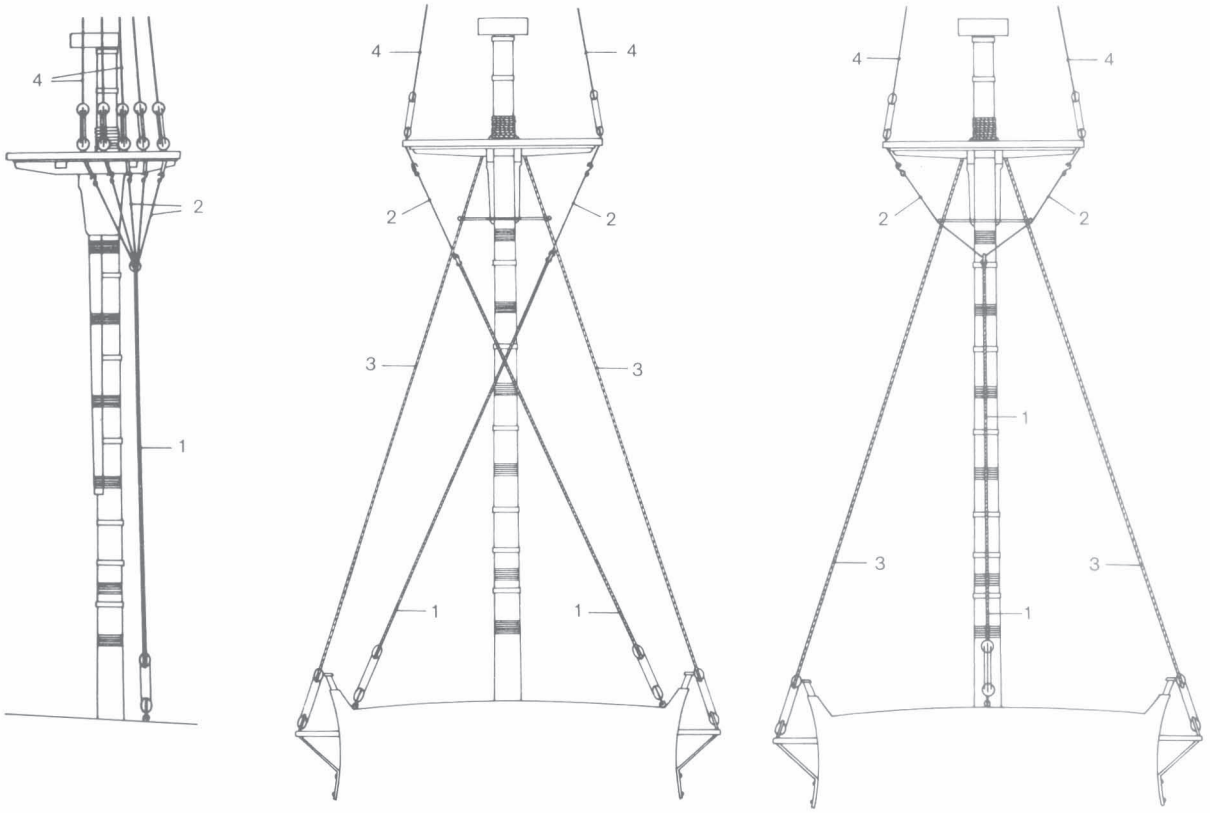
Topmast shrouds at the topmast head:
1. Shrouds
2. Burton pendants (fore and main only)
3. Futtock stave
4. Catharpins (after Vaisseau)



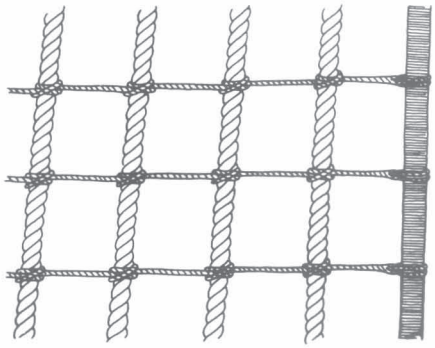
Methods of securing the topmast futtock plates:
1. Shrouds; 2. Futtock stave; 3. Futtock shroud; 4. Seizings



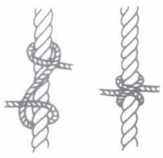
Catharpins: Top: run of the catharpins; bottom: methods of bowing in the catharpins



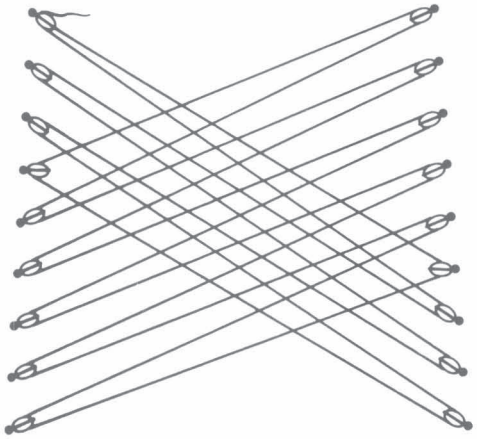
Bentinck shrouds: left – side elevation; middle – double Bentinck shrouds; right – single Bentinck shroud.
1. Bentinck shroud; 2. Futtock shroud; 3. Shrouds;
4. Topmast shrouds



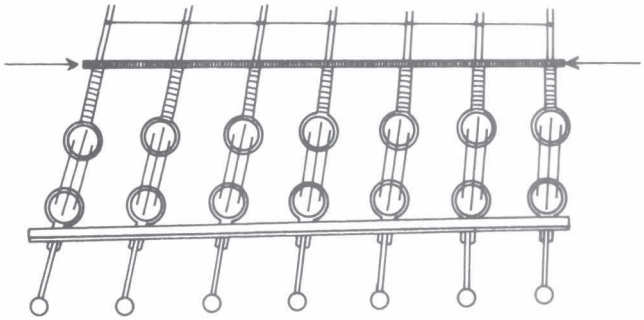
rat-lines



clove hitch

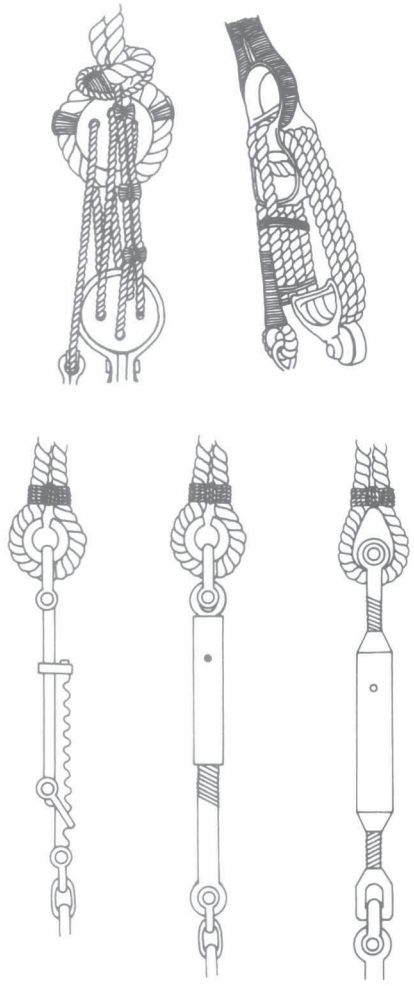


Lower catharpins on English ships, 1650 to 1720



Sheer pole in the 19th century

Shrouds



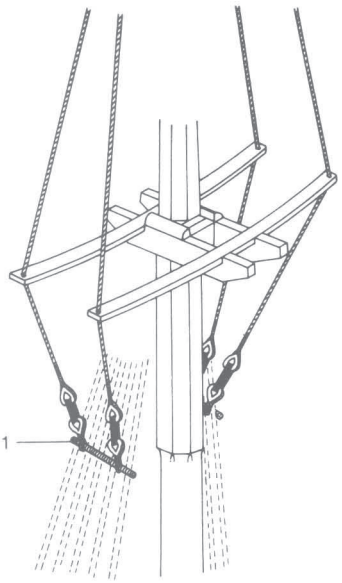
Methods of setting up the shrouds in the 19th century. Top: left, cutter stay fashion, right, iron heart. Bottom: left, rack; middle, rigging screw with single thread; right, rigging screw with left and right handed threads.

The bentinck shrouds
Additional shrouds for the lower masts, known as bentinck shrouds after their inventor Captain Wm. Bentinck, Royal Navy, were introduced into the British navy in the latter part of the 18th century. They were normally only rigged in very heavy weather.
Four or six short ropes with eyes spliced in one end were seized round the futtock stave and shrouds close up to the catharpins and led down through the shrouds where they were spliced into a common ring or seized to a thimble. In large ships the bentinck shroud was also spliced into this ring and led to a ringbolt in the opposite waterway where it was set up with a tackle. Small ships occasionally had the rings from both sides joined by a short span from which a single bentinck shroud led down to the foot of the mast and was set up in the same way.

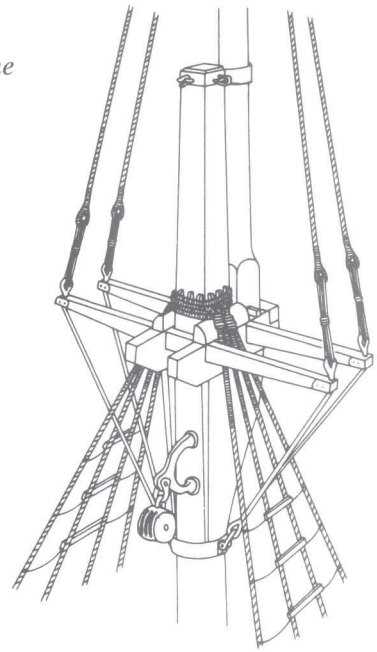
The catharpins
From the middle of the 17th century on, it was usual to link the shrouds by catharpins. A line was looped round the futtock stave and the shrouds, and then lashed together with seizings – the various methods used are shown on the drawing. British warships occasionally had lower catharpins about one-third of the mast height above deck at the main and foremast, more rarely also on the mizen mast, which was rove through blocks seized to the shrouds. They were not used after 1730.

The topmast shrouds
The topmast shrouds were fitted and secured in the same way as the lower mast shrouds. The methods used for shipping the topmast shrouds on the masthead, the shrouds themselves, the deadeyes and lanyards were all identical to those used on the lower shrouds, except that the dimensions were correspondingly smaller and thinner. Around the middle of the 19th century it became standard practice in some areas to set up the topmast shrouds with small hearts or thimbles instead of deadeyes, especially in smaller ships.

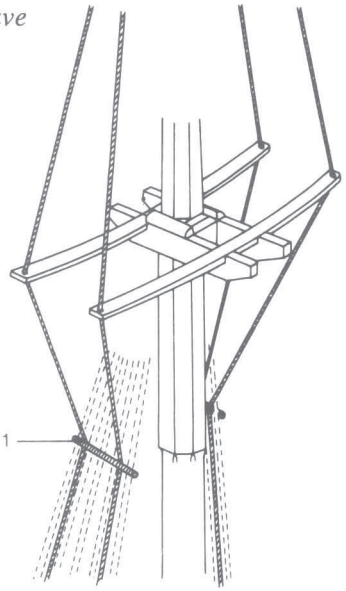
The topgallant shrouds
In the 16th and 17th centuries the topgallant shrouds were attached by means of deadeyes, like the topmast shrouds.



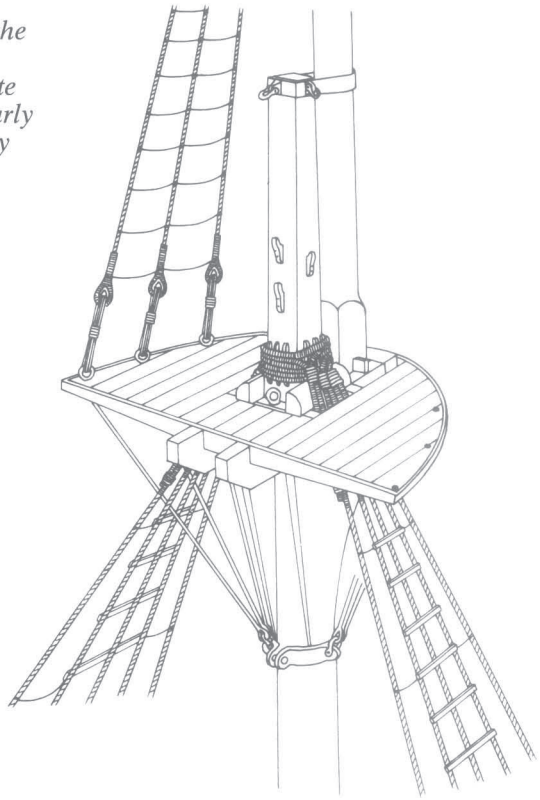
Setting up the topgallant shrouds, before 1720

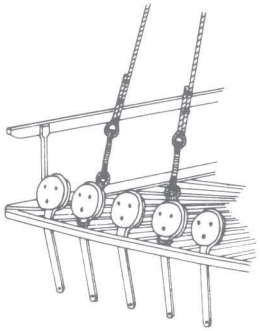


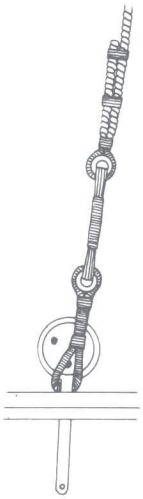
1. Futtock stave



Setting up the topgallant shrouds; late 18th and early 19th century



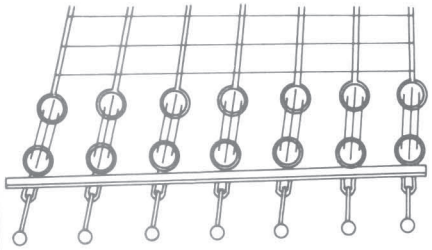




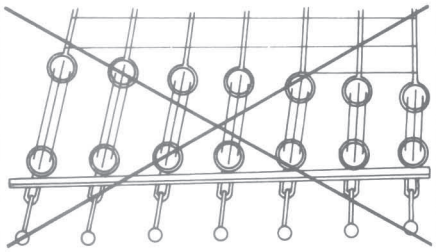
Top and mizen mast topmast crosstrees of a merchant vessel from the second half of the 19th century. Metal futtock shrouds; battened rat-lines

Shrouds

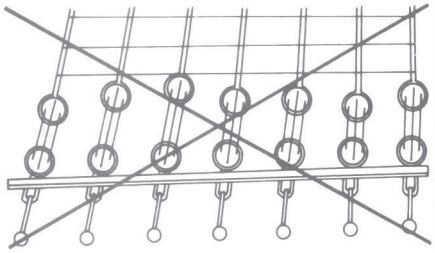
Position of the shroud deadeyes (top) with reference to the channel deadeyes (bottom) and the channels



Correct!
Shroud deadeyes in one line, parallel to the channels



Wrong!
Shroud deadeyes rising towards the left



Wrong!
Shroud deadeyes at differing heights

After the early 18th century deadeyes were no longer used, and the topgallant shrouds were tensioned over the ends of the topmast crosstrees; on Continental ships they were attached to the futtock stave under the topmast crosstrees with small hearts or thimbles. In small ships they were simply lashed to the futtock stave and the topmast shrouds like the futtock shrouds. In British and American ships the topgallant shrouds were pulled through behind the futtock stave and taken down to the top, where they were set up with thimbles and lanyards with the lower thimble fixed to the chain plate of the lower top deadeye.

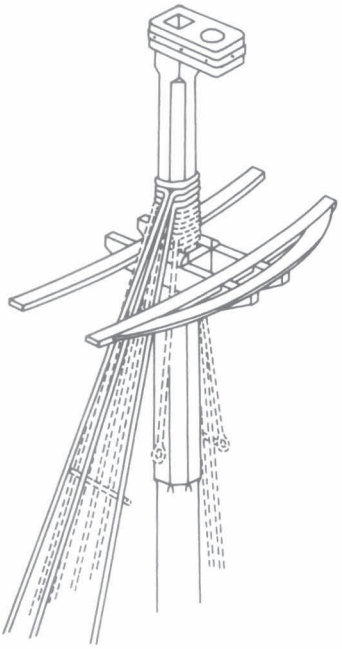
The royal shrouds
The royal shrouds were carried like the topgallant shrouds, and were fixed to the futtock stave of the topgallant shrouds.

The ratlines
The fitting of ratlines to the shrouds – known as rattling down – is rather a tedious task, but one which should be carried out with great accuracy. However, there is one way of making this job much easier: draw the first and last shroud on a piece of card, then draw in the ratlines as cross lines, and clamp the template behind the shrouds; the ratlines are then filled in following the template. The lower limit of the ratline is the rail, the upper limit is the futtock stave; the ratlines themselves should run parallel to the waterline. This job needs to be done on the lower shrouds, the futtock shrouds and the topmast shrouds, almost always the sprit topmast shrouds and the mizen topmast shrouds, but only rarely the topgallant shrouds, and never the royal shrouds.
The ratline spacing was about 15 or 16ins, and they were 1½ins in circumference. The ratlines must not be pulled tight; they should only form a loose connection between the shrouds. The drawing shows how they are attached. In the middle of the 19th century wooden battens were occasionally fitted between the middle shrouds instead of the ratlines. The drawing also shows how these were attached. They were originally about 1½ins high and ⅝in thick.

The sheer pole
Sheer poles were introduced in the middle of the 19th century to prevent the shrouds twisting. They were round iron bars which were seized to the shrouds above the deadeyes or rigging screws.

Rigging screws
After about 1830 rigging screws were frequently used in place of deadeyes for setting up shrouds, backstays and stays. Making rigging screws yourself is extremely difficult, indeed, almost impossible if you need metal ones. If you cast them in resin, you must be sure that they are strong enough to take the tension – and the occasional knock. Rigging screws, with opposite threads at either end, are just about impossible to make, although there are one or two commercial sources of rigging screws of this type of a very high quality. Rigging screws were generally tarred black.

Backstays



Backstays at the topmast head

During the course of the 17th century the topmasts grew longer, the topsails grew ever larger, and the topgallant masts and topgallant sails were added; by then the topmast and topgallant shrouds were no longer capable of providing adequate support. Initially shifting backstays were fitted but by the middle of the 17th century standing backstays were added in Britain, initially one pair, but ultimately up to three pairs leading from the topmast crosstrees to the channels, and set up with deadeyes and lanyards.

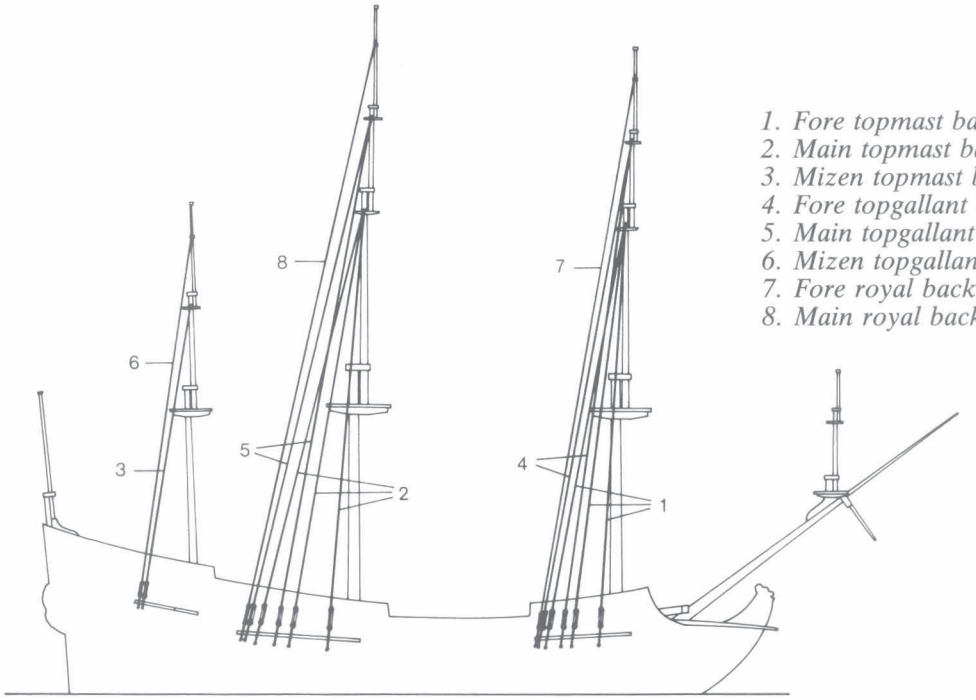
The backstays were shipped round the topmast head above the topmast shrouds in exactly the same way as the topmast shrouds, and from the first half of the 18th century it became usual to serve many of them over their full length. After 1840 backstays were often made of steel wire ropes, like the shrouds and stays.

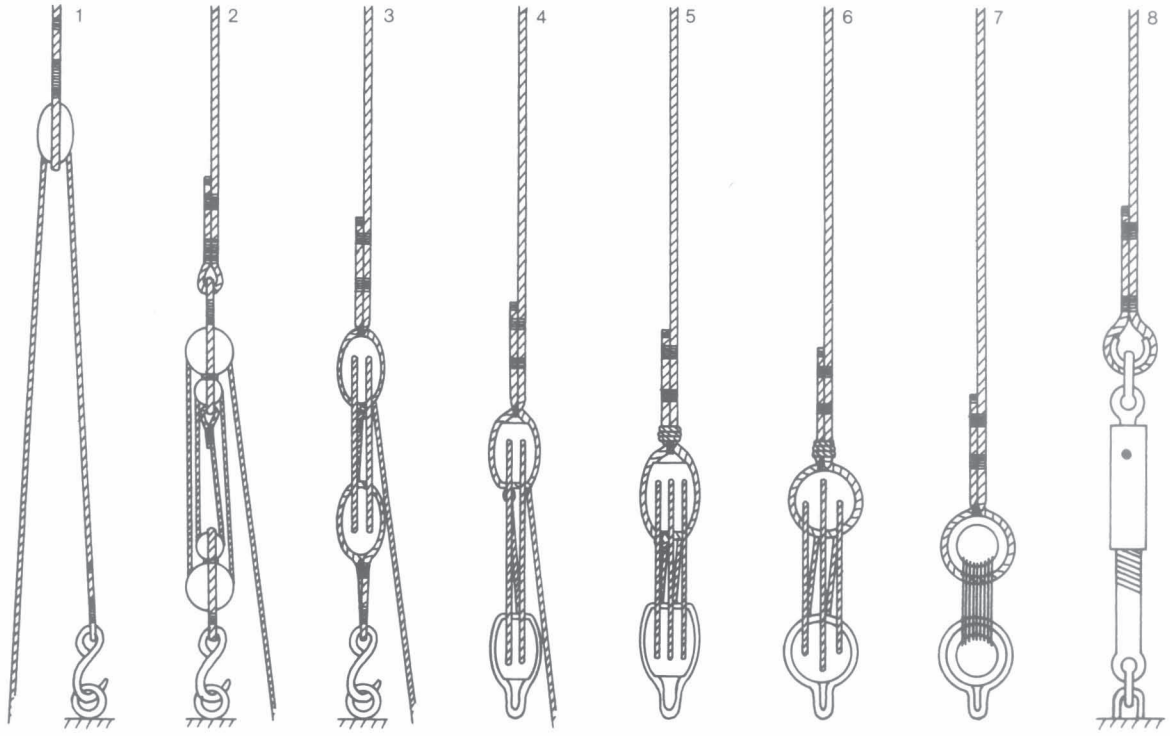
We now to have to differentiate between shifting and standing backstays. Shifting backstays were set up with tackles, the running part of which belayed inboard on a belaying pin or cleat. Standing backstays were attached with deadeyes (they were the same size as the topmast shroud deadeyes), blocks (the running part of which was made fast above the upper block, as with the deadeyes), thimbles or rigging screws. The lower blocks of shifting backstays were fitted with a hook, which was engaged in a ring bolt on the channel or on the ship's side abaft the channel. If this ring bolt was located on the channel, it usually had its own small chain plate.

The lower deadeyes, blocks and thimbles of standing backstays were fixed in place to the channels with small chain plates, although in some cases they had their own small backstay stools – or to ring bolts on the ship's side abaft the channels. Rigging screws were fixed to the channels or the ship's side with chain plates.

Backstays were fitted to topmasts, topgallant masts and royal masts. It was quite common to use a wide variety of methods to attach the backstays in one and the same ship. For example, including topgallant and royal masts HMS *Victory*, Lord Nelson's flagship at Trafalgar, carries three pairs of shifting backstays with blocks on the foremast, three pairs of standing backstays with deadeyes and one pair of standing backstays with thimbles, all on the fore channel; two pairs of shifting backstays with blocks and two pairs of standing backstays with deadeyes on the main channel, plus one pair of shifting backstays with blocks, two pairs of standing backstays with deadeyes and one pair of standing backstays with thimbles on a stool abaft the main channel; on the mizen mast one pair of shifting backstays with blocks on the mizen channel, two pairs of standing backstays with deadeyes and one pair of standing backstays with thimbles on a stool abaft the mizen mast channel.

Before about the middle of the 19th century the backstays had a completely free run, but after that time they were led over spreaders on the crosstrees.

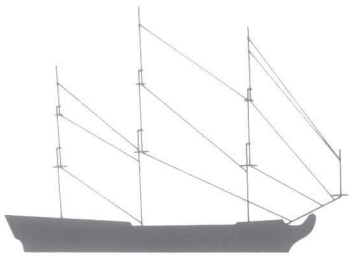




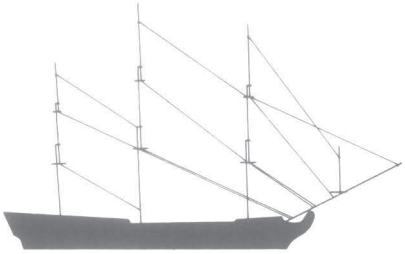
Methods of securing the backstays: 1. Shifting backstay, before 18th century; 2., 3. Shifting backstays, mid 18th century; 4. Shifting backstay, 18th/19th century; 5., 6. Standing backstays, 19th century; 7. Standing backstay, 18th/19th century; 8. Standing backstay, 19th century

The Stays

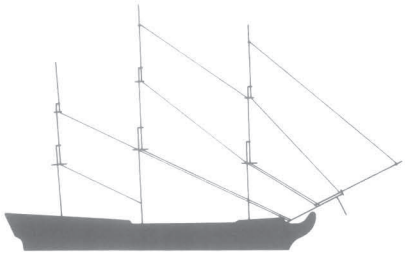
Lead of the stays:



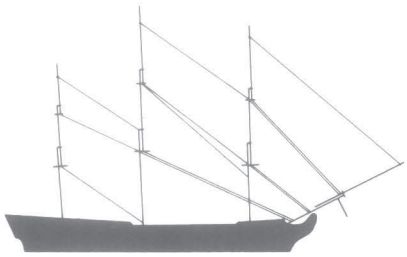
French warship, 1700



British warship, 1720



Swedish merchant ship, 1760



French warship, 1770

Next to the shrouds the stays are the most important part of the standing rigging, and in the history of the development of shipbuilding they are also the oldest part. They support the masts towards the bow, but they also serve to bring the shrouds and backstays to full supporting effect by exerting a balancing counter-tension. What I have already said twice in this chapter about equalising the tensions between shrouds, stays and backstays does not need to be repeated again here in detail, does it?

The stay eye

An eye was formed in the end of the stay which was rigged round the masthead over the shrouds and the trestletrees. Until the beginning of the 16th century a seized or spliced eye was used for this connection (although the latter was less durable), and in the case of double stays a seized eye was used, like those of the shrouds. The stay eye ended approximately below the front edge of the trestletrees.

In the first half of the 16th century a new method of forming the stay eye was introduced: the mouse. A small eye was spliced in at the upper end of the stay, which was just large enough for the rope itself to pass through, thus forming a loop. However, to prevent this eye tightening up on itself, the stay was locally thickened, this thicker part being termed the mouse.

The model mouse is made as follows: woollen thread is wrapped tightly round the stay to form the shape of the mouse, which in the 17th century was rounded, and in the 18th century more pear-shaped. It is a good idea not only to wrap the woollen threads round, but to glue them to the stay, so that the mouse cannot slip later. Then a loose ring of strong thread is fitted round the stay at both ends of the mouse. Using a needle and thread these two rings are then linked with a continuous series of vertical stitches. When this is complete, the thread is woven in and out as when darning, alternating above and below the thread all round. Take care always to take the thread alternately over and under the same thread, i.e. – for example – first round under, second round over, third round under, fourth round over etc., so forming a strong, evenly woven surface. Weaving a mouse evenly and neatly demands a degree of patience, but this is just the sort of small detail which makes a good model into an excellent one.

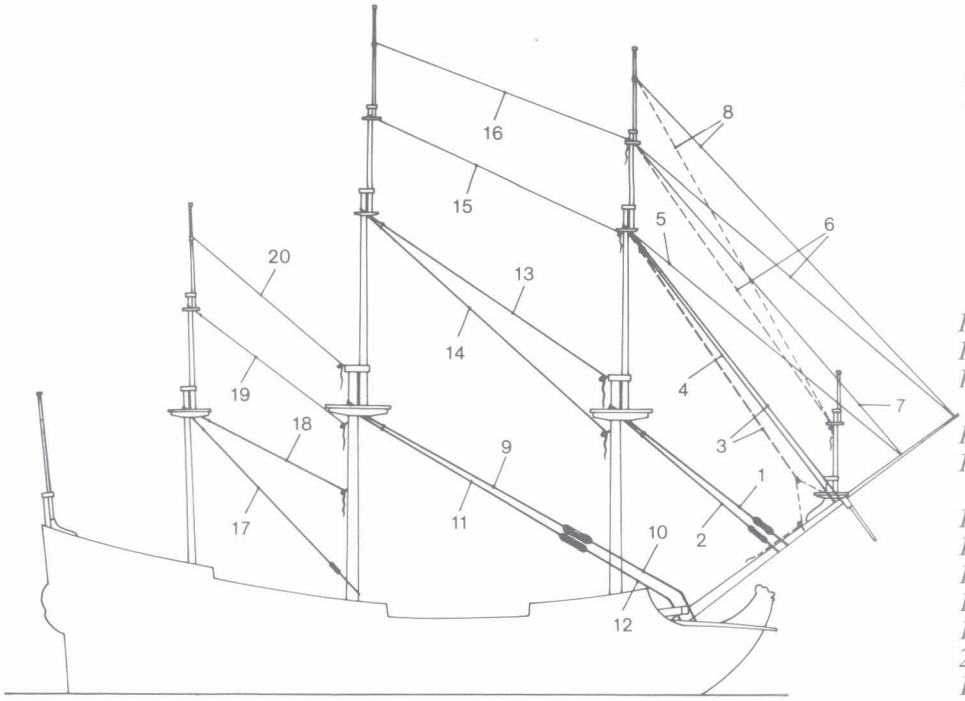
After the second half of the 16th century the stay eye itself was fully served, although the mouse was never served, thus leaving the elegant weaving exposed. Where the spliced eye of the stay end was located on the mouse, the rope was sheathed in a short leather sleeve for protection against chafing. The stay itself was wormed, like the shrouds, and was fully served from about the middle of the 19th century, when steel wire ropes were introduced. Around 1830 the mouse began to disappear; the upper end of the stay had a leg spliced into it with an eye spliced into the ends of both legs. They were seized together abaft the masthead with a rose lashing. A little later the system changed back again; the stay went over the masthead with the spliced eye, or – in the case of double stays – with a seized eye, as used for the shrouds.

The mainstay

The mainstay was the strongest rope on the whole ship (with the exception of the anchor cables) and its blocks were the same length as the diameter of the main mast.

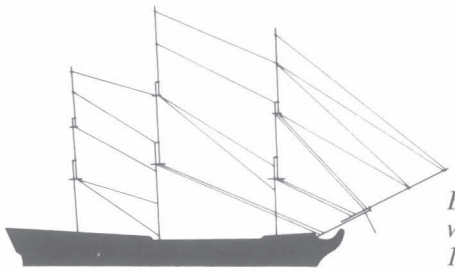
Until the middle of the 17th century the mainstay was set up with blocks or deadeyes.

After this time triple blocks were used exclusively on the Continent until

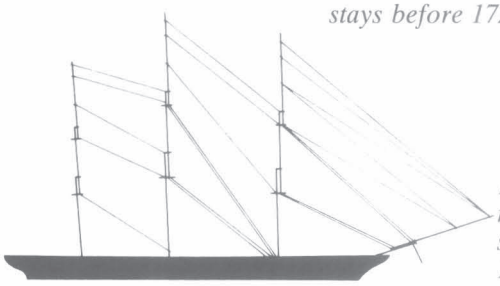


1. *Fore stay*
2. *Fore preventer stay*
3. *Fore topmast stay*
4. *Fore topmast preventer stay*
5. *Jib stay*
6. *Fore topgallant stay*
7. *Outer jib stay*
8. *Fore royal stay*
9. *Mainstay*
10. *Mainstay collar*
11. *Main preventer stay*
12. *Main preventer stay collar*
13. *Main topmast stay*
14. *Main topmast preventer stay*
15. *Main topgallant stay*
16. *Main royal stay*
17. *Mizen stay*
18. *Mizen preventer stay*
19. *Mizen topmast stay*
20. *Mizen topgallant stay*

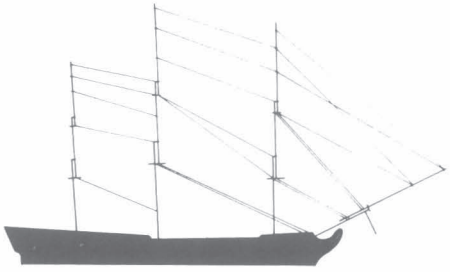
Dotted lines: stays before 1720



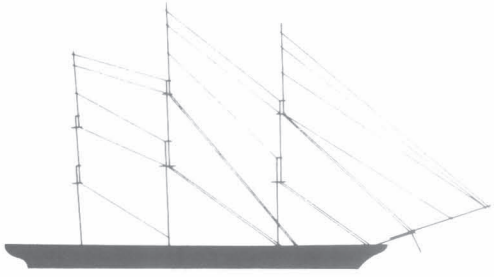
British warship, 1800



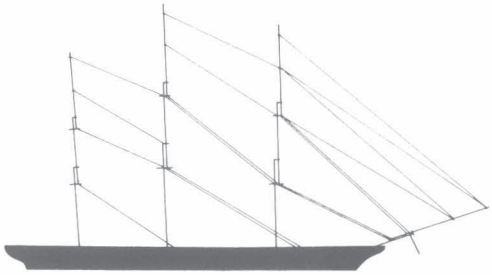
British merchant ship, 1850



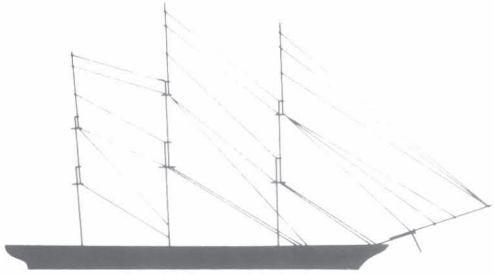
British merchant ship, 1820



American merchant ship, 1850

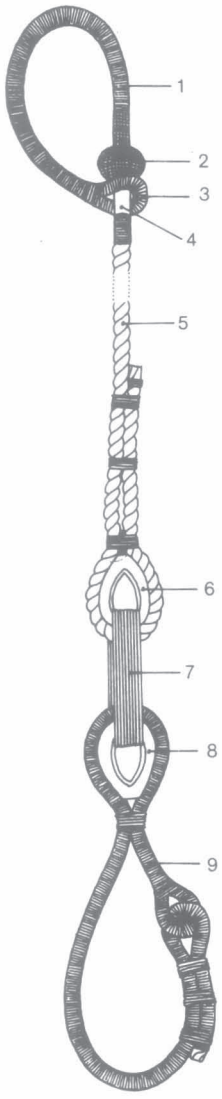


French warship, 1840



German merchant ship, 1860

The Stays



Mainstay with stay collar: 1. Stay eye at main masthead; 2. Mouse; 3. Spliced eye; 4. Leather parcelling; 5. Stay; 6. Upper heart; 7. Lanyard; 8. Lower heart; 9. Stay collar from 18th century, fully served

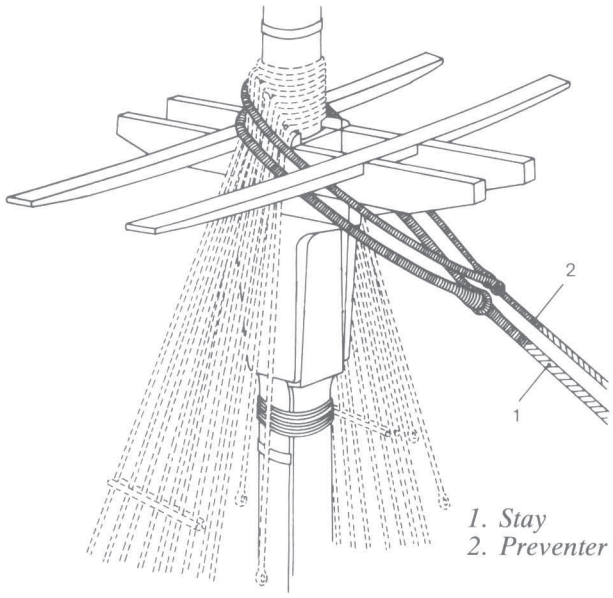
the first half of the 18th century. In Britain deadeyes were used up to 1690, and thereafter hearts, which also came more and more into use on the Continent after the middle of the 18th century. After 1830 the mainstay was set with rigging screws or thimbles. Continental ships also used deadeyes with 5 holes.
The lower stay block, deadeye or heart was seized into the stay collar, a rope, slightly thinner than the stay itself, which reeved through a hole in the gammoning knee, or engaged on the hook of the gammoning knee. The combination of blocks, deadeyes or hearts for setting up the stay could be located ahead of or abaft the foremast. If abaft the foremast, the stay collar was led either side of the foremast (at this point on the mast a rubbing sleeve was often fitted) and if ahead of the foremast, the mainstay usually passed to starboard of the mast.
The lanyard of the stay deadeyes was reeved and made fast in the same way as the shrouds. The fall of the stay tackle was attached to the lower block, and the free end was made fast by wrapping it round the middle of the lanyard several times; a similar arrangement was adopted if hearts were used.
A special feature of the mainstay of steam/sail driven ships of the 19th century should be noted. As the funnel was situated between the main and fore masts, the main stay was divided and made fast on the forecastle deck to starboard and port.

The forestay
The forestay was rigged in the same way as the mainstay, and made fast to the bowsprit. Various combinations of blocks were used up to the first half of the 16th century, whereafter the same method of setting up the forestay was adopted as for the mainstay, i.e. using blocks on the Continent and deadeyes in Britain, the lower of which was stropped to the bowsprit, where it was prevented from moving by thumb cleats.
Triangular hearts were used in British ships from 1690 until 1733 when an open lower heart was introduced through which the jib boom passed.

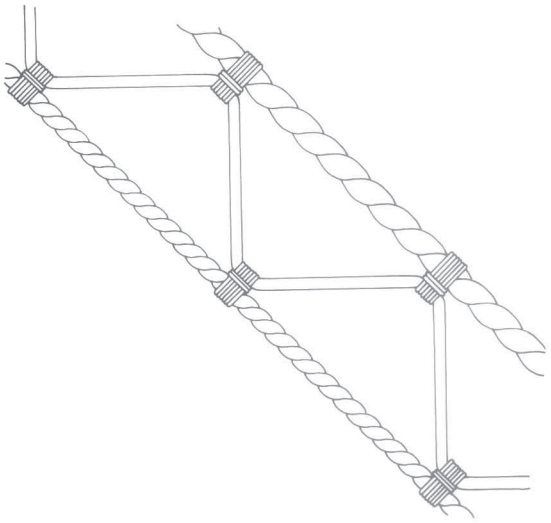
Main preventer stay and fore preventer stay
The preventer stays were slightly thinner than the stays proper, and their blocks, deadeyes, and hearts were correspondingly smaller; otherwise, however, they were attached in exactly the same way as the stays. From the middle of the 19th century, when double stays were fitted, the stay and preventer stay were one and the same rope.

The mizen stay
The mizen stay was attached to the masthead like the main and fore stays, and made fast with blocks, deadeyes or hearts at the foot of the mainmast.

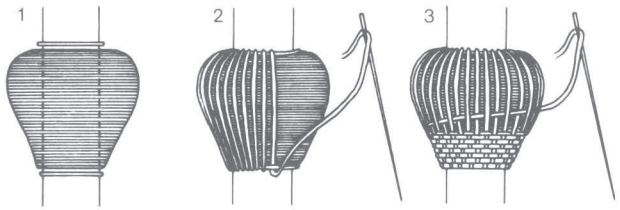
The main topmast stay
Like the stays of the lower masts, the topmast stays were rigged over the topmast head by means of an eye secured with a mouse, or – in the 19th century – with a seized eye. The main topmast stay then passed through a leading block, which was stropped to the fore topmast just above the top, or to the foremast cap, and down to the deck, where it was set up with a tackle hooked to a ring bolt at the foot of the mast. In rare cases (mainly in the 16th century) the main topmast stay was attached to the fore top with deadeyes or blocks. The main topmast preventer stay followed the topmast stay, set up on the larboard side of the foremast with the main topmast stay set up to starboard.



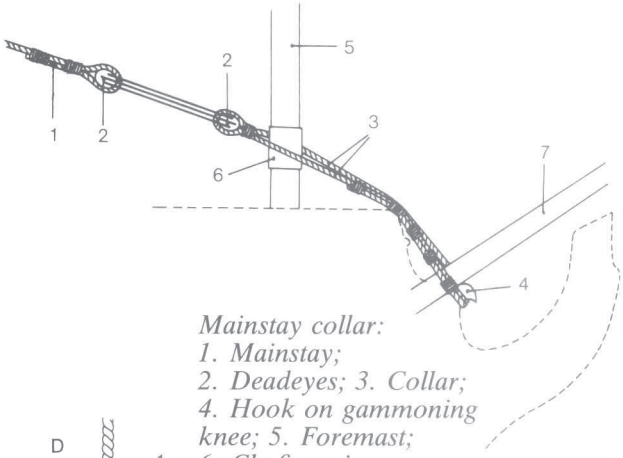
1. Stay
2. Preventer stay



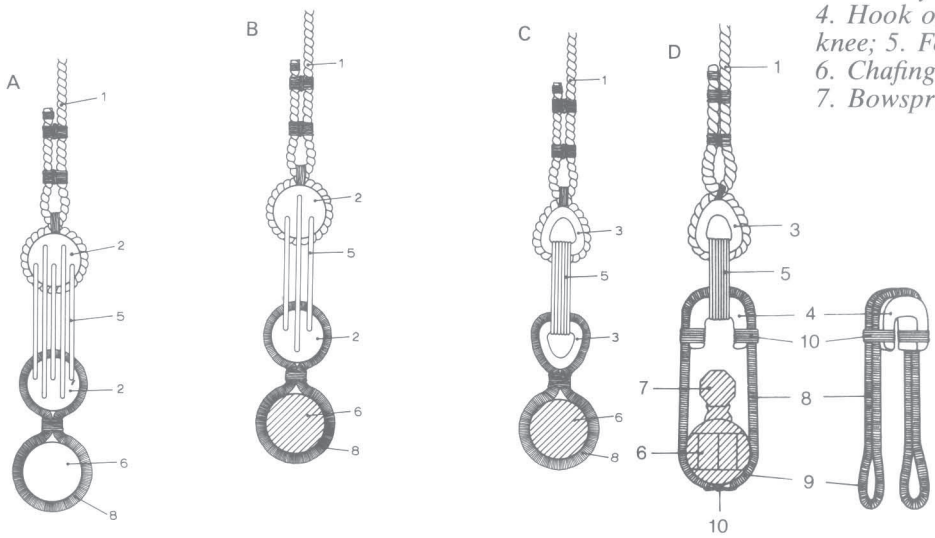
Stays snaked – worming not shown



Model stay mouse: 1. Basic shape built up from wood with rings top and bottom; 2. vertical threads; 3. Horizontal 'darning'



Mainstay collar:
1. Mainstay;
2. Deadeyes; 3. Collar;
4. Hook on gammoning knee; 5. Foremast;
6. Chafing piece;
7. Bowsprit

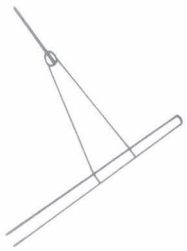


Forestay:
A Continental, 17th century
B British up to 1690
C British 1690-1775
D British after 1775
1. Stay; 2. Deadeyes;
3. Hearts, 4. Bowsprit heart; 5. Lanyards;
6. Bowsprit; 7. Jib boom;
8. Bowsprit strop;
9. Eyes; 10. Seizing

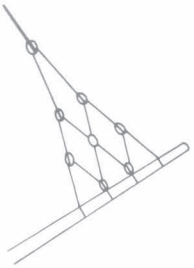
The Stays

Methods of attaching the fore topmast stay in the 16th and 17th centuries

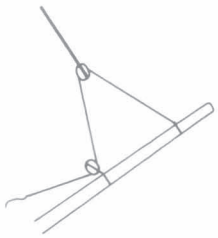
Portuguese 1490-1510; Spanish 1500-20



Portuguese 1510-1520; Spanish 1520-40, Dutch 1600



Spanish 1510-30; British 1520-40



Portuguese 1520, British 1580, Genoan 1590-1600

The fore topmast stay

Until the introduction of the jib boom, that is, in the period between 1500 and 1720, the fore topmast stay was attached to the bowsprit with multiple block systems up to 1670, then deadeyes and lanyards in small ships.

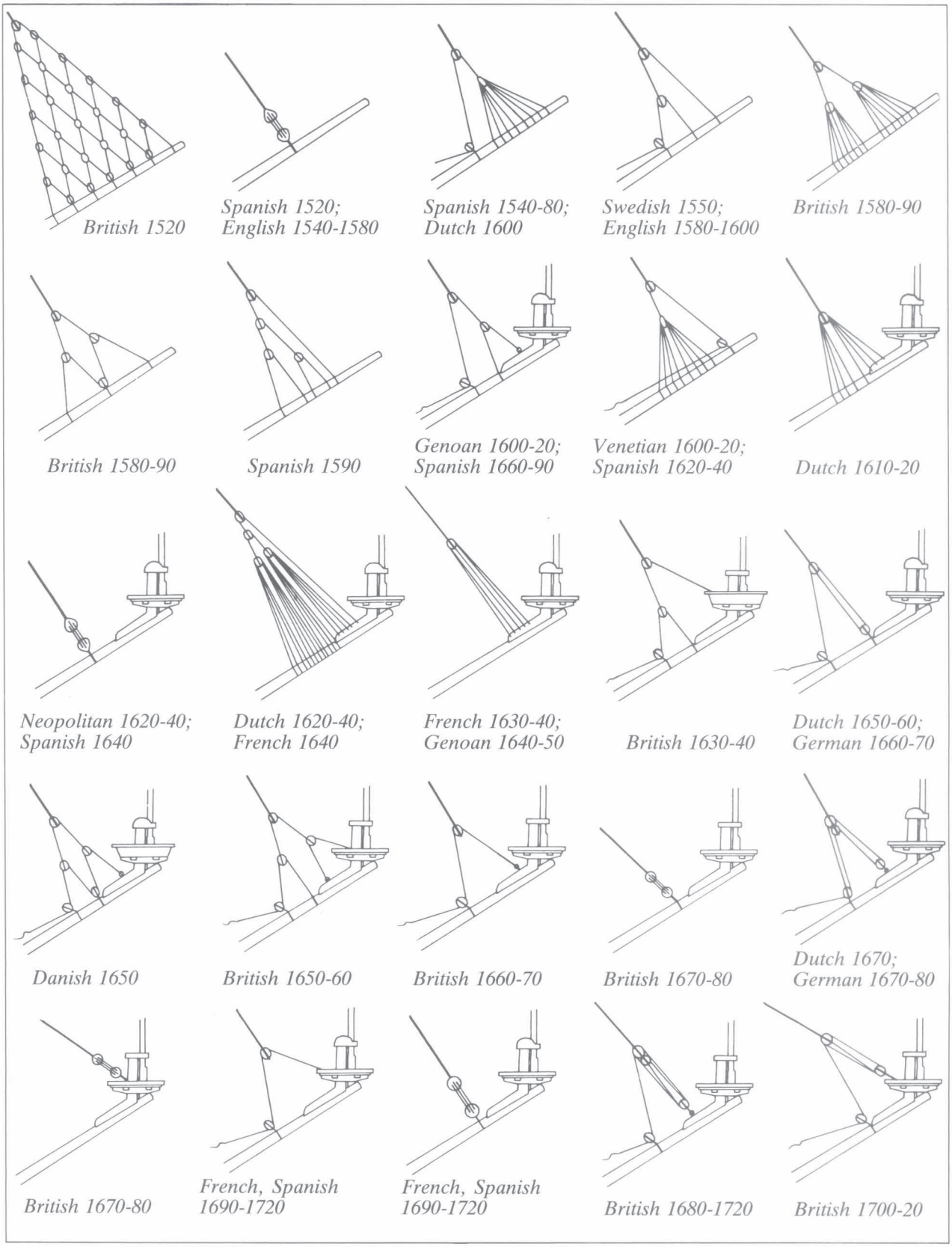
There are no rules regarding the fitting of the topmast stay in respect of time, nor of nation, nor of ship type, as even on two ships of the same size, the same nationality and the same year of building, a wide variety of arrangements was used. The running part of the tackle usually belayed to a cleat on the bowsprit, and more rarely to a belaying pin on the beakhead bulwark. The collection of arrangements for attaching the fore topmast stay drawn on the facing page is not comprehensive. They are intended to show distinct trends only, and give you the chance to judge whether what your plan shows is likely to be right or not. In fact, the very wide variety of possibilities seduces many draughtsmen into drawing their own variant. However, when I see, for example, a fiddle block on the fore topmast stay of a ship built in 1630, then I have justifiable doubts. Fiddle blocks were used from 1660 on; they might be acceptable for 1650, but if they turn up on a plan for an older ship, then that cannot be right. If you have any doubts about the correctness of your plan on this point, and if a good museum model is not available to put you right, you would do better to stick to the types shown in this book.

With the introduction of the jib boom the run of the fore topmast stay was much simplified. Initially the fore topmast stay was made fast to the bowsprit bees with a simple combination of blocks. From the second half of the 18th century the two stays – fore topmast to starboard, fore topmast preventer stay to larboard – reeved through holes in the bees, and were set up at the foot of the bowsprit with a tackle. The running part belayed to a cleat on the bowsprit.

In the middle of the 19th century the fore topmast and fore topmast preventer stays were made fast to the bow on either side of the stem.

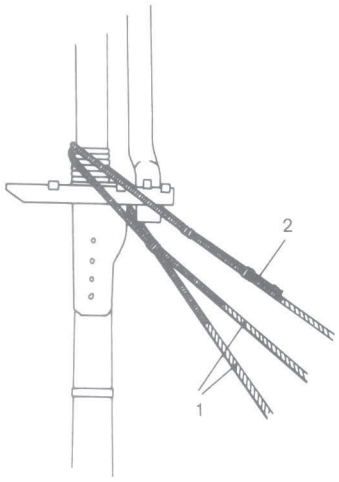
The mizen topmast stay

Until the middle of the 17th century the mizen topmast stay was divided and attached to the last pair of mainmast shrouds with a more or less complex arrangement of ropes and blocks to starboard and larboard . . .

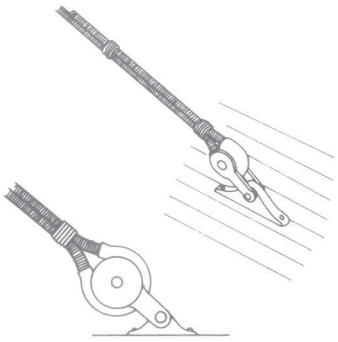

British 1520
Spanish 1520; English 1540-1580
Spanish 1540-80; Dutch 1600
Swedish 1550; English 1580-1600
British 1580-90
British 1580-90
Spanish 1590
Genoan 1600-20; Spanish 1660-90
Venetian 1600-20; Spanish 1620-40
Dutch 1610-20
Neopolitan 1620-40; Spanish 1640
Dutch 1620-40; French 1640
French 1630-40; Genoan 1640-50
British 1630-40
Dutch 1650-60; German 1660-70
Danish 1650
British 1650-60
British 1660-70
British 1670-80
Dutch 1670; German 1670-80
British 1670-80
French, Spanish 1690-1720
French, Spanish 1690-1720
British 1680-1720
British 1700-20

The Stays

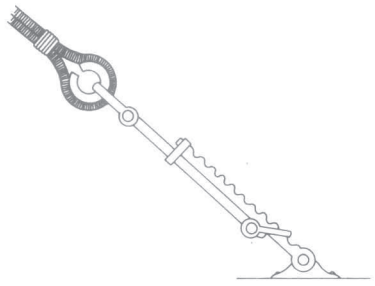
Main and fore stay, second half of the 19th century



Mast head: 1. Double stay; 2. Single stay



Setting up with a thimble



Setting up with a rack (late 19th century)

. . . After this time it was set up with blocks or deadeyes at the mainmast head or – rarely at first, then more commonly in the 18th century – reeved through a leading block, and set up with a tackle on the deck abaft the main mast, in a similar fashion to the main topmast stay.

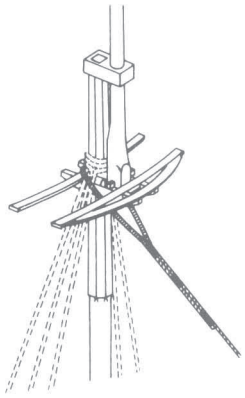
The topgallant stays
The topgallant stays had no mouse, but were shipped over the masthead with a spliced or seized eye. Until 1720 the fore topgallant stay passed through a leading block in the sprit topmast crosstree and ended in a tackle in the sprit top. Thereafter, until the introduction of the dolphin striker it reeved through a block on the jib boom, and belayed on the forecastle.
After the introduction of the dolphin striker the stay led through a sheave on the jib boom and through a hole in the striker and into the head on the starboard side. The main topgallant stay passed through a leading block on the fore topgallant crosstrees and was set up in the foretop with blocks or thimbles. The mizen topgallant stay also reeved through a leading block, and set up with thimbles in the main top.

The royal stays
Generally speaking the information on the topgallant stays also applies to the royal stays. Please refer to the drawings in the section JIB RIGGING for the arrangement of the fore topgallant, fore topgallant preventer and fore royal stays to the jib boom and the outer jib boom.

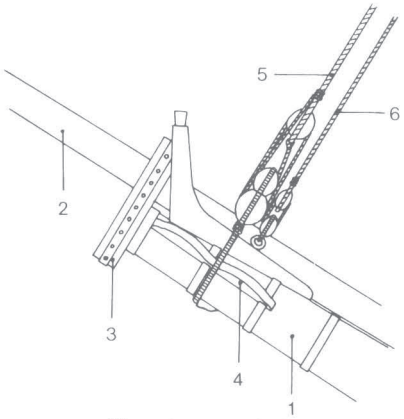
Crowsfeet
To prevent the topsails blowing underneath the tops, crowsfeet were fitted between the fore edge of the tops and the stay. These consisted of a number of ropes which were laced from holes in the edge of the top and the euphroe. The euphroe was fixed to the stay with a simple tackle. Crowsfeet were always carried on the main and fore tops, and frequently also on the mizen top. Towards the end of the 18th century the crowsfeet disappeared.

Staysail
When staysails began to be introduced on large ships around 1660, they were set on staysail stays – with the exception of the mizen staysail and the mizen topmast staysail. These staysail stays ran below the stay proper, and were fitted to fore topmast stay, mainmast stay, and main topmast stay. The staysail stay was fitted to the stay below the mouse with a spliced eye, and made fast at its lower end with blocks or deadeyes to the mainstay collar, and foretopmast stay strop or the foretop.
The staysail stays only have to be fitted if you wish to set the staysails, as if the staysails were not set, the staysail stays were also taken down. In the first half of the 18th century most of the staysail stays disappeared, the staysails being set on the stays themselves or on the preventer stays.

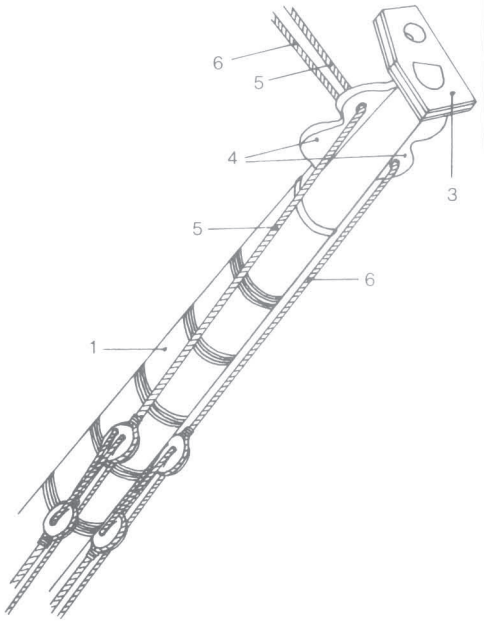
Snaking the stays
In warships of the 18th and 19th centuries the stays and preventer stays were "snaked" together by a thin rope in wartime.
It is important that the distance between stay and preventer stay is not altered by the snaking. It is advisable to fit temporary spacers when fitting the snaking, which can be removed later.

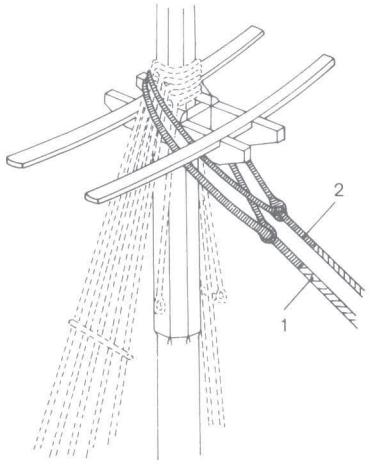


Topgallant stay

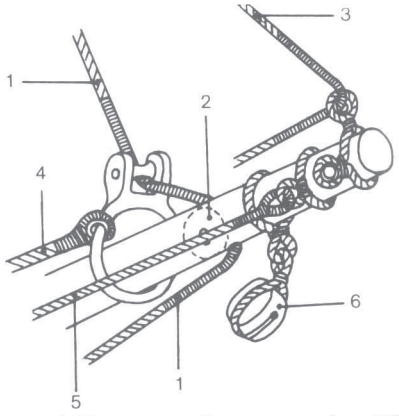


Fore topmast stay: top before 1750, right from 1750 to 1830. 1. Bowsprit; 2. Jibboom; 3. Cap; 4. Bee; 5. Fore topmast stay; 6. Fore topmast preventer stay

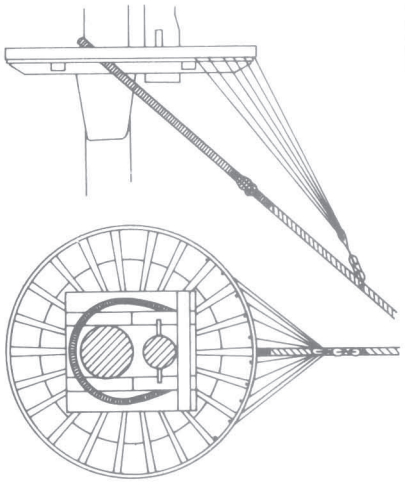




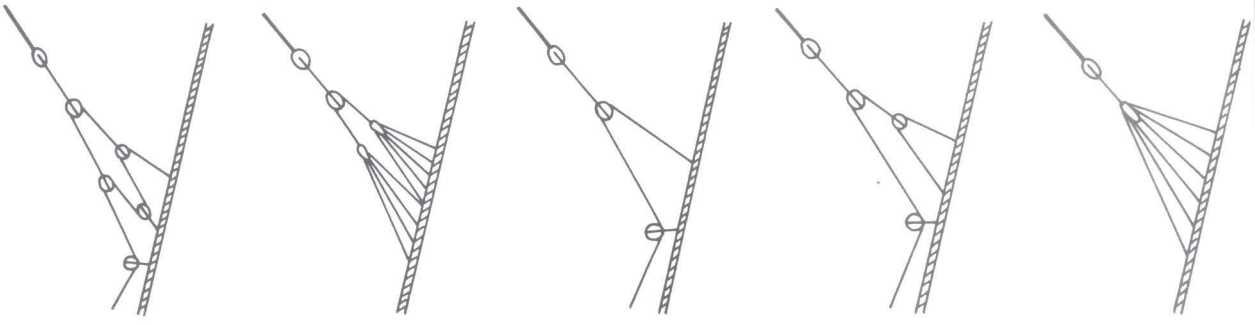
1. Topmast stay (mouse to starboard) 2. Topmast preventer stay (mouse to port)



Jibstay and Fore topgallant stay after 1750: 1. Jib stay; 2. Sheave; 3. Fore topgallant stay; 4. Jib inhaul; 5. Outer jib boom guy; 6. Block for outer martingale stay (Continental practice)



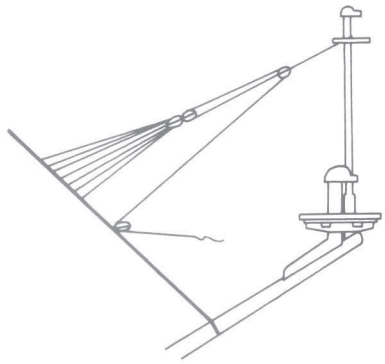
Crowsfeet at the top



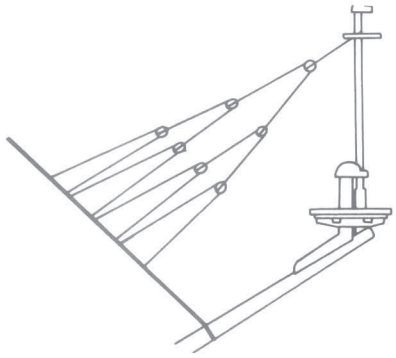
British 1620 *Dutch 1630* *Dutch 1650* *Dutch 1660* *British 1660*

Divided mizen stay, secured to the aftermost main shroud

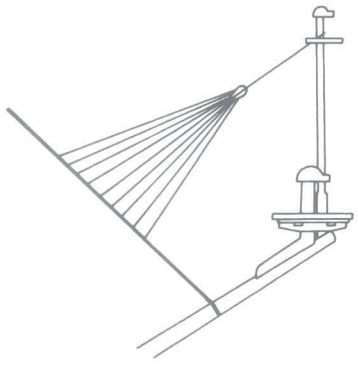
The Sprit topmast backstay



Italian 1620



Danish 1650



Spanish 1690

The sprit topmast backstay can be considered as the final member of the stay family. As long as a sprit topmast was carried, it was necessary to support this aft, and the sprit topmast backstay served this purpose. As with the fore topmast stay there were very many variations on this theme, which changed from time to time and from country to country, and sometimes even from ship to ship.

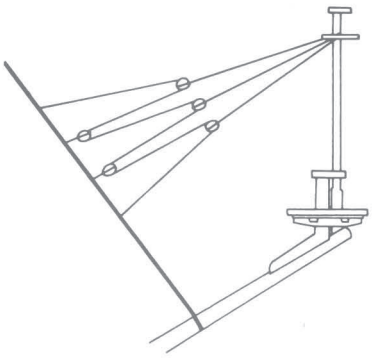
The system was based on a combination of crowsfeet and blocks, which were attached to the fore topmast stay and/or the foremast stay, sometimes standing, sometimes running – i.e. fitted with a tackle. The sprit topmast backstay was attached to the sprit topmast crosstress with a short seized or spliced eye, and ran from there aft between the trestletrees. The running part reeved through the last block of the combination (sometimes over a leading block on the bowsprit) and generally ran to a cleat in the sprit top, although sometimes to a cleat at the foot of the bowsprit, where it belayed.

As with the fore topmast stay drawings, the illustrations on the facing page are intended primarily to give you the chance to check your plans for accuracy, and if necessary to correct them, as this is another case where some plan makers draw in the first arrangement they come across without thinking twice.

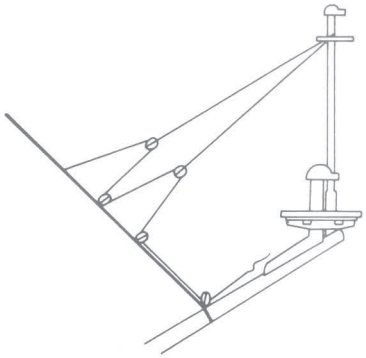
With the disappearance of the sprit topmast around 1720 the sprit topmast backstay also vanished, as its function was assumed by the dolphin striker and the martingale stays – although in a quite different way. The sprit topmast backstay can present a few difficulties to the modeller. The most common problem is that the stay (fore topmast stay, foremast stay), to which the sprit topmast backstay is attached, is pulled towards the bow by it, and is then no longer straight. This can be countered by retensioning the fore topmast or foremast stay (take care – balance out the tensions), and in any case it can be allowed to deflect by a small amount; roughly 3%, or 1/10in in every 3ins of stay length. No more than that!

You are in a spot of trouble if the tension of the sprit topmast backstay causes the sprit mast to bend back towards the stern. This is why I emphasized so strongly when discussing the fixing of the sprit topmast that it must be really securely fixed. If the sprit topmast bends further aft than the vertical when you set up the sprit topmast backstay, there is only one redress: dismantle the standing rigging on the sprit topmast and fix it more strongly.

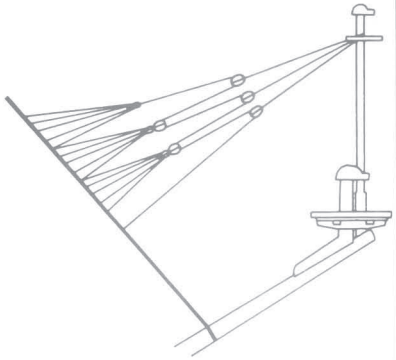
Many model makers try to get round the problem by leaving the backstay loose. Now, it does not need to be as taut as the shrouds, backstays and stays, but on the otherhand it must on no account look slack!



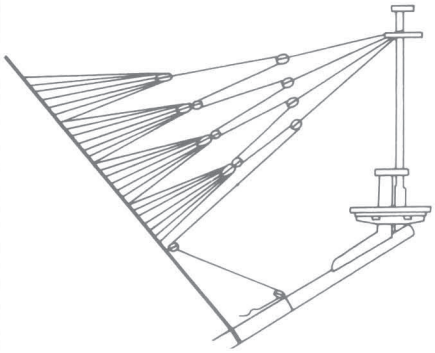
British 1620



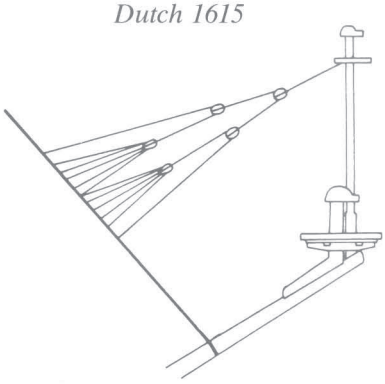
Dutch 1615



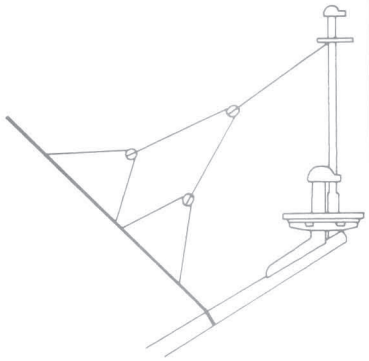
Dutch 1630, French 1640



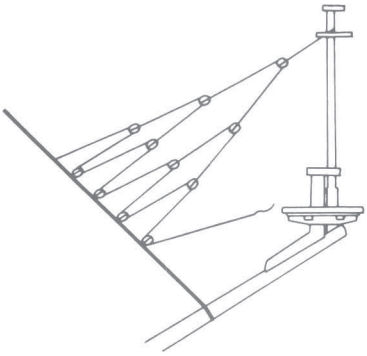
British 1640



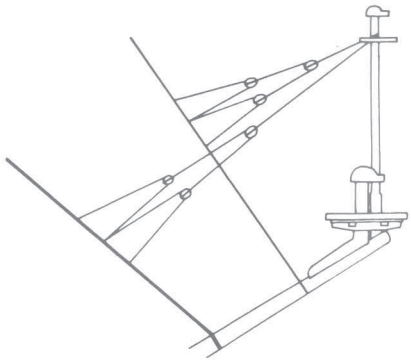
Dutch 1670



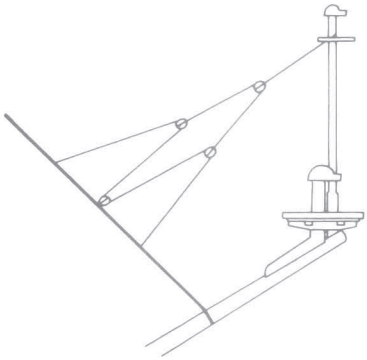
French 1690, Swedish 1690



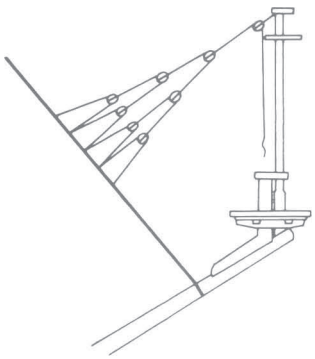
British 1670



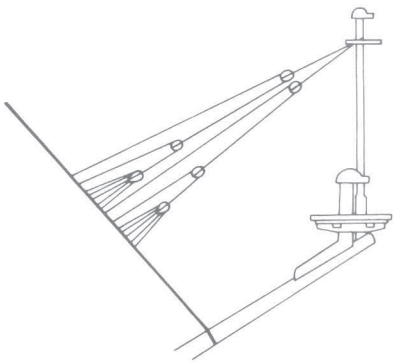
Dutch 1680



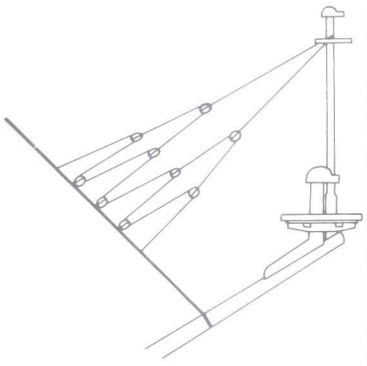
German 1675



British 1700

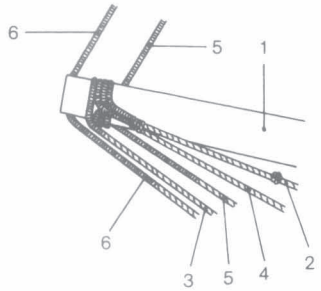


Dutch 1700



German 1680, Russian 1700

The Jib boom rigging



Flying jib boom around 1850:
1. Flying jib boom; 2. Horse;
3. Outer martingale stay;
4. Flying jib boom guys;
5. Topgallant stay;
6. Royal stay

Around 1715 an extension of the bowsprit was added below the sprit topmast. For a short period the jib boom, as it was called, and the sprit topmast existed together, then the sprit mast disappeared.

The crupper
Until the middle of the 18th century the crupper was the only standing rigging fitted to the jib boom. This was a lashing which connected the bowsprit and jib boom. It consisted of about seven turns around both the bowsprit and jib boom with cross turns between them. Around 1850 the crupper was in many cases replaced by a chain crupper and a heel lashing.

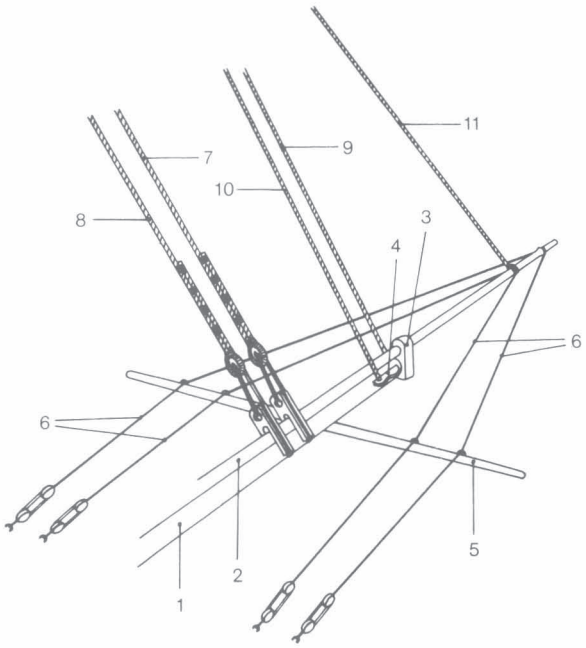
The martingale stay
In the second half of the 18th century the jib boom became so long that downwards support became an urgent necessity; this was the martingale stay. The martingale stay was secured at the head of the jib boom, then reeved through a hole in the dolphin striker, and was usually set up at the foot of the bowsprit with hearts.

The martingale back stays
This method was soon seen to be too complicated, and not strong enough. For this reason a change was made to two ropes supporting the dolphin striker from the bow – the martingale back stays, which were set up with hearts. The martingale stay, for which a chain was used after 1840, was just taken to the dolphin striker and fixed to an iron ring there.

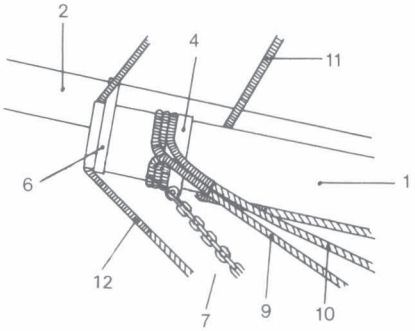
The outer martingale stay
Eventually this method superseded all others, when at the end of the 18th century the jib boom was extended by the flying jib boom. The outer martingale stay was led from the flying jib boom to the dolphin striker in the same manner as the martingale stay, now known as the inner martingale stay. Occasionally the inner and the outer martingale stays were a single rope, which was rigged from the jib boom, through an eyebolt on the dolphin striker, and passed forward again to the flying jib boom. The martingale stays were tensioned by setting up the martingale back stays.

The jib and outer jib guys
The jib and outer jib guys were designed to give the jib and outer jib boom lateral support. They were attached in pairs to the jib boom band and the outer jib boom band. Until about 1830 they reeved through eyes on the spritsail yard, and were attached to the hull with hearts. When the spritsail disappeared, the guys ran directly to the hull, although in many cases the outer jib guys ran over whisker booms on the catheads, in order to spread them more widely.

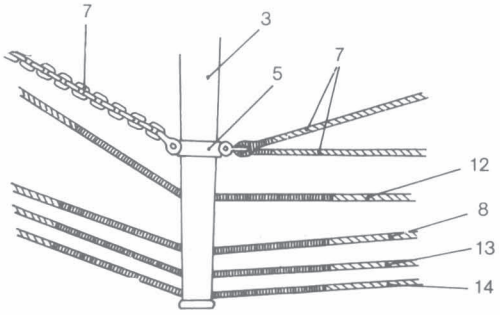
The jib boom footropes
The jib boom footropes, usually fitted in pairs, fulfilled the same function as the foot ropes on the yards. They were secured to the bowsprit cap, and were often knotted at regular intervals, in order to provide the sailors with a better foothold. Nets were often stretched under this area to provide additional security for the crew.



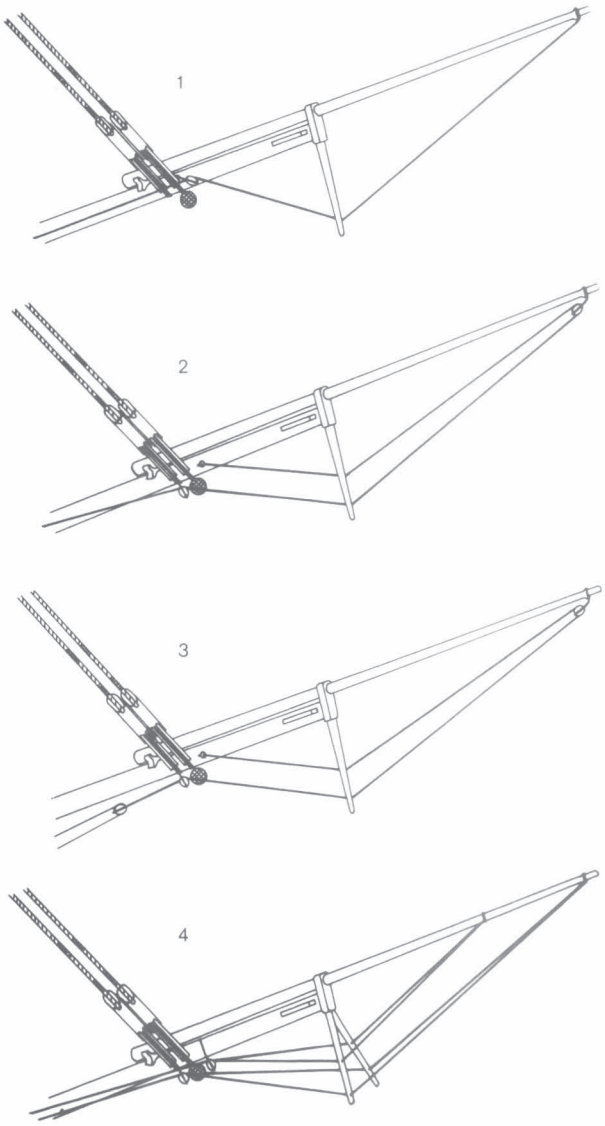
Jib boom guys, 18th century:
1. Bowsprit; 2. Jib boom; 3. Cap; 4. Bee; 5. Spritsail yard; 6. Jib boom guys; 7. Fore stay; 8. Fore preventer stay; 9. Fore topmast stay; 10. Fore topmast preventer stay; 11. Fore topgallant stay



Jib boom, Fore end, with outer boom, around 1850



Dolphin striker, lower part, around 1850

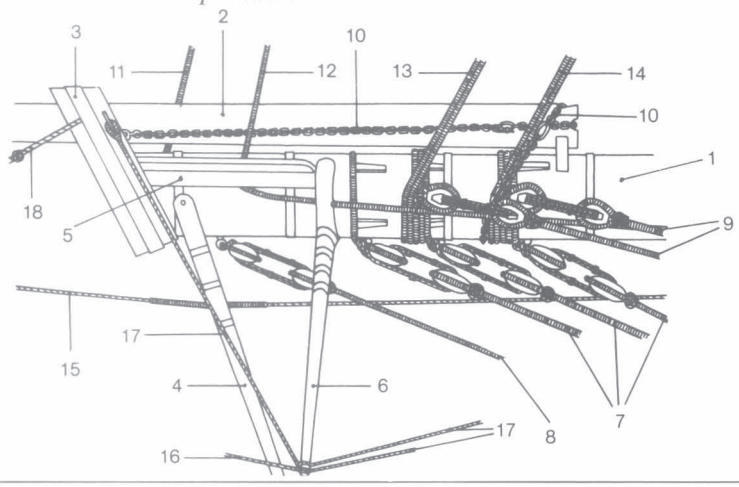


Development of martingale stay: (Continental practice)
1. Single martingale stay 1750
2. Double martingale stay 1780
3. Double martingale stay with tackle, 1790
4. Double martingale stays with double dolphin striker, 18/19th century

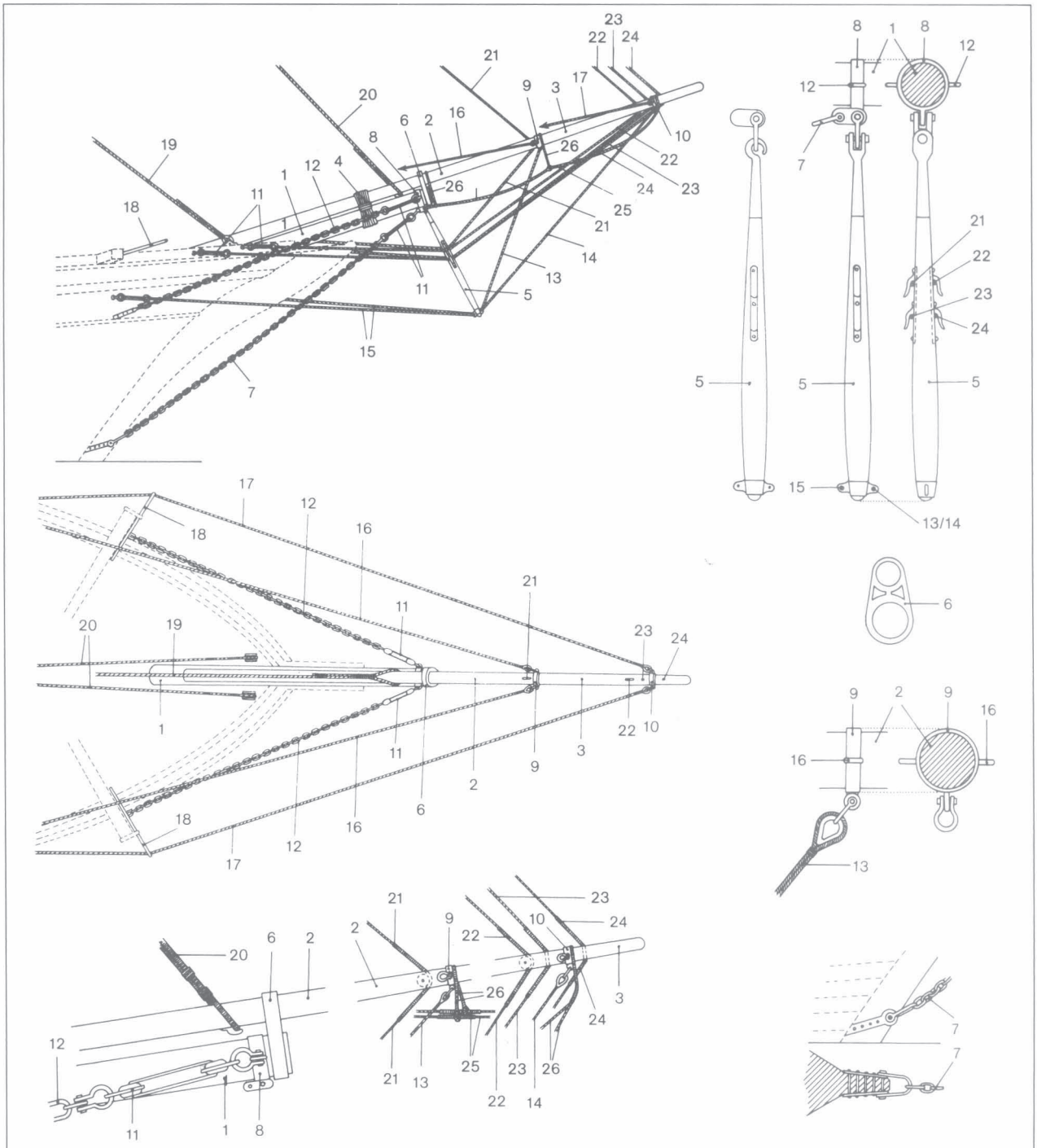
Jib boom and dolphin striker, 19th century:
1. Jib boom; 2. Flying jib boom; 3. Dolphin striker; 4. Martingale stay band; 5. Dolphin striker band; 6. Jib boom band; 7. Outer martingale stay; 8. Flying jib stay; 9. Jib boom guys; 10. Footrope; 11. Jib stay; 12. Fore topgallant stay; 13. Fore royal stay; 14. Flying martingale stay

The Jib boom rigging

The English opium clipper Falcon *in 1824.*
Note the spritsail yard. It is situated on top of the bowsprit abaft the jib boom. It could not carry sail at this stage, and its only purpose was to spread the jib boom and flying jib boom guys. Soon after this period the spritsail was replaced by a spreader.



Fore end of bowsprit around 1850: 1. Bowsprit; 2. Jib boom; 3. Cap; 4. Fixed dolphin striker; 5. Bee; 6. Spreader; 7. Bobstays; 8. Cap bobstay; 9. Bowsprit shrouds; 10. Chain heel lashing; 11. Fore topmast stay; 12. Fore topmast preventer stay; 13. Fore stay; 14. Fore preventer stay; 15. Fore topgallant stay; 16. Jib boom guy; 17. Spreader guy; 18. Horse



Jib boom rigging with a pivoted dolphin striker, second half of the 19th century:
1. Bowsprit; 2. Jib boom; 3. Jib boom head; 4. Crupper; 5. Dolphin striker or martingale (variant shown) 6. Iron bowsprit cap; 7. Bobstay; 8. Martingale band; 9. Jib stay band; 10. Outer jib stay band; 11. Lanyards; 12. Bowsprit guy; 13. Martingale stay; 14. Outer martingale stay; 15. Martingale backstays; 16. Inner jib boom guy; 17. Outer jib boom guy; 18. Whisker boom; 19. Fore stay; 20. Fore topmast stay; 21. Jib stay; 22. Outer jib stay; 23. Fore topgallant stay; 24. Fore royal stay; 25. Footrope; 26. Stirrup

Running rigging

Running rigging · Running rigging, rope sizes · Halyard Slings · Outhauler Parrals Lifts · Spritsail yard lifts Height of the yards · Braces Position of the yards · Sheets Tacks · Clew lines · Leech lines and bunt lines · Reef tackle · Bowlines · Bearing out spar · Topmast tye · Gaff sails Staysails · Staysail rope sizes Studding sails · Studding sail rope sizes · Furled sails Yards without sails · Lateen sails

The running rigging of a ship covers all the ropes which are used to manipulate yards and sails:
Halyards, tyes and jeers – for hoisting the yards on the mast.
Trusses and parrals – for holding the yards tight against the mast.
Lifts – for holding the yard horizontal, or topping up the yard (at an angle).
Braces – for swinging the yard to one side.
Sheets – for holding down the clews (lower sail corners).
Tacks – for hauling the clews forward.
Clew lines – for hauling up the clews when furling the sails.
Leech lines and bunt lines – for hauling the mass of the sailcloth on to the yard.
Reef tackles – for hauling up the reef bands onto the yard, when the sail is to be shortened.
Bowlines – for keeping the leech well out when sailing close-hauled.
In contrast to the standing rigging the running rigging underwent few major changes in the course of the centuries. There was good reason for this: the standing rigging was rigged up in port, where the time and leisure were available for fitting the most complex arrangements of rope, especially in the 16th century. The running rigging, on the other hand, had to be quick and straightforward to operate at sea, even in the worst weather, otherwise the safety of the whole ship was at risk. Hence while the standing rigging was subject to the latest aesthetic and technical fashions, the first consideration in the design of the running rigging was that it should work perfectly.
The ropework of the running rigging was generally in its natural state and therefore lighter in colour than most of the standing rigging.
Steel wire ropes and chains gradually came into use after the middle of the 19th century, and here you should note that the chains of the running rigging – as with the standing rigging – were always of plain link rather than the stud link type.
Take care! Check the rope thicknesses and block size shown on your rigging plans very thoroughly, as advised for the standing rigging.
On many plans, and especially if you are working from a kit, there is a tendency to make the lower yard rigging too heavy, and the upper yard rigging too light. You must also establish which ropes were taut, and which were carried loose.
Basically the halyards, trusses and parrals, lifts and braces, and all the upper sail sheets were set up taut. When the sails are set, the weather bowline is hauled taut, as also are the lee sheets and weather tacks.
Brails, clew lines and reef tackles are carried loosely when the sails are set. If the sail is hauled up to the yard, furled on the yard, or the model is shown without sails, then the clew lines, leech lines, bunt lines and reef tackles must also be hauled taut.
The running rigging is belayed to kevel blocks, staghorns, cleats and belaying pins. Until the beginning of the 17th century individual ropes were also simply wound round the rail; the thinner ropes of the topgallant and royal sails were also belayed in the tops in some instances.
Take care! The ropes of the running rigging must not be cut short after belaying. A certain amount of rope was generally coiled up by the belaying point, hung over the belaying pins (see BELAYING PINS), coiled up by the cleats, hung over the head of the kevel blocks, or hung over one of the horns of the staghorn.

The French corvette L'Astrolabe *of 1811*

Running rigging sizes

Bowsprit and jib boom	16th/17th century	18th century	19th century hemp	19th century steel
Spritsail				
Spritsail yard sling	40%	26%	88%	
Halliard	18%	20%	24%	
Lifts	20%	23%	23%	
Pendant	13%	15%		
Purchase	10%			
Braces	20%	23%		
Pendant	13%	15%	24%	
Sheets	20%	20%		
Clew lines	13%	13%		
Spritsail topsail (Spritsail topmast)				
Halyard	25%	25%		
Pendant	13%	13%		
Lifts	8%	8%		
Braces	12%	12%		
Sheets	20%	20%		
Clew lines	10%	10%		
Spritsail topsail (jib boom)				
Sprit topsail yard sling		20%		
Halliard		15%		
Lifts		11%		
Braces		11%		
Sheets		20%		
Clew lines		12%		
Leech and bunt lines		11%		

The figures given refer to the thickness of the main stay, 0.166% of the diameter of the mainmast at the deck (100%).
These values are a guideline only, and national variations have not been taken into account.

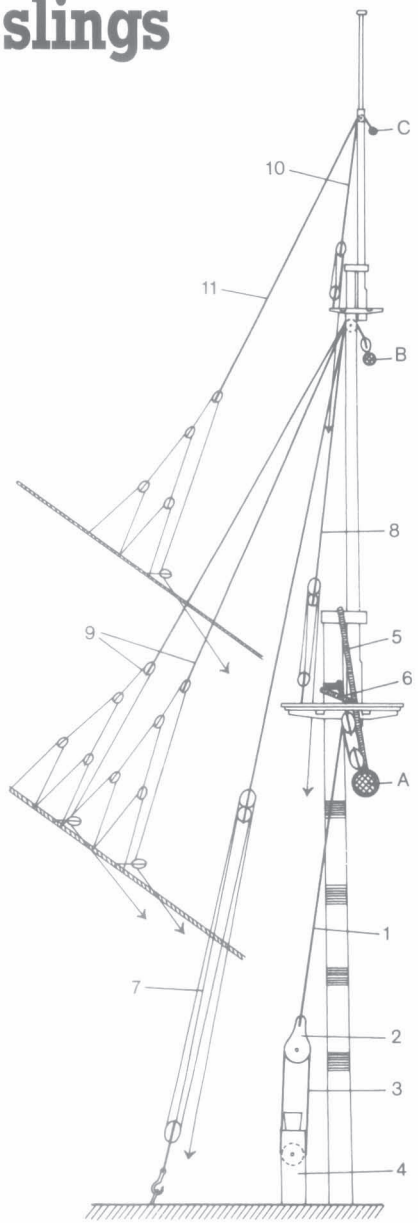
In the case of a mainstay made of steel rope, the figures in the table are still based on the use of hemp rope.

Foremast	16th/17th century	18th century	19th century hemp	19th century steel
Fore course				
Tye	50%	32%	50%	
Purchase	35%	20%	35%	
Slings		51%	60%	chain
Lifts	20%	22%	36%	12%
Braces	35%	32%		
Pendant	25%	23%	28%	
Sheets	37%	34%	45%	
Tacks	50%	30%	36%	
Clew lines	19%	22%	20%	
Leech and bunt lines	16%	15%	20%	
Bowlines	20%	26%	15%	
Fore topsail				
Top rope	50%	32%	48%	
Tye	50%	32%	48%	chain
Halyard	25%	20%	30%	
Lifts	13%	20%	28%	10%
Braces	20%	31%		
Pendants	13%	20%	24%	
Sheets	36%	46%	50%	chain
Clew lines	22%	20%	30%	
Leech and bunt lines	19%	15%	30%	
Bowlines	20%	22%	20%	
Reef tackle	14%	15%	20%	
Fore topgallant sail				
Tye	25%	23%	40%	chain
Halyard	13%	20%	28%	
Lifts	8%	12%	17%	
Braces	19%	19%		
Pendant	12%	12%	24%	
Sheets	20%	20%	24%	chain
Clew lines	10%	11%	15%	
Bowlines	10%	10%	17%	
Fore royal sail				
Tye	15%	15%	15%	chain
Halyard	10%	11%	11%	
Lifts	7%	10%	12%	
Braces	12%	12%	15%	
Sheets	12%	12%	15%	
Clew lines	7%	8%	11%	

Mainmast	16th/17th century	18th century	19th century hemp	19th century steel
Main Course				
Tye	50%	33%	50%	
Purchase	35%	22%	35%	
Sling		56%	60%	chain
Lifts	20%	22%	38%	13%
Braces	35%	32%		
Pendant	25%	23%	30%	
Sheets	37%	40%	45%	
Tacks	5;%	32%	40%	
Clew lines	19%	23%	28%	
Leech and bunt lines	16%	17%	28%	
Bowlines	20%	28%	23%	
Main topsail				
Top rope	50%	33%	48%	
Tye	50%	33%	48%	chain
Halyard	25%	22%	30%	
Lifts	13%	22%	30%	10%
Braces	20%	34%		
Pendants	13%	22%	26%	
Sheets	44%	50%	53%	chain
Clew lines	22%	22%	24%	
Leech and bunt lines	19%	17%	21%	
Bowlines	20%	25%	20%	
Reef tackle	12%	15%	34%	
Main topgallant sail				
Tye	25%	23%	44%	chain
Halyard	13%	20%	36%	
Lifts	8%	12%	20%	
Braces	19%	19%		
Pendants	12%	12%	26%	
Sheets	20%	22%	26%	chain
Clew lines	10%	12%	14%	
Bowlines	10%	10%	15%	
Main royal sail				
Tye	18%	20%	17%	chain
Halyard	12%	14%	14%	
Lifts	8%	10%	12%	
Braces	12%	13%	19%	
Sheets	12%	15%	17%	
Clew lines	8%	10%	12%	

Mizen mast	16th/17th century	18th century	19th century hemp	19th century steel
Crossjack yard				
Sling	25%	26%	30%	
Lifts	10%	15%	38%	13%
Braces	13%	18%		
Pendants	11%	15%	26%	
Mizen Course				
Tye	25%	23%	30%	chain
Halyard	13%	13%	24%	
Lifts	8%	13%	26%	10%
Braces	12%	19%		
Pendants	8%	13%	19%	
Sheets	20%	25%	30%	chain
Clew lines	10%	13%	19%	
Leech and bunt lines		12%	14%	
Bowlines	10%	12%	14%	
Reef tackle		10%	15%	
Mizen topgallant sail				
Tye		20%	36%	chain
Halyard		12%	21%	
Lifts		10%	14%	
Braces		13%	14%	
Sheets		13%	19%	
Clew lines		10%	11%	
Bowlines		10%	9%	
Mizen sail (lateen)				
Halyard	40%	30%		
Pendant	20%	15%		
Lift	20%	20%		
Bridles	8%			
Tack tackle	13%	20%		
Sheet	25%	18%		
Clew line	15%	13%		
Leech and bunt lines	15%	12%		
Mizen sail (gaff)				
Peak halyard		30%	30%	
Throat halyard		30%	28%	
Topping lift		40%	40%	
Sheet		30%	30%	
Vangs		19%	19%	
Tack		28%	28%	
Out haul		30%	30%	
Brails		19%	19%	
Signal halyard		6%	6%	

Halyards and slings



Halyard: 1. Tye; 2. Ramshead block; 3. Halyard tackle; 4. Knighthead; 5. British sling; 6. Continental sling; 7. Halyard, British before 1720; then generally; 8. Topsail halyard before 1720, Continental; 9. Fore topsail halyard before 1660; 10. Topgallant halyard; 11. Topgallant halyard before 1660. A. Lower yard; B. Topsail yard; C. Topgallant yard

The lower yard tye and halyard
In the Middle Ages the tyes of the lower yards (fore yard, main yard) either reeved through sheave holes on the masthead or through blocks like the topsail halyards. A purchase was fitted abaft the mast to set them up taut. In the mid-16th century the tyes ran to a common ramshead block – they had previously been fitted individually – which with the knighthead formed the halliard purchase.
Towards the middle of the 16th century the tyes were taken through two sheaves in the mast, a system which was retained in Britain until the second half of the 17th century.
On the Continent the halyards were fitted over the round caps (see CAPS) after the late 16th century, where they passed through two holes on the forward, flat part, then ran back into the grooves and ended in the ramshead block. In Britain after 1650 two double blocks were fixed to the yard, and two triple blocks to the crosstrees. The jeers, which replaced the tyes and halyards, were secured to the yard, reeved through the blocks, and finally ran to the deck, where they belayed to the jeer bitts.
This form of lower yard jeers was also adopted on the Continent at the beginning of the 18th century. After the introduction of iron parrals in the second half of the 19th century the lower yard jeers fell out of use.

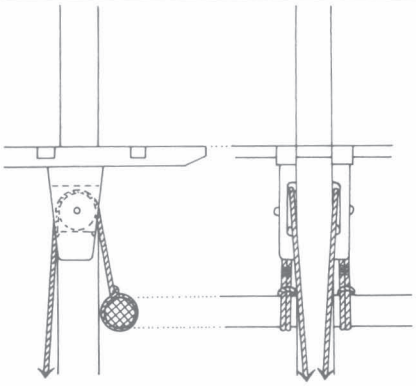
The slings
Slings were used from the early 18th century onward as an improved means of securing lower yards, which were very heavy. They were strong, served rope strops, which were slid round the masthead over the shrouds in Continental ships, and over the cap in British vessels, and were connected to a second rope sling seized to the yard. After the middle of the 19th century chains were used as slings in many cases.

The topsail halyard
The topsail tyes were attached with a strop round the yard on small ships, and with a block on large ships. They passed through a sheave in the topmast on smaller ships, and on larger ships through a block (on very large ships through two blocks) and on Continental ships in the 16th/17th centuries they led to the halyard purchase in the top. In Britain the topsail halyard purchase was taken down to the deck, and the running part belayed abaft the aftermost shroud. This system also became standard on the Continent in the 18th century.

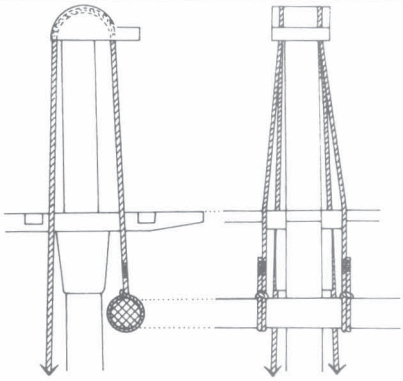
The topgallant and royal halyards
The topgallant and royal tyes were always fixed with a strop, sometimes also with a hook on the yard, and then led through a sheave in the topmast to the topmast crosstrees and the halyard which belayed in the top.

The spritsail halyard
The spritsail halyard was attached to a block in the middle of the yard, reeved through a double or fiddle block on the bowsprit, and belayed to a cleat at the base of the bowsprit.

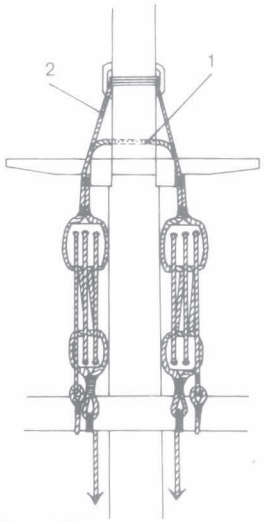
The crossjack yard sling
The crossjack yard had no halyard, but was held with a sling laid over the crosstrees.



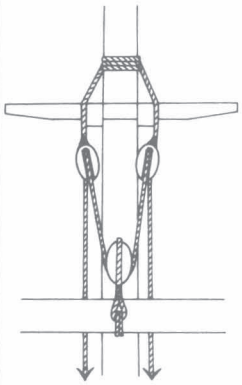
Tye, English 16th/17th century



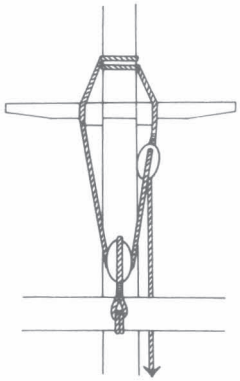
Tye, Continental 16th/17th century



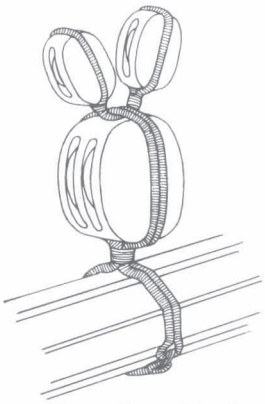
Tye, 18th/19th century; 1. Continental; 2. English



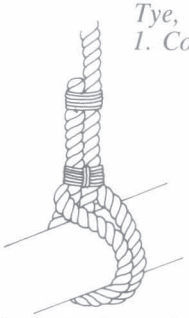
Topsail tye, 1685-1810



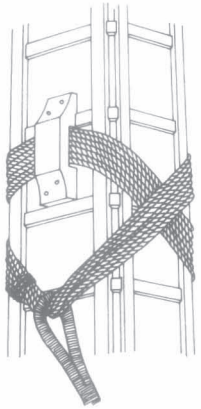
Topsail tye, 1650-1685



Topsail tye block with two buntline blocks

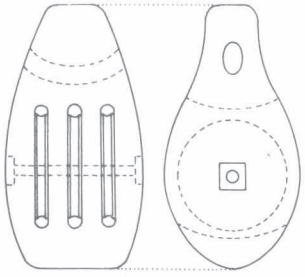


Method of securing the tye to the yard

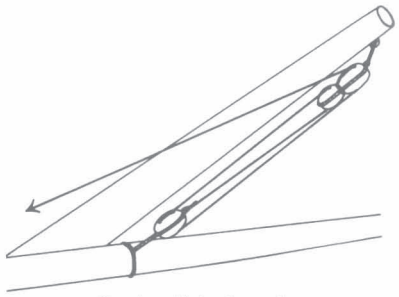


English jeer block strop at the mast head

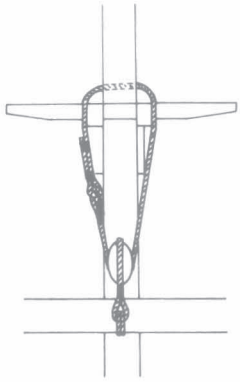
Sling, 18th/19th century



Ramshead block

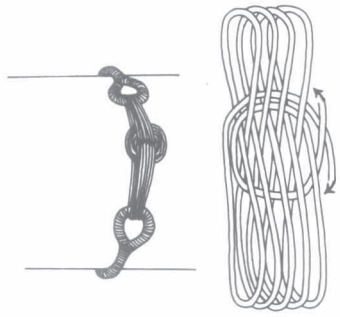


Spritsail halyard

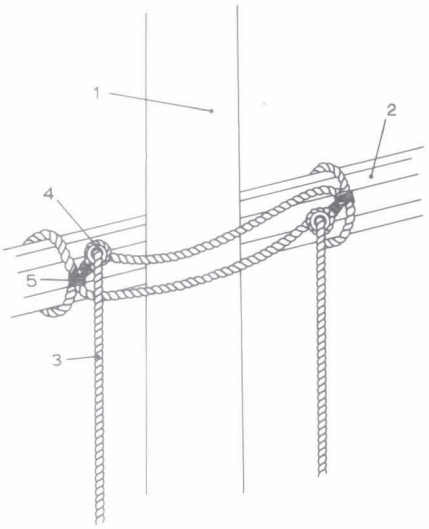


Crossjack sling

The Parral



Rose lashing on the yard



Truss pendants on the lower yards, 18th century;
1. Mast; 2. Yard; 3. Truss pendant; 4. Thimble; 5. Seizing

Dolphin

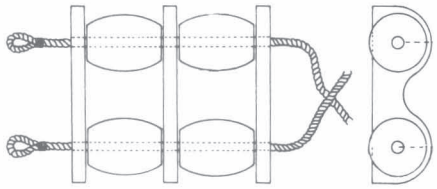
In ancient times and in the early Middle Ages the parral consisted of a strong rope strop which held the yard to the mast. Wooden balls known as trucks were threaded on to the parral from the 13th century on, to permit the parral to slide up and down the mast as easily as possible when the yard was hoisted or lowered. They were soon fitted with a tackle which ran down to the deck, so that the parral could be loosened when the yard was hoisted.

The lower yard parral
From the beginning of the 13th to the middle 18th century parrals with up to four rows of trucks were fitted for the lower yards, and ribs were used as spacers where there were two or more rows of trucks. The ribs of three-row parrals were about as long as the yard diameter, and sometimes slightly longer. A rope seizing was usually laid round the yard on the larboard side.
The parral ropes were fixed to this seizing, then passed round the mast and reeved through a thimble, which was seized to the yard on the starboard side. They were then spliced together just below the thimble, and led down to the deck, ending in a purchase.
In the 18th century parrals were no longer used on the lower yards. Two truss pendants were now used, which, as the drawing on the left shows, led to the top in Continental ships and to the deck in British ships up to 1810, after which they led to the top and could be set up with purchases. As this form of parral did not slide easily on the mast, it was fitted with a downhaul when the pendants led to the top. In the second half of the 19th century fixed iron trusses came into use, which no longer permitted the yards to be moved up and down.

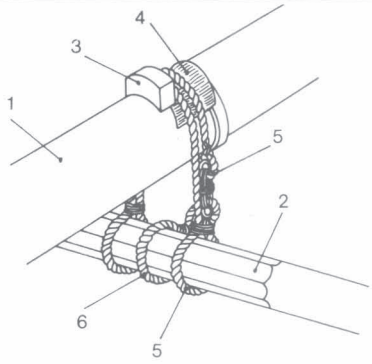
The topsail yard parral
The topsail yards nearly always carried parrals with ribs and trucks until the first half of the 19th century, but in this case a purchase was not fitted, instead they were seized to the yard on either side.
In the first half of the 19th century rope parrals alone were used in some areas, in which case the part which passed round the topmast was protected from chafing with a leather sleeve. After this time the upper topsail yard and topgallant yard parrals were also made of iron, and fixed to a batten, as the drawing on the right shows.

The topgallant and royal parrals
Topgallant and royal parrals were sometimes fitted with trucks (but not ribs) until the end of the 17th century, after which time rope parrals were used exclusively without trucks until the middle of the 19th century.

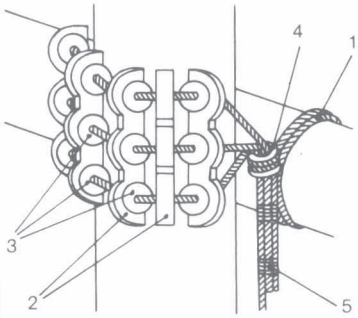
The spritsail and crossjack parrals
Until the beginning of the 17th century various types of parral with two rows of trucks appeared, and after this time (and very often before this time) the spritsail yard was suspended from the bowsprit with just a double rope sling. A similar sling was used for the crossjack yard, which could also not be moved up and down.

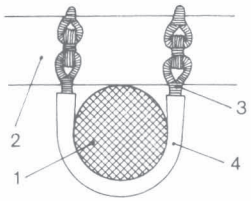


Parral with ribs and trucks:
1. Strop; 2. Ribs; 3. Trucks;
4. Thimble; 5. Truss fall

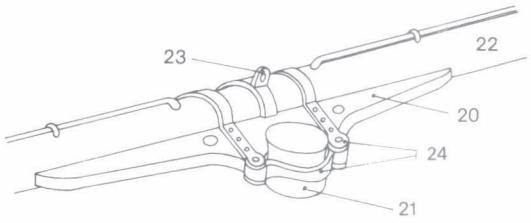


Spritsail yard sling: 1. Bowsprit; 2. Spritsail yard;
3. Saddle; 4. Lead facing; 5. Spritsail yard sling;
6. Halliard strop

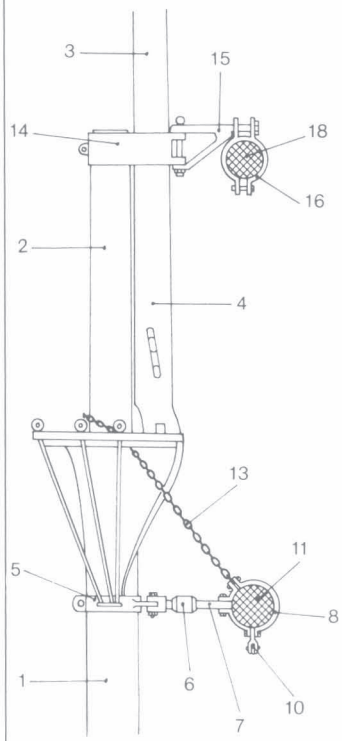


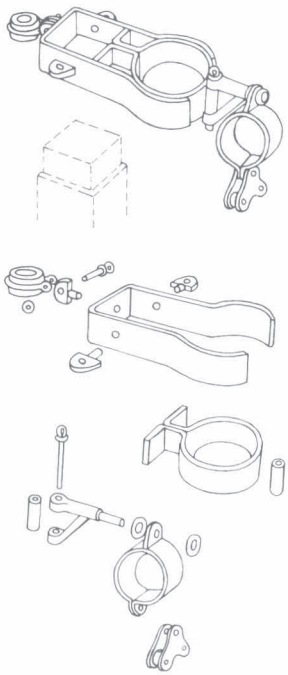


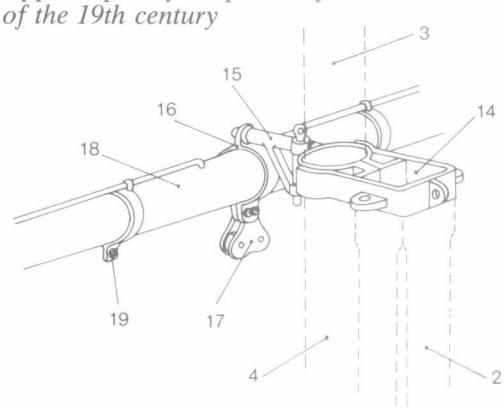
Topsail yard parral,
19th century:
1. Topmast;
2. Topsail yard;
3. Parral;
4. Leather sleeve

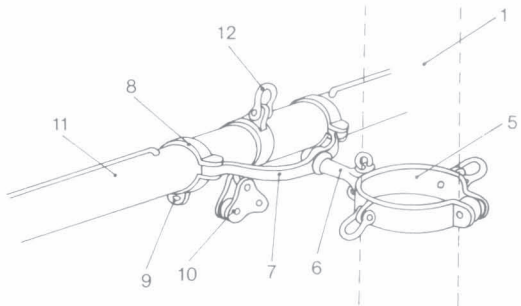


Upper topsail yard parral after the middle of the 19th century



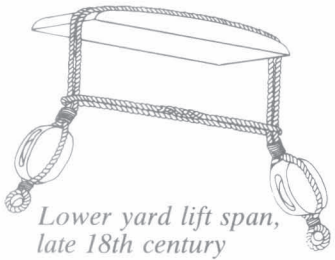




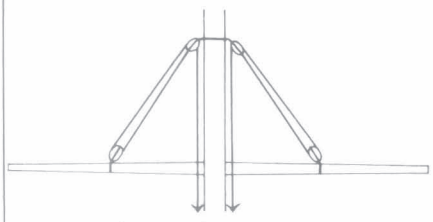


Lower yard and lower topsail yard after the middle of the 19th century (clarified for model purposes):
1. Lower mast; 2. Lower masthead; 3. Topmast; 4. Topmast heel; 5. Futtock band; 6. Truss link;
7. Truss span; 8. Yard bands; 9. Eye for clew lines block; 10. Clover leaf block; 11. Lower yard;
12. Sling shackle; 13. Chain sling; 14. Cap; 15. Truss crane; 16. Crane band; 17. Clover leaf block;
18. Lower topsail yard; 19. Eye for clew line block; 20. Parral batten; 21. Leather liner; 22. Upper topsail yard; 23. Eye for tye block; 24. Hinged parral

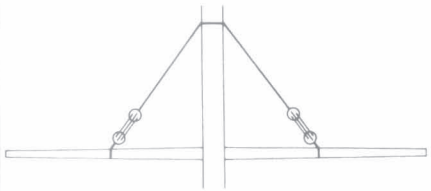
The Lifts



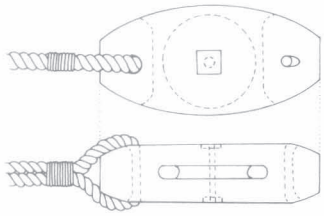
Lower yard lift span, late 18th century



Spritsail yard lifts



Standing spritsail yard



Continental lift block

Height of the yards

The lifts' purpose was to hold the yards horizontal. They consisted of a pair of ropes, which ran from the yard arms to the mast and from there downwards to the deck. In ancient times and in the early Middle Ages the lift blocks were situated at the masthead; until the beginning of the 17th century they were on the crosstrees, and since then have been on the cap.

British ships employed either common or fiddle blocks for this purpose, while Continental practice varied: in the 17th century they had special extended lift blocks (see drawing on the left), from the early 18th century fiddle blocks were used for the lower yard lifts, and sometimes for the topsail yards, while common blocks were used for the upper yards.

From the middle of the 16th century in Britain the yard arm blocks were stropped to the sheet blocks, while on the Continent the lifts reeved through the upper part of the specially shaped sheet blocks (see SHEETS).

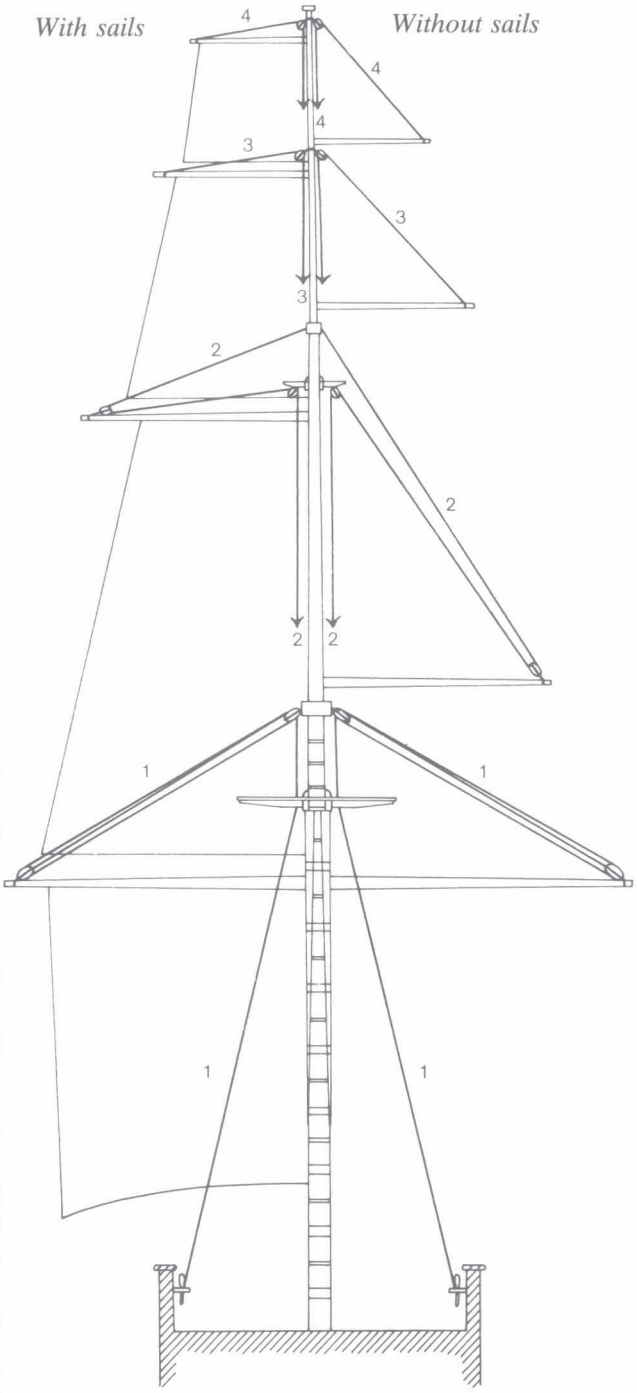
The lower yard lifts were almost always doubled, and sometimes even trebled, while those of the topsail yards were usually double, and those of the topgallant and royal yards were single. In smaller British ships the topgallant sail sheets sometimes doubled as topsail yard lifts.

The lower yard lifts belayed on pins in the bulwark, while the topsail lifts often belayed in the top until the first half of the 16th century. Later they also belayed to pins on the bulwark, while the topgallant lifts almost always belayed in the top. In the second half of the 19th century the lifts were sometimes made from steel wire rope, and in the case of non-lowering yards standing lifts were used i.e. the lifts were fixed to the yard arm with a shackle, without any blocks, taken to an eyebolt on the mast, and shackled in place there too.

The spritsail yard lifts

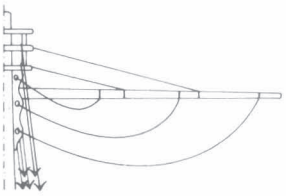
The spritsail yard lifts could be either fixed or movable. Standing lifts were connected to deadeyes stropped to the yard, and further deadeyes attached to the bowsprit on a long strop, the pairs of deadeyes being linked by a lanyard, like the shroud deadeyes. Running lifts consisted of two blocks on the yard and two blocks on the bowsprit, which were linked with falls and belayed at the foot of the bowsprit. The blocks or deadeyes of the spritsail yard lifts were not fitted at the yard arms, but half-way between the yard arms and the slings.

One of the commonest mistakes on model ships is incorrect positioning of the yards. Basically it is safe to assume with earlier, smaller ships that the fore, main, mizen and crossjack yards were rigged just below the mast cheeks and were not normally lowered from this location; the spritsail yard and sprit topsail yard were also likely to remain in a "fixed" position. However, as ships grew larger the topsail, upper topsail, topgallant and royal yards, carried immediately below the hounds when the sails were set, were lowered to just above the cap below when the sails were furled or removed. A typical example is *La Jeanne d'Arc* on page 331. Inspection of museum models or reliable illustrations of ships of similar size and date to that under construction should resolve any doubt.

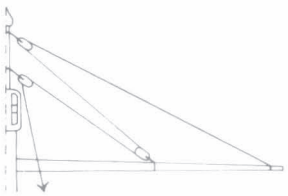


Lifts: 1. Lower lifts (may also be belayed adjacent to mast at deck level); 2. Topsail lifts; 3. Topgallant lifts; 4. Royal lifts. Note the position of the yards in each case, with and without sails respectively

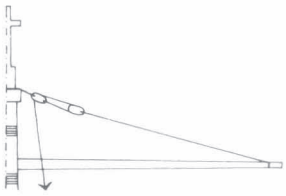
Development of the lifts



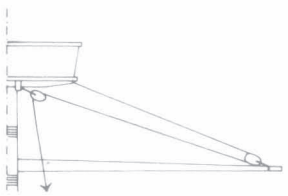
Egyptian 2500-800 B.C.



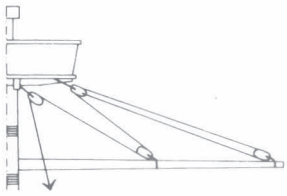
Roman 50/300 A.D.



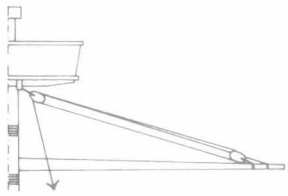
13th/14th century



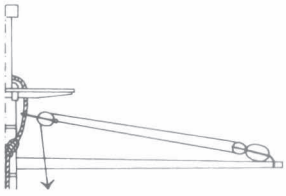
14th/15th century



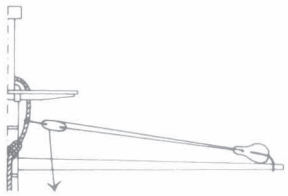
15th century



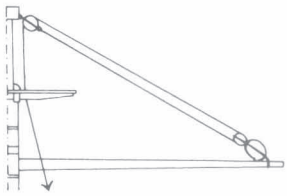
15th/16th century



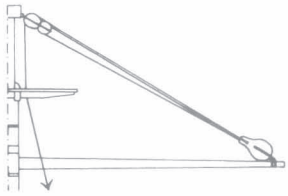
British, 17th century



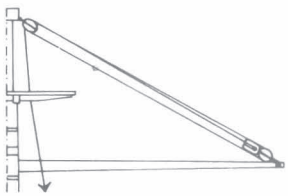
Continental, 17th century



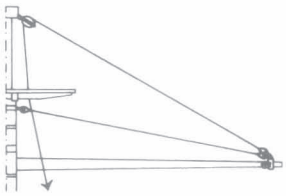
British, 18th century



Continental, 18th century

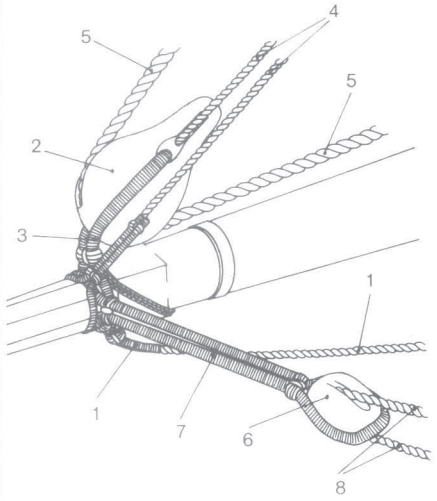


Early 19th century

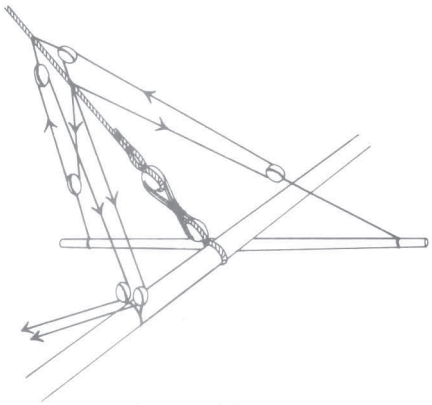


Late 19th century

The Braces



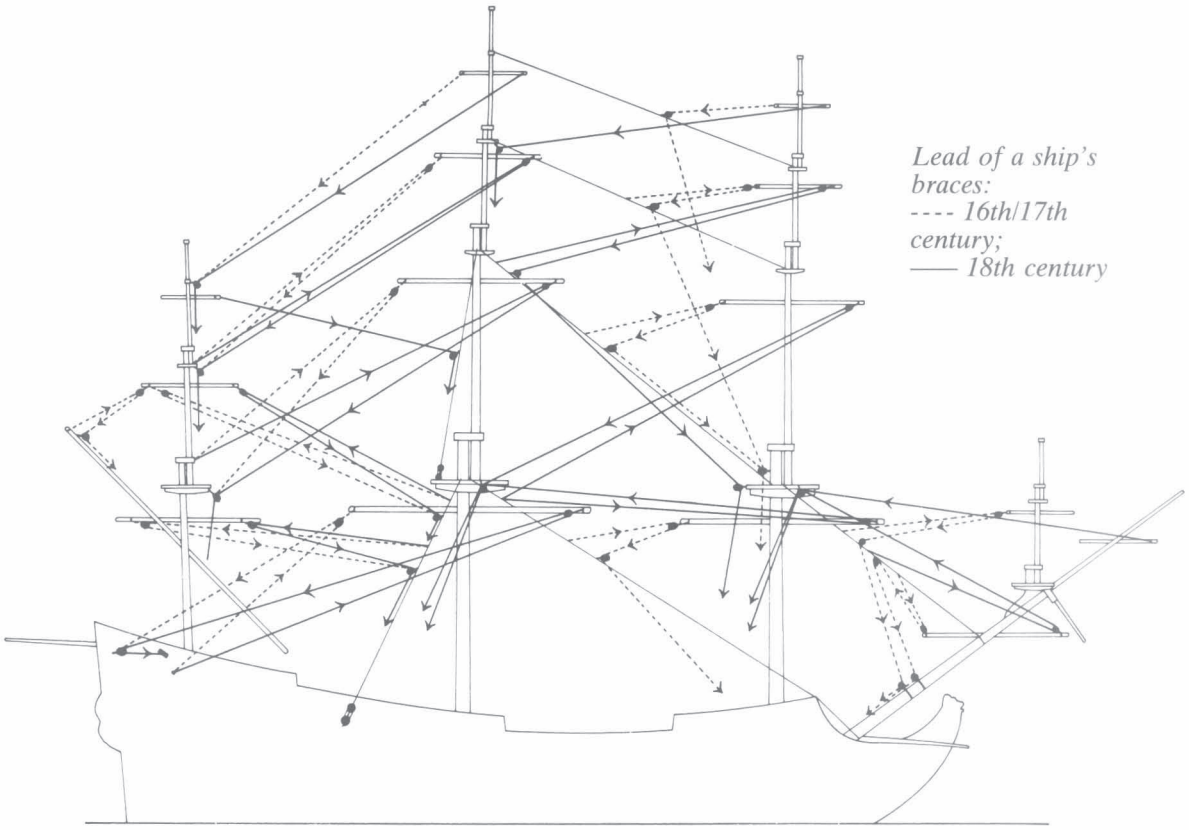
The lower yard arm:
1. Footrope; 2. Sheet block (Continental form); 3. Sheet block strop; 4. Lift; 5. Topsail sheet; 6. Brace block; 7. Brace block strop (before 1730 single brace); 8. Brace (after Vaisseau)



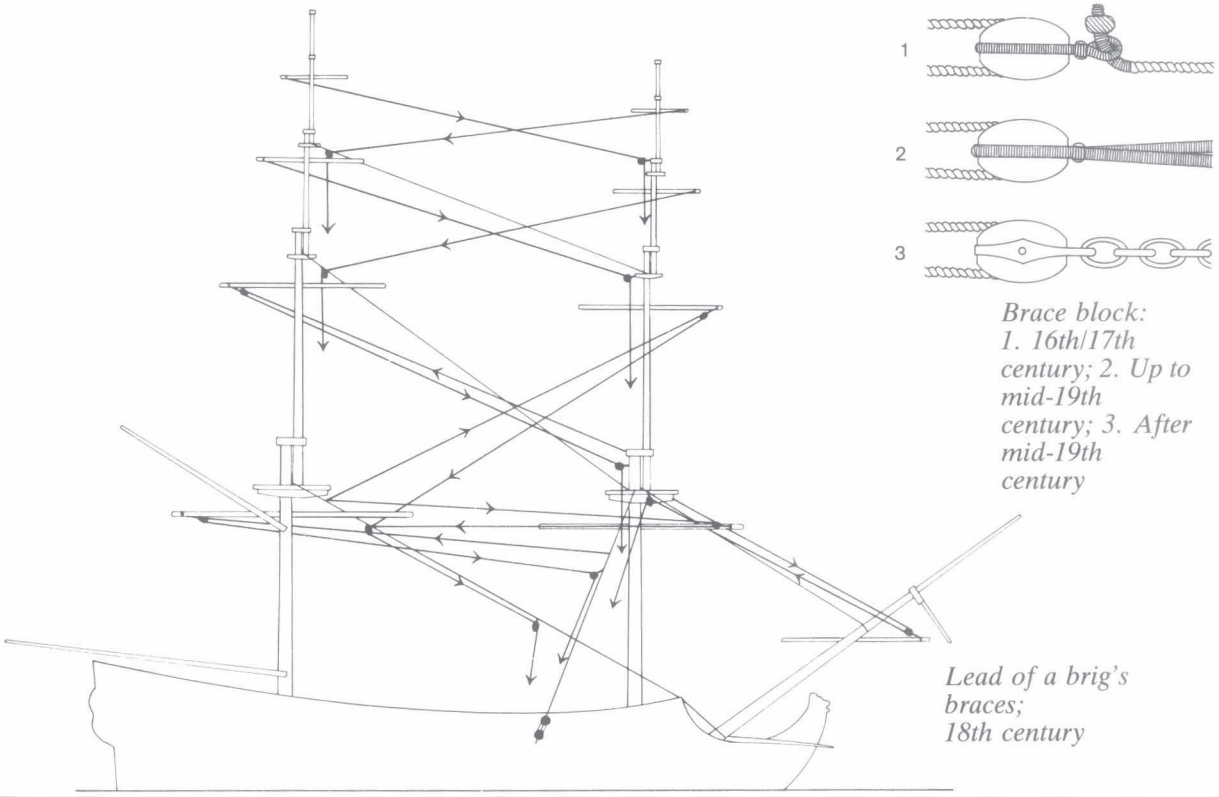
Spritsail braces

The braces were used to swing the yards laterally, and there is hardly any part of the rigging which has altered so little over a period of thousands of years. For smaller yards the braces were a rope with a seized or spliced eye secured to the yard arm, which was usually led down and aft to the deck.
On the larger yards a single block was stropped to the yard. This strop – the brace pendant – was very short in ancient times and in the early Middle Ages. From the 13th century the brace pendant grew longer and longer, until the 16th/17th centuries a length of about 4/10 of the yard length was reached. In the course of the 18th century it was shortened again, until around 1800 the block was situated immediately on the yard arm where it was shackled to a ring bolt in the 19th century.
The braces of the lower yards ran from a ring bolt on the ship's side, then reeved through the brace block, and usually belayed to a range cleat; on the Continent after 1500 it almost always belayed to a staghorn. This applied to all yards until the first half of the 16th century, then later to the main yard. The fore braces were attached to the mainstay after 1525, then reeved through the brace blocks and leading blocks on the main stay, and often belayed to small kevel blocks on the bulwarks until the early 18th century when they belayed to the main bitts.
The top, topgallant and royal braces followed a similar route to the lower braces, except that the topgallant braces were often single, and the royal braces almost always single, as the drawings on the right show. The crossjack braces were frequently attached to the last pair of main shrouds. The mizen and mizen topgallant braces were either taken to the main shrouds, or to the peak of the mizen lateen yard or the gaff, and from there again to the deck.
The spritsail braces followed a similar route to the foremast braces. They ran from the fore stay and were taken via leading blocks on the fore stay to a belaying pin on the bow rail of the forecastle, either directly, or via a further pair of leading blocks in the head.

The position of the yards
In some modelling books it is recommended to furl the lower sails and the spritsails to their yards, or at least to brail them up, and also to leave the staysails and studding sails out altogether, so that the deck superstructure and the rigging can be seen clearly; otherwise the sails would conceal too much detail. For the same reason many modellers prefer to leave off the sails altogether. There is good sense in this advice, but on the other hand much of the fine effect of a ship under full sail is lost if some of the sails are brailed up.
Now, there is a very simple and effective trick, by means of which all the sails – including the stay and studding sails – can be set, whilst still leaving the decks and rigging fully exposed; the trick is simply to swing the yards round to one side.
On a model with sails furled on the yard, or without sail altogether, the yards should always be at an angle of 90° to the ships' centreline. If you have set sails, this setting of the yards looks rather stolid and boring, and does not look very natural, since the wind would nearly always blow from one side or other to some extent. If you set the yards – and hence the sails – at 15° to a maximum of 35° from the ship's centreline, the effect is not only better visually, but you will also obtain a full and unobstructed view of the decks and rigging, at least from one side.



Lead of a ship's braces:
---- 16th/17th century;
—— 18th century

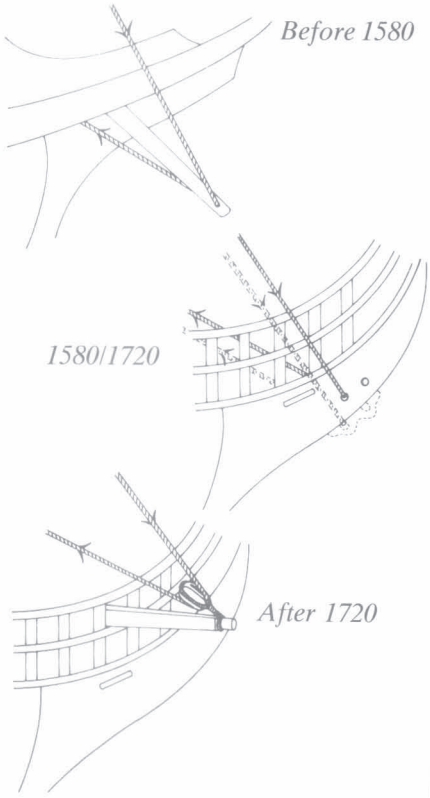


Lead of a brig's braces;
18th century

Brace block:
1. 16th/17th century; 2. Up to mid-19th century; 3. After mid-19th century

Sheets and tacks

Top: Topsail sheet and tack block in single strop
Bottom: Fiddle block



Lead of the fore tack

The course sheets
The sheets' task was to hold the leeward lower corners of the sails – the clews – against the wind pressure. From ancient times until the 19th century the method of guiding the course sheets remained the same. A single block was fixed to the clew. The sheet itself was fixed to a ring bolt on the outer side of the bulwarks, reeved through the sheet block, and ran directly inboard – or after the 15th century through a sheave in the bulwarks – where it belayed to a range cleat, or on the Continent from the early 16th century, to a staghorn.

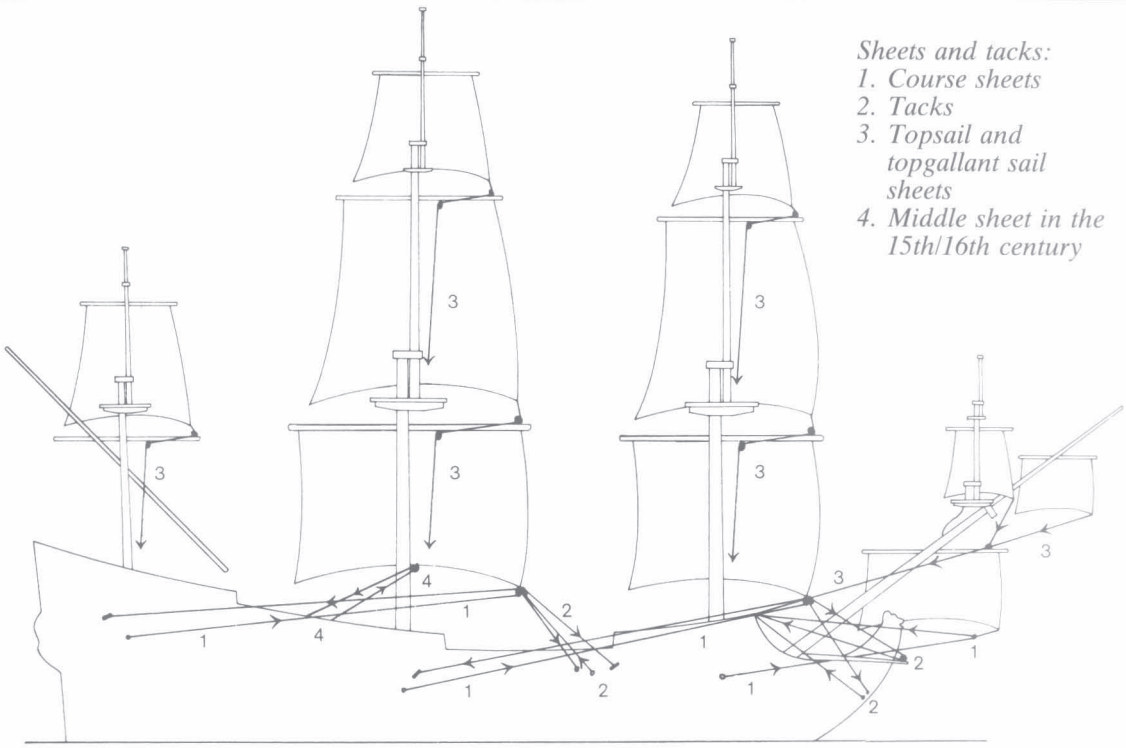
Multiple sheets
Until the late 10th century multiple sheets were used in Viking ships; they were spliced into the foot rope of the sail, and 8 to 12 rope ends hung down to the deck for the men to hold. The Stenkyrka figurestone, illustrated on the right, shows a clear example of this type of multiple sheet.

The middle sheets
After the middle of the 14th century a further sheet was fitted to the middle of the foot rope, and after the middle of the 15th century there were two of them, one on the foot rope of the mainsail, and one on the foot rope of the bonnet. The sharp vertical centrefold, which can be seen on the mainsails and sometimes on the foresails of ships between the middle of the 14th and the middle of the 16th century, was a result of these middle sheets, which disappeared again in the mid-16th century.

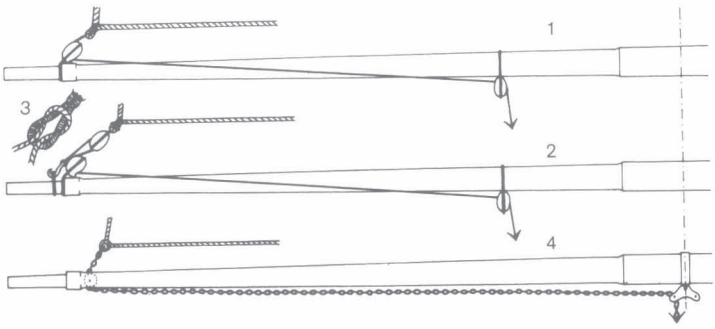
The topsail sheets
In the second half of the 15th and the early 16th century, when the topsails were still very small, the sheets as well as the braces were taken to the top and belayed there. Shortly after 1500 the topsail sheets were led to the lower yard arm via small blocks, and thence to the deck parallel to the braces.

The topgallant and royal sheets
In the middle of the 16th century the topsail sheet was fixed to the clew with a stopper knot (pictured opposite), reeved through a block at the yard arm situated below it, then ran to a leading block on the inner third of the yard, and finally down to the deck, where it reeved through a sheave in a kevel block, and belayed to its head. The topgallant and royal sail sheets followed a similar course to the topsail sheets, and belayed to the bitts.

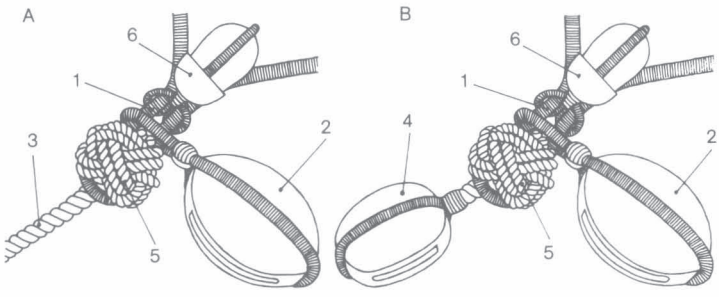
The tacks
Tacks were only used on the courses. Until the first half of the 18th century they were single ropes, which were attached to the clew with a stopper knot. The main tack reeved through the hole in the chesstree into the waist, and belayed on a range cleat. The fore tack ran through a square timber with two holes, fixed to the knee of the head until the beginning of the 17th century, around 1630 through a guide below the knee of the head, around 1650 through two holes in the knee of the head, and since the first half of the 18th century through a block on the outboard end of the bumkin. In the first half of the 18th century doubled tacks were fitted, reeved through a block fixed to the clew with a stopper knot. This was a Continental development, later adopted by the British.



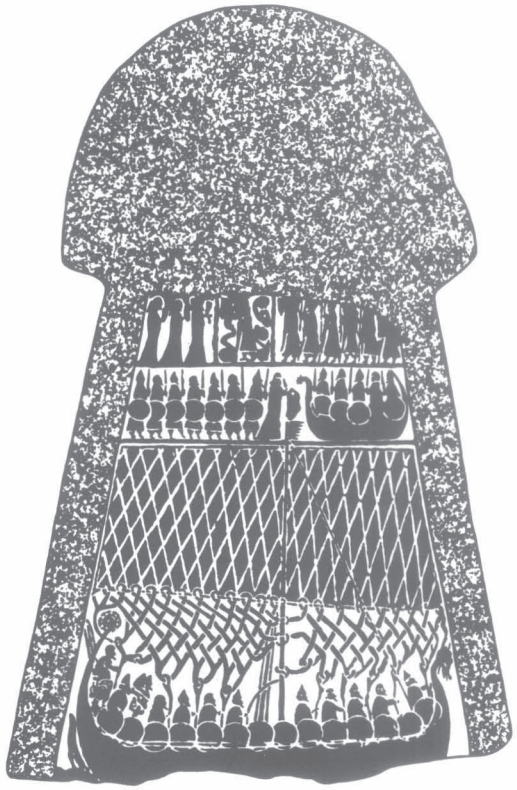
Sheets and tacks:
1. Course sheets
2. Tacks
3. Topsail and topgallant sail sheets
4. Middle sheet in the 15th/16th century



Topsail and topgallant sail sheet: 1. Single sheet; 2. Single sheet with tackle; 3. Clew; 4. Chain used after 1850



Clew of courses A. 14th/17th century; B. 18th/19th century; 1. Clew; 2. Sheet block; 3. Tack; 4. Tack block; 5. Stopper knot; 6. Clew line block

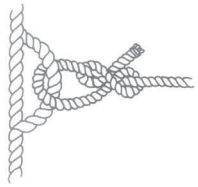


Multiple sheets of a Viking ship (Stenkyrka figurestone)

Clew lines

The clew lines (clew garnets on courses)
Clew lines have been used since the 14th century. The clew garnet and topsail clewlines were attached to the yards – ⅔ of the half-yard length plus 2ft from the middle of the yard – reeved through a block on the clew (see SHEETS), returned to a block on the yard – 2ft inside the attachment point – then reeved through a leading block at the top and through a shroud truck half-way up the shrouds, and belayed to a belaying pin. Topgallant clew lines – they were single ropes on smaller ships – were sometimes belayed in the top. Spritsail clew lines belayed to a cleat in the head before 1720, and later reeved through the gammon lashing or rack block and belayed to a timber head on the forecastle. The sprit topsail clew lines belayed in the sprit top before 1720, and after 1720 followed the same route as the spritsail clew lines. Clew-line blocks were almost always used for clew lines after 1670.

Leech lines and bunt lines



Leech line made off to cringle

First we have to differentiate between leech lines and bunt lines. Leech lines have been in use since the middle of the 15th century. They were attached to the leeches of the sail with martnets, and were always carried on both sides of the sail. After 1650 the leech lines were simplified, the various versions being shown in the drawings on the right. After 1720 simple leech lines of the British type were in general use.
Bunt lines were carried on the fore side of the sail only, and were attached to cringles in the foot rope. From the middle of the 16th century they were fitted to the courses, from the first half of the 17th century to the top sails, from the end of the 17th century to the topgallant sails. Before 1720 one pair was carried on the courses, and after 1720 two pairs on large ships; one pair was fitted on top sails, and often only a bunt line on the topgallant sails, attached with a thimble to a span between two foot cringles. The bunt lines ran below the top or to the stay collar via blocks, then down the shrouds through shroud trucks, and belayed to belaying pins. The spritsail possessed only bunt lines, often the same type as the topgallant bunt lines; the sprit topsail carried neither leech lines nor bunt lines.

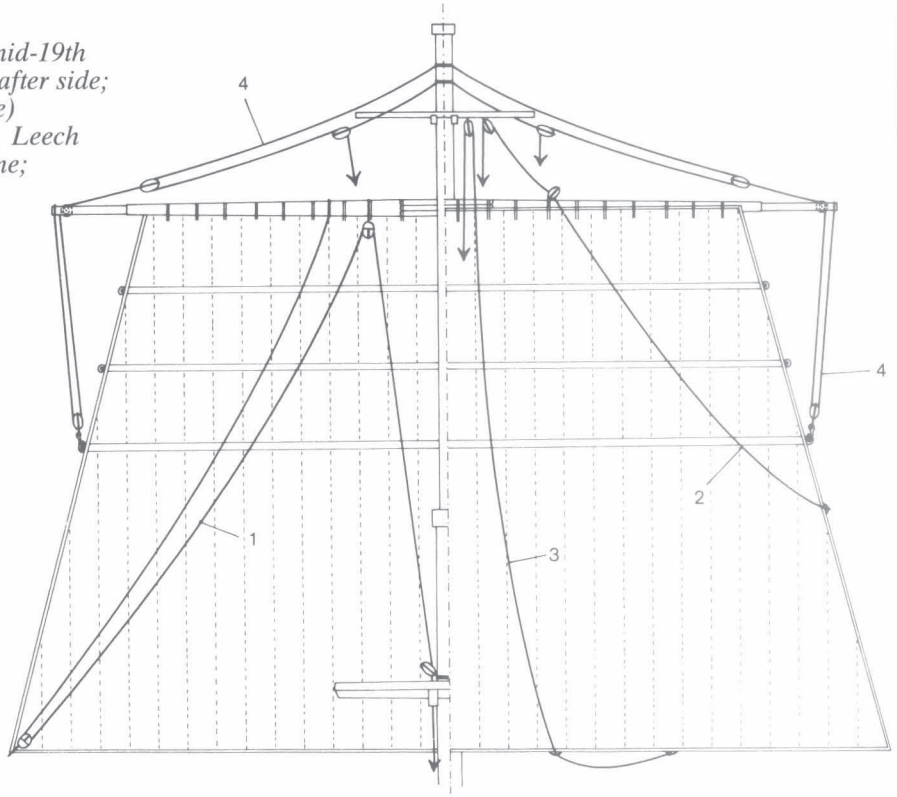
Reef tackles

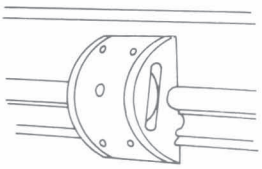
After the introduction of the reef on the topsails in the 17th century, reef tackles became necessary. They hooked into cringles in the leeches of the sail, reeved through a sheave in the yard arm, and ended in a tackle, which was stropped to the topmast head in Dutch ships, and in others to the parral ropes. The Dutch method became standard after 1710. The reef tackle belayed to the chain plate deadeyes in the top. Clew lines, leech lines, bunt lines and reef tackles are slack when the sails are set, that is, they just hang freely.

Yard tackles

From about 1685 the lower yards were fitted with yard tackles to augment the stay tackles.
A yard tackle consisted of a pendant, which was fixed to the yard arm, and which carried a long tackle block. The running part carried a hooked double block. When the ship was under sail, the yard tackle was hooked to the futtock shrouds and made up along the yard, as shown in the drawing on the right. Yard tackles were principally a feature of English ships; they were very seldom seen on Continental ships.

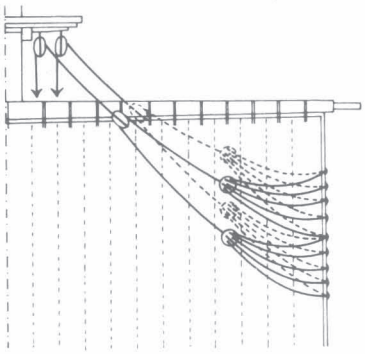
Sail – 18th to mid-19th century: (left – after side; right – fore side)
1. Clew line; 2. Leech line; 3. Bunt line; 4. Reef tackle



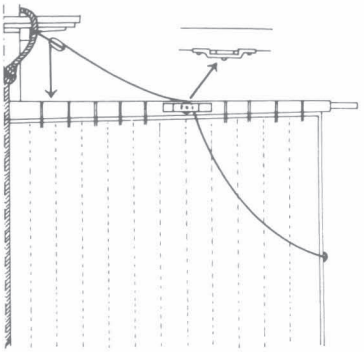


D-block on the bulwark for the lifts, 18th/19th century

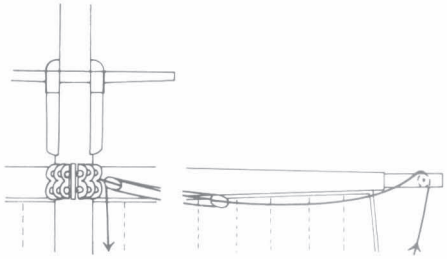
Leech lines, 15th/17th century



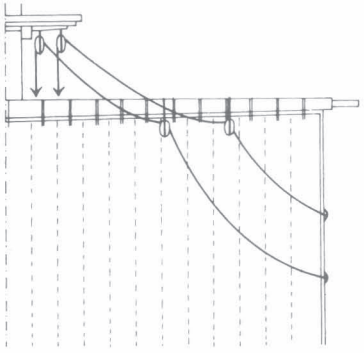
Martnets, 1450/1650



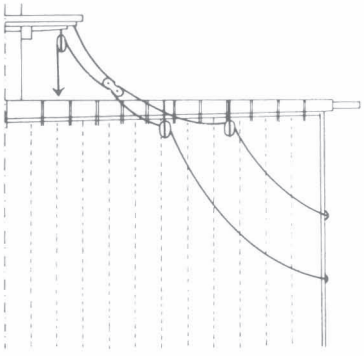
Continental 1640/1720



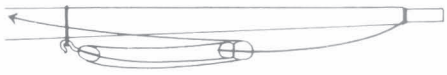
Reef tackle 1660 to 1710 except Holland (see above), whose method became standard at the beginning of the 18th century



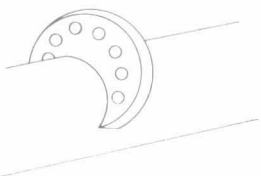
British 1640/1700



British 1670/1720

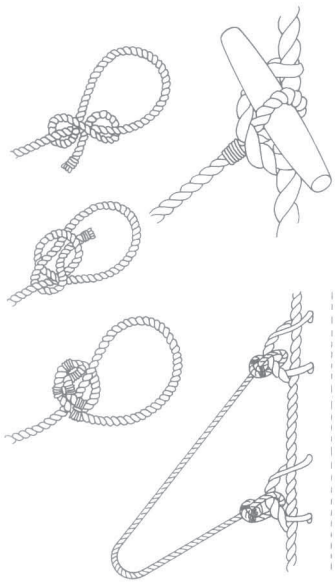


Yard tackle



Saddle fairlead on the bowsprit replacing the rack block

Bowlines



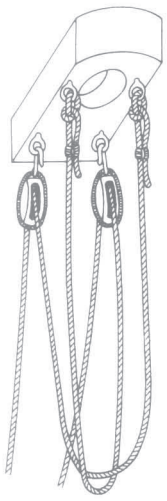
Hitches for bowline bridles

The purpose of the bowlines was to keep the weather leech well out when sailing close-hauled. Many ship historians have supposed that the ships of the ancient Greeks and Romans had bowlines, although they cannot prove it. Reliable evidence of their existence dates from the early 13th century.

The bearing out spar
Before bowlines were introduced the Viking ships and ships of the early Middle Ages carried bearing out spars in their ships. This was a wooden spar with a shoulder at its outboard end, which was plugged into a cringle in the leech rope. There were two wooden blocks with round depressions fixed inside the bulwarks, and level with the mast; the lower end of the spar was stepped in these, and by this means the sail was spread forward.

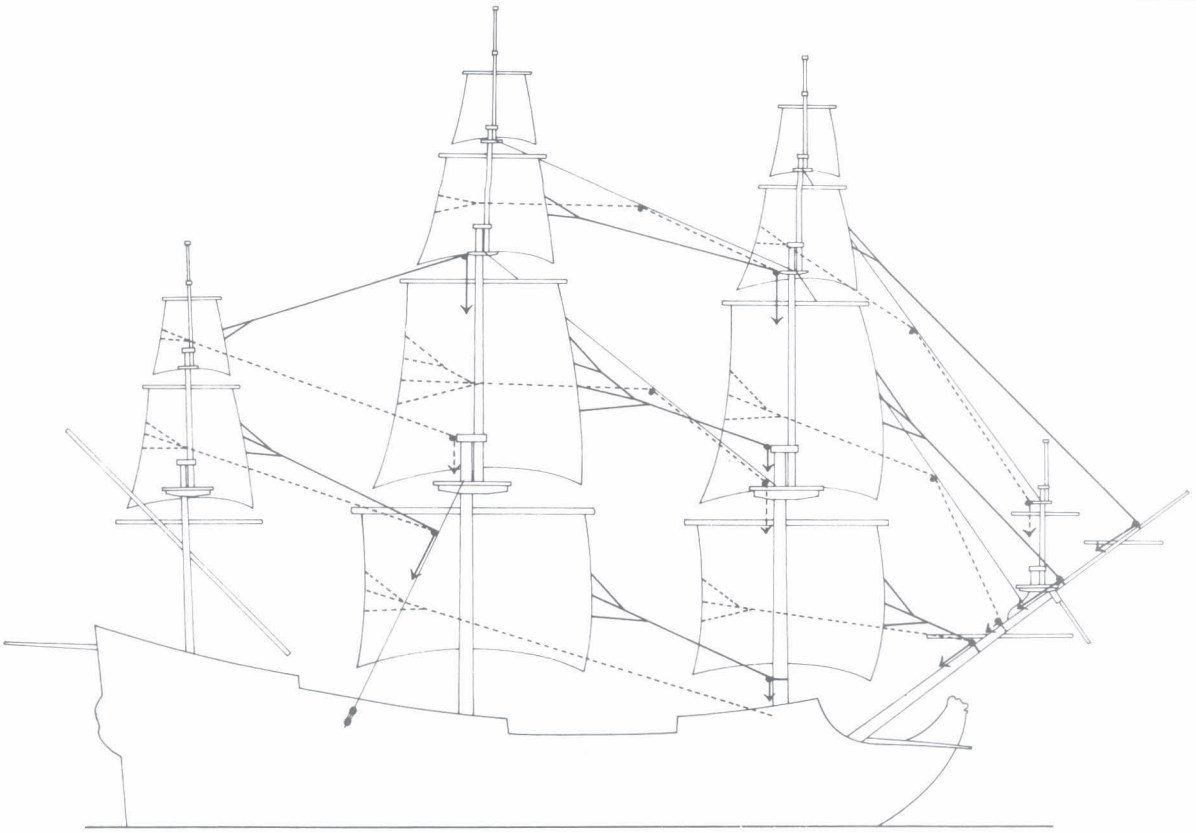
Bowlines
The run of the bowlines is usually shown clearly on the rigging plans. The bowline bridles were hitched to the cringles of the leech ropes – toggled after 1819. Until the late 15th century the bowlines were attached to the leech of the sail with two or at most three bridles.In the 16th century the number of bowline bridles increased dramatically in some areas, while in the early 17th century the number was reduced again as follows: courses three bridles, or if a bonnet was fitted, four bridles, the lowest of which was attached to the bonnet; fore topsail three or four bridles, main topsail four bridles, mizen topsail two or three bridles, topgallant sails two bridles. The bridles were joined together by means of spliced eyes, thimbles, or – more rarely – small blocks.
In the second half of the 19th century the bowlines disappeared.

Top rope

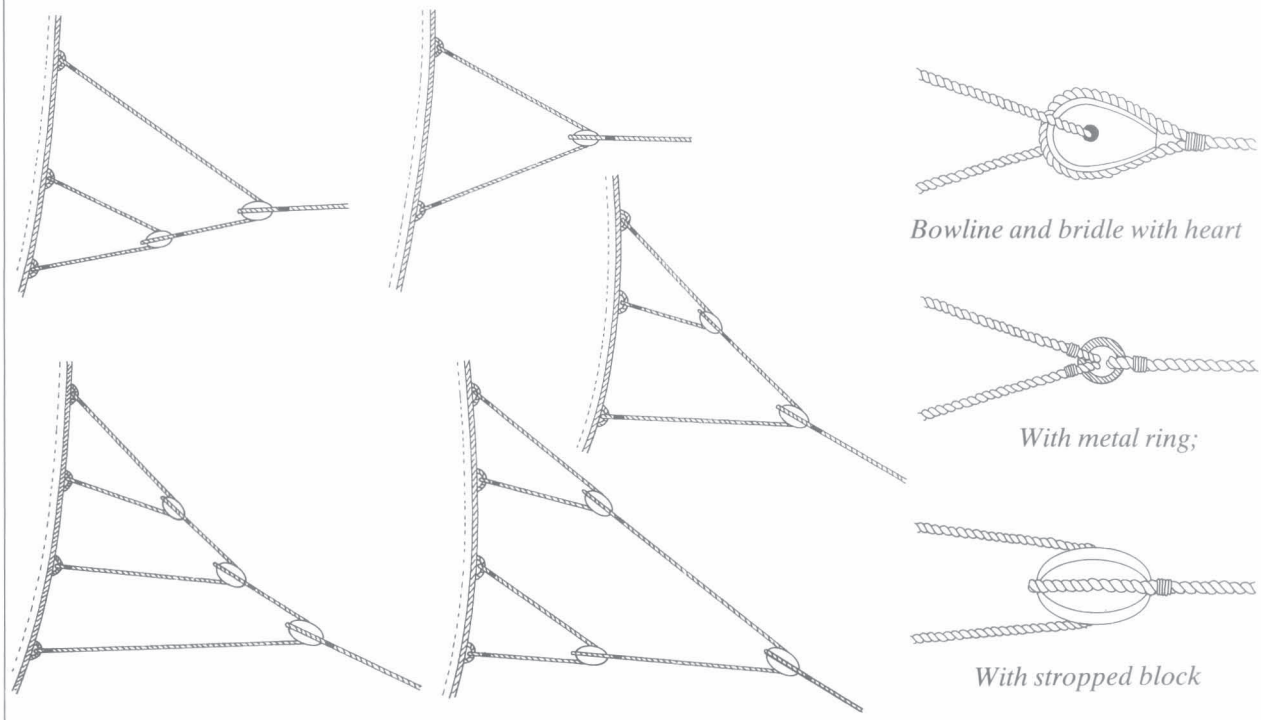


Top rope

The top rope was used to hoist and lower the topmasts. It was hooked under the underside of the cap, reeved through the sheave at the foot of the topmast, up through a block, which was hooked to the cap, and down to the deck. On a model the top rope can be omitted, as it was only used when sending up or striking the topmast, and was only rigged at those times. The only traces to be seen are two or four ringbolts on the underside of the cap.



Bowlines: Top, run of bowlines —— 16th/17th ---- 18th century

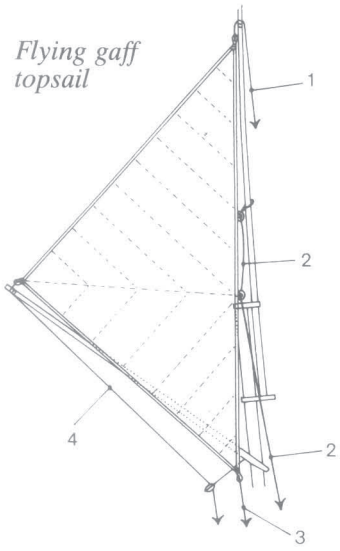


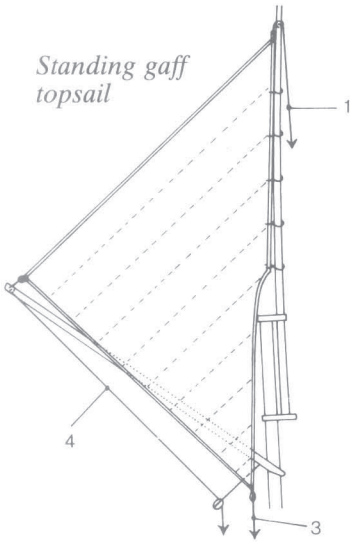
Bowline and bridle with heart

With metal ring;

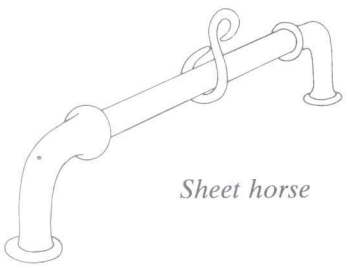
With stropped block

Gaff sails





Gaff topsail: 1. Halyard; 2. Down haul; 3. Tack; 4. Sheet;



In the first half of the 18th century gaff sails superseded mizen lateen sails. Initially they were still carried on lateen yards, then after the middle of the 18th century on the gaff proper in conjunction with a boom (driver), or without the boom (spanker). In the merchant service the name spanker was used for a mizen gaff sail with or without a boom. In the 19th century boomless gaff sails replaced staysails between the masts in the Royal Navy and were known as trysails. When fitted to merchant ships they were called spencers. After the late 18th century gaff topsails were also carried in many merchant ships on the mizen only.

The parral
The parrals for the gaff and driver boom were fitted with a series of trucks early on, but after the middle of the 19th century an iron goose neck was used (see GAFF and DRIVER BOOM).

The throat halyard
The throat halyard served to hoist the gaff. An upper block was suspended from the crosstrees, a lower one on a ring bolt in the gaff jaws. The two were joined by the throat halyard.

The peak halyard
The peak halyard assumed the job of lifts and set the correct angle of the gaff. There was a very wide variety of methods of attaching the peak halyard, as the drawings on the right show.

Vangs
The vangs served as braces to the gaff, and were rigged in a similar way.

The topping lift
The topping lift held the driver boom horizontal. It was attached to the cap, and there were various methods of rigging it.

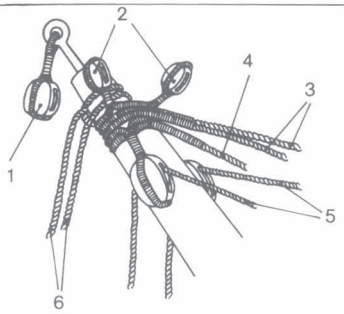
The sheet
The sheet was used to control the driver boom. The strop of its upper block was prevented from slipping by a thumb cleat. The lower block was often hooked to a transverse iron rod, known as the horse. In the case of spencers the sheet was also hooked or shackled to a horse.

The peak outhaul
A rope ran via a sheave on the peak of the gaff to the peak of the sail, and back to the mast; the sail was hoisted by this means.

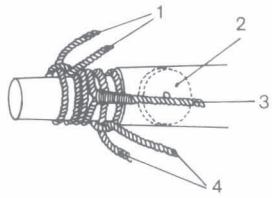
The downhaul
A further rope was fixed to the peak, which passed to the jaws and on to the base of the mast; by this means the sail could be hauled down when it was to be furled.

The foot outhaul
The outhaul ran via a block or a sheave on the end of the boom and ran directly inboard on small ships, or by means of a purchase on large ships, then belayed to a cleat.

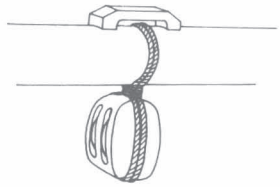
Brails
There were up to 5 brails, which were used to haul the sail to the mast when the sail was to be furled.



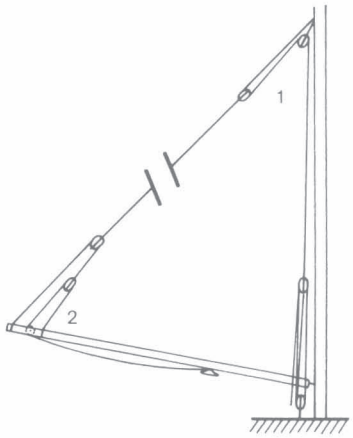
Gaff peak: 1. Signal halyard block; 2. Mizen topgallant braces; 3. Standing part of mizen braces; 4. Standing part of peak halyard; 5. Running part of mizen braces; 6. Vang pendants



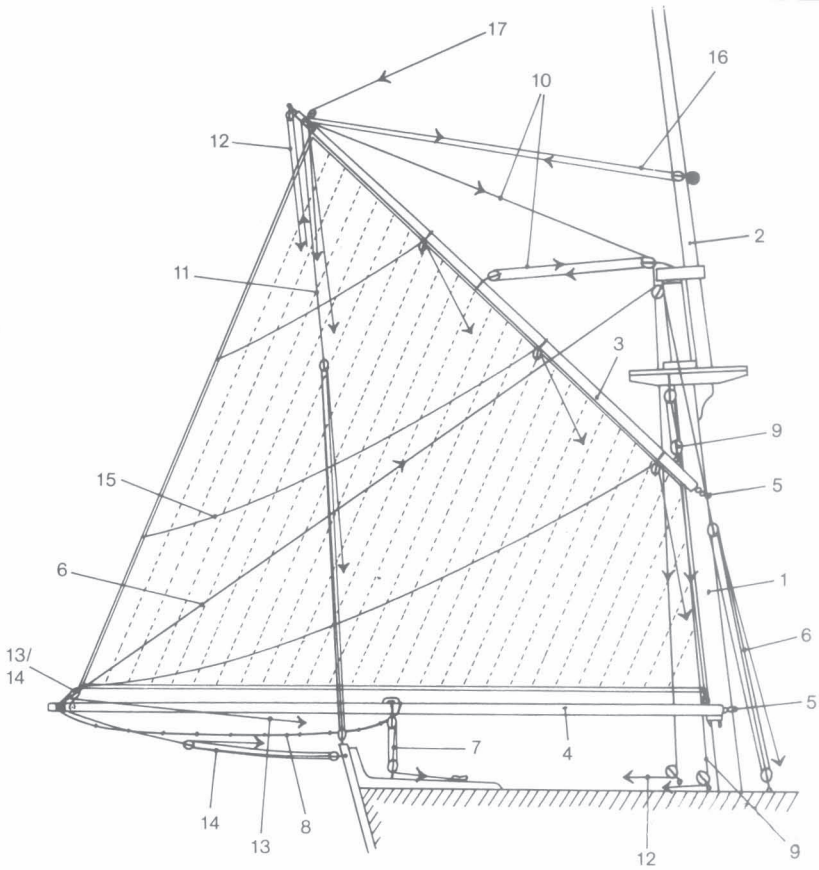
Driver boom end: 1. Topping lift; 2. Outhaul sheave; 3. Guy pendants; 4. Horse



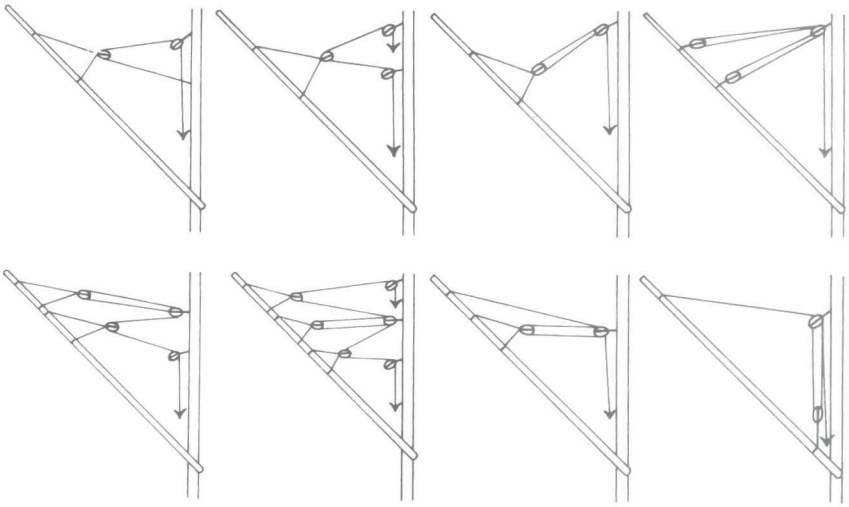
Comb cleat for retaining the upper sheet block



Alternative leads for the driver boom topping lift

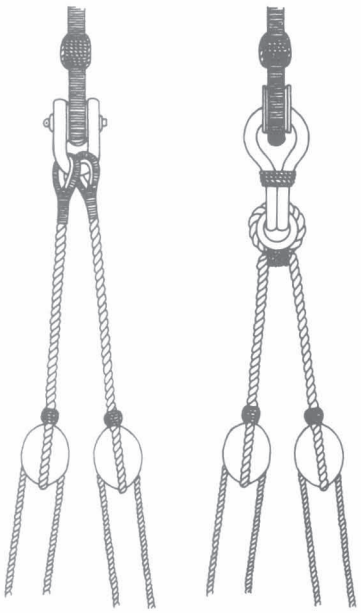


Driver: 1. Mizen mast; 2. Mizen topmast; 3. Gaff; 4. Driver boom; 5. Parral; 6. Topping lift; 7. Horse; 8. Sheet; 9. Throat halyard; 10. Peak halyard; 11. Vangs; 12. Signal halyard; 13. Outhaul; 14. Guys; 15. Brails; 16. Mizen topsail yard braces; 17. Mizen topgallant yard braces



Alternative leads for the peak halyard

Staysails



Methods of attaching the sheets to the clew, second half of the 19th century, using iron shackles or hook and thimble

Since their introduction on large ships in the second half of the 17th century the rigging of the staysails changed little. We have to differentiate between fixed staysails, which were bent to a stay, and jibs set flying, which were not.

The Staysail stay
As already described under STAYS, the staysails in the 17th and early 18th centuries were bent to false stays, which were removed when the staysails were furled.

The halyard
The halyard reeved through two single blocks, the upper of which was fixed to the mast or the crosstrees, the lower seized or hooked to the head of the sail. The halyard ran down to the deck, and was set up with a tackle in the case of large staysails.

The tack
The tack was a rope spliced into the tack cringle to secure the bottom of the staysail.

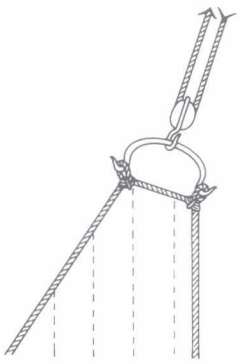
The sheet
Staysails featured double sheets with a block spliced in each end. The lee sheet was hauled taut, and the weather sheet hung loosely over the next stay.

The downhaul
On fixed staysails the downhaul was attached to the head – on large sails it sometimes ran on to the clew – and was used for hauling the sails down, when they were being furled Sails set flying had no downhaul.

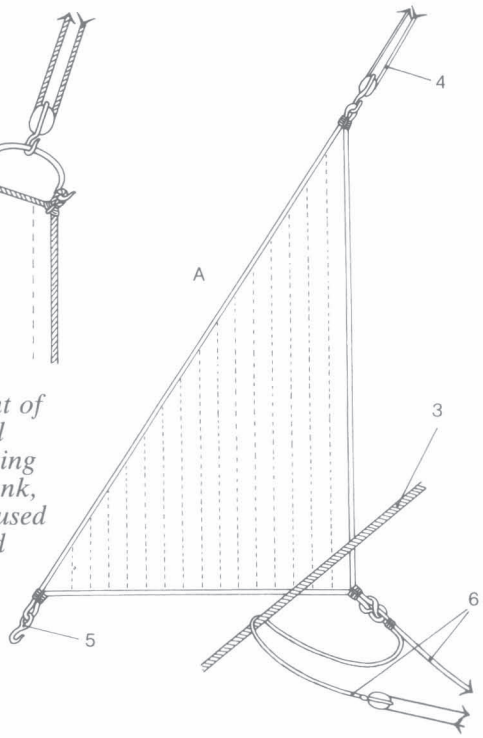
The brails
Four-sided staysails carried a brail on both sides of the sail, which were used to haul the canvas to the mast when the sails were being furled.

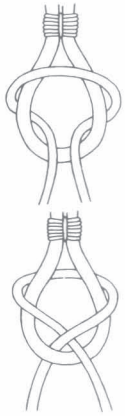
Staysail rope sizes

Sail	False Stay	Halyard	Tack	Sheet	Down-haul	Brail
Outer jib	30%	15%	16%	28%	10%	
Inner jib	26%	15%	16%	26%	10%	
Fore topmast staysail	22%	21%	18%	23%	10%	
Main staysail	25%	20%	18%	22%	10%	10%
Main topmast staysail	25%	20%	18%	20%	10%	10%
Middle staysail	24%	16%	18%	16%	10%	10%
Main topgallant staysail	20%	12%	16%	12%	10%	10%
Mizen staysail	25%	15%	18%	15%	10%	10%
Mizen topmast staysail	20%	12%	16%	12%	10%	10%



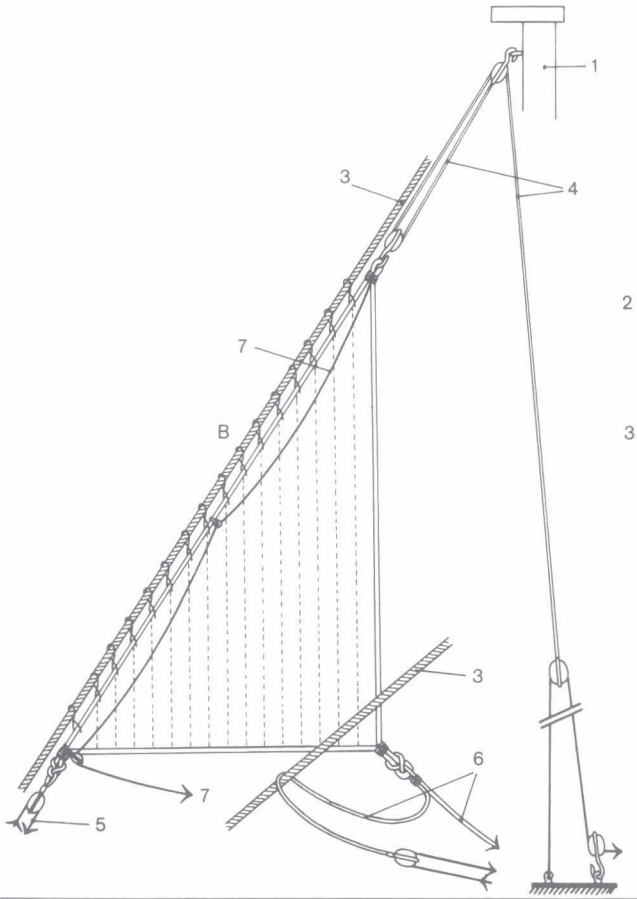
Attachment of the staysail halyard using an iron hank, as widely used in Holland

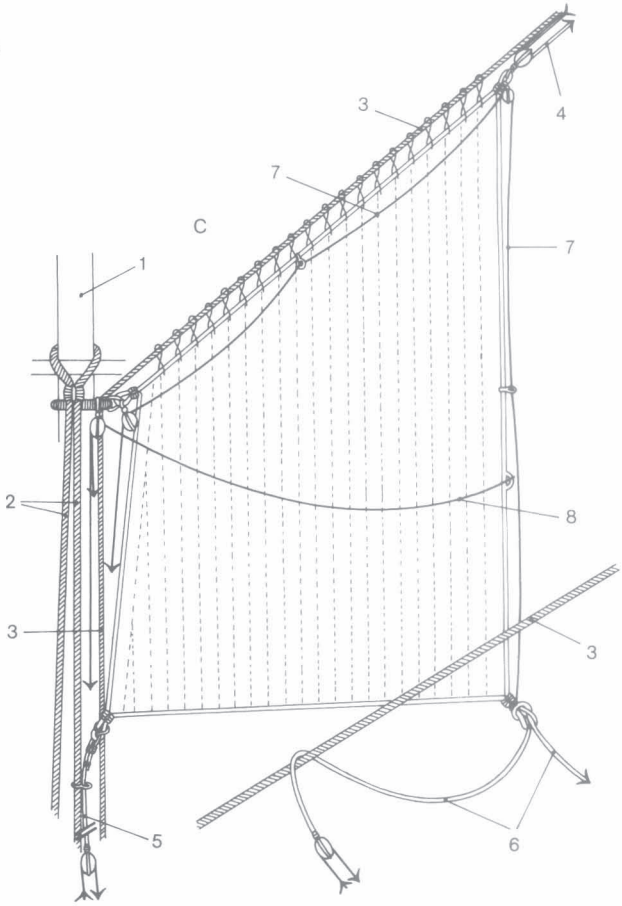




Bending the staysail sheets to the clew

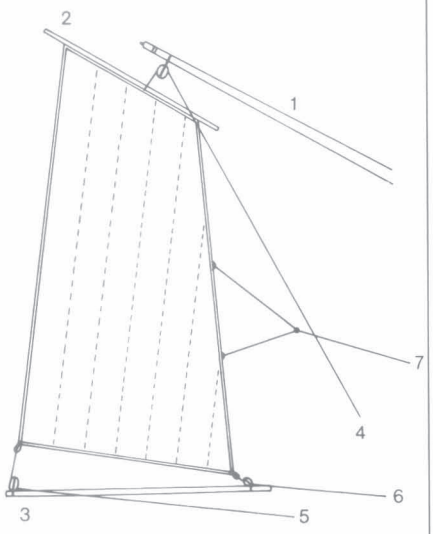
Strop for topgallant stay and fore topgallant bowlines with three jib boom travellers



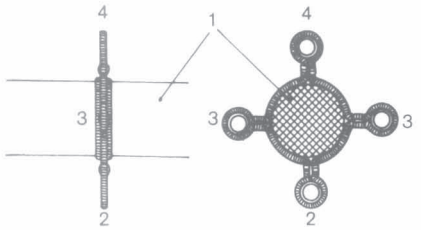


Staysails: A. Flying jib sail; B. Stay sail; C. Four sided stay sail;
1. Mast; 2. Shrouds; 3. Stays; 4. Halyard; 5. Tack; 6. Double sheets; 7. Downhaul; 8. Brail

Studding sails



Ring tail or driver:
1. Gaff; 2. Ringtail or driver yard;
3. Ringtail or driver boom;
4. Halyard; 5. Outhaul; 6. Tack;
7. Bowline



Studding sail boom strop:
1. Studding sail boom; 2. Thimble for martingale; 3. Thimble for guys; 4. Thimble for topping lift

The studding sails were used to increase the sail area when the wind was light and following. With the exception of the yard lashing, all of the studding sail gear was rigged when the studding sails were set; when they were unbent, the entire gear was sent down.

The spar and boom rigging
The studding sail booms were normally fixed to the yard with a lashing at their inboard end. The topmast studding sail boom was often fitted with a small additional brace on the Continent and the topmast studding sail tack was sometimes arranged that it also served as lift to the topmast studding sail boom on the Continent. The studding sail boom was held upwards by a lift, downwards with the martingale, and supported laterally by guys.

Studding sail yards and halyards
The studding sails were always bent on their own small yards. The lower studding sails up to about 1750 carried yards the full width of the sail, and after that time the yards were half the sail width, and the inner earing was hoisted with an inner halyard.
If no studding sail boom was carried, the lower studding sail was fitted with a lower yard of half sail width, and was set flying, with a tack which was attached to the lower yard with three bridles. The halyards of the studding sail yards were single, and reeved through blocks on the yard arms or the booms to leading blocks on the mast and down to the deck.

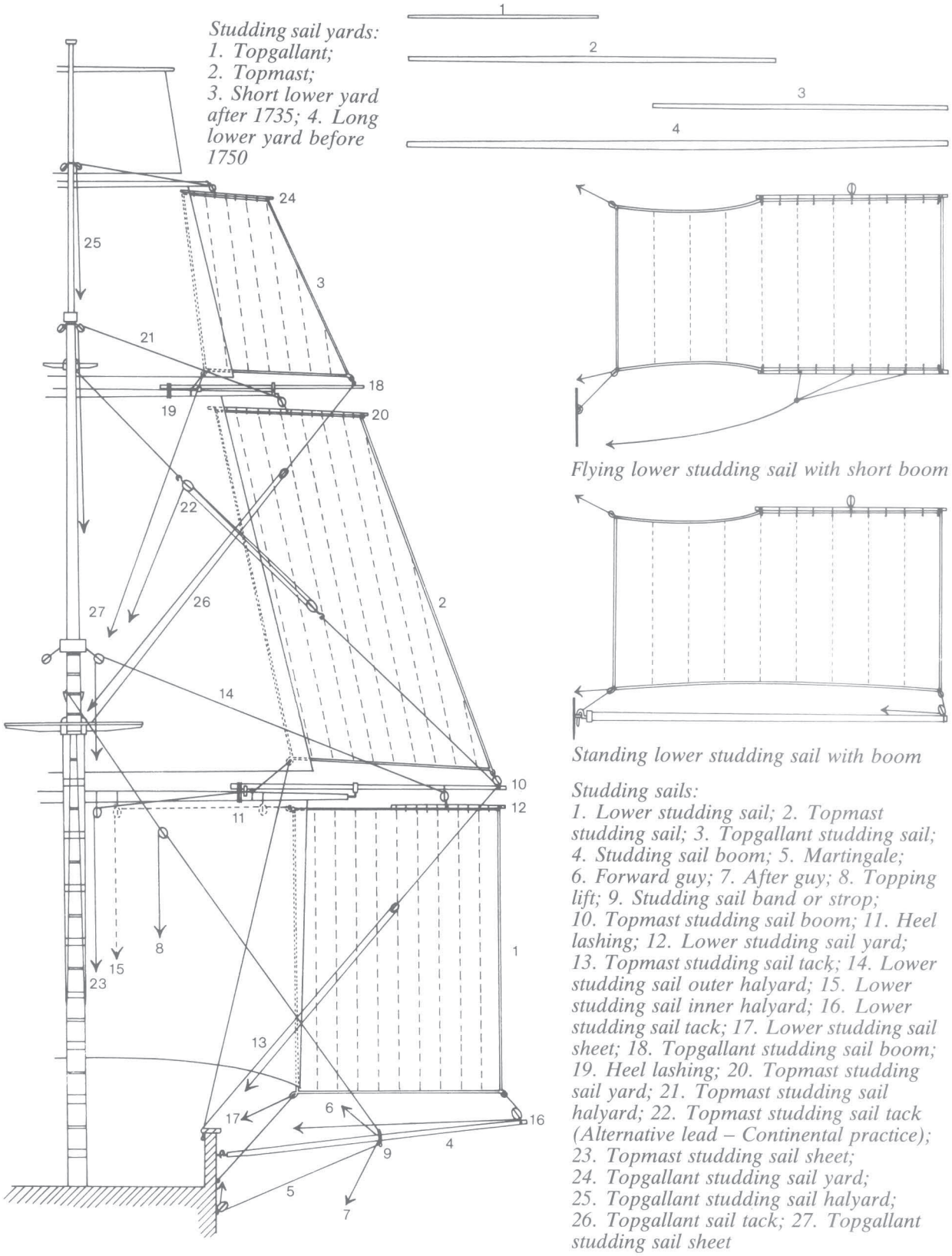
The tacks
Blocks were stropped at the outer ends of the booms, through which the tacks reeved; they were usually set up with a single whip, the fall of which ran down to the deck.

The sheets
On the mast side the studding sails were tensioned with double sheets which were belayed to the rail or the yard. They were usually bent to the clew of the sail without a block, and ran down to the deck via leading blocks.

The early 18th century driver
The original driver was a form of spanker studding sail and was similarly rigged. As well as the halyard, sheet and tack, it also carried a bowline on the leech. It was displaced in the late 18th century by the boom driver. Merchant ships in the late 19th century sometimes carried a similar sail outboard of the spanker, usually called a ringtail.

Studding sails, rope sizes

Rope	Studding sail boom	Topmast studding sail boom	Lower studding sail	Topmast studding sail	Topgallant studding sail
Martingale	22%				
Forward guy	20%				
After guy	20%				
Lift	20%				
Brace		10%			
Outer halyard			20%	18%	12%
Inner halyard			18%		
Tack			18%	15%	10%
Sheet			18%	15%	10%



Studding sail yards: 1. Topgallant; 2. Topmast; 3. Short lower yard after 1735; 4. Long lower yard before 1750

Flying lower studding sail with short boom

Standing lower studding sail with boom

Studding sails: 1. Lower studding sail; 2. Topmast studding sail; 3. Topgallant studding sail; 4. Studding sail boom; 5. Martingale; 6. Forward guy; 7. After guy; 8. Topping lift; 9. Studding sail band or strop; 10. Topmast studding sail boom; 11. Heel lashing; 12. Lower studding sail yard; 13. Topmast studding sail tack; 14. Lower studding sail outer halyard; 15. Lower studding sail inner halyard; 16. Lower studding sail tack; 17. Lower studding sail sheet; 18. Topgallant studding sail boom; 19. Heel lashing; 20. Topmast studding sail yard; 21. Topmast studding sail halyard; 22. Topmast studding sail tack (Alternative lead – Continental practice); 23. Topmast studding sail sheet; 24. Topgallant studding sail yard; 25. Topgallant studding sail halyard; 26. Topgallant sail tack; 27. Topgallant studding sail sheet

Furled sails

If you wish to show your sails furled loosely on the yard, by this stage you should have prepared them as described under FURLED SAILS in the chapter SAILS, and fitted them with all the appropriate ropework. The sheets and tacks are now left loose, and the sail is pulled up to the yard using clew lines, the leech lines and the bunt lines, so that they hang like a floppy bolster below the yard. A good example of this type is the model of the English galleon on page 23, and the French armoured frigate *La Gloire* on page 211.

If you do intend showing the sails completely furled on the yards, it is often advisable to fix the ropes (clew lines, leech lines, bunt lines and reef tackles) to the front of the yard, and to make the sails from de-laminated paper handkerchiefs or Japanese tissue.

Please note that up to the middle of the 19th century the sail was never furled in an even thickness along the yard; it was fairly thin towards the yard arms and was gathered up to a thick bundle in the bunt. In the latter part of the 19th century sails were clewed up to the yard arms instead of the bunt and the furled canvas was more evenly spread along the yard.

In many cases a bunt gasket was used for this, which was attached to larboard and starboard of the yard with two lines, and with a centre line reeved through a block on the top or the cap; the bunt of the sail was gathered up in the middle and held fast.

The furled sails are held in place on the yard with the gaskets, which are wound several times round the sail and the yard, and then knotted.

Take care that the furled sail is the right thickness: neither too fat and bulging, nor too thin and mean-looking. The French armoured corvette *La Jeanne d'Arc* represents a particularly fine and successful example of sails furled on the yards – that is just how they should look!

Yards without sails

If the modeller decides to omit the sails from his model, he often does not quite know what to do with the various ropes which otherwise would be attached to the sails; you will sometimes see quite outlandish solutions to this problem.

Here are the general rules:

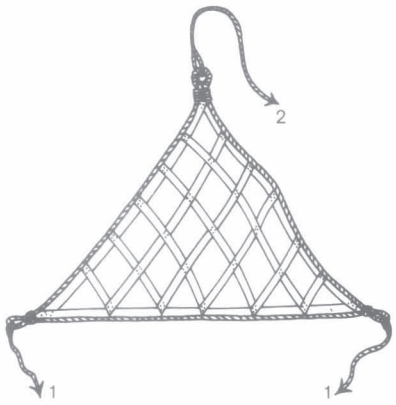
The stopper knot of the tack is passed through the stropped eye of the clew-line block, which would otherwise be fixed to the clew of the lower sail; the strop of the sheet block is then fitted over it. The whole combination is pulled up to the yard, with the lower and upper clew-line block retaining about one block's length between them.

The clew-lines and sheets of the topsails, topgallants and royals are arranged in a similar way.

The leech and bunt lines are fitted with stopper knots and pulled up on their yards as far as their leading blocks, so that the stropper knots are always located outboard of the block.

The bowlines are made fast to the yard, distributed along it at the same spacing as they would have with sails set. Take care here. When sails were furled or unbent, the yards were always set at right-angles to the centre line, i.e. parallel to the midships frame.

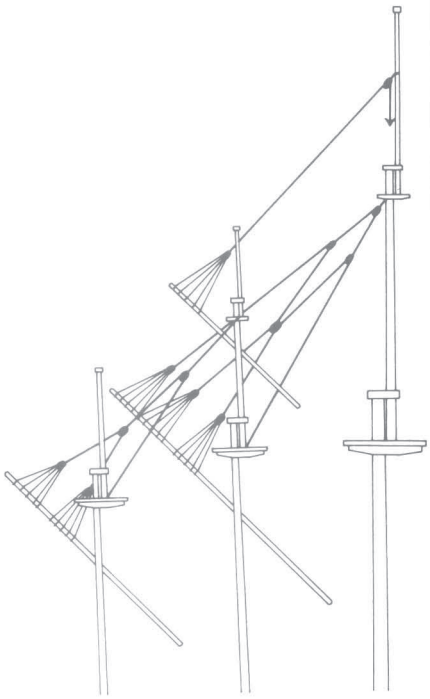
Be sure to locate the yards correctly (see LIFTS).



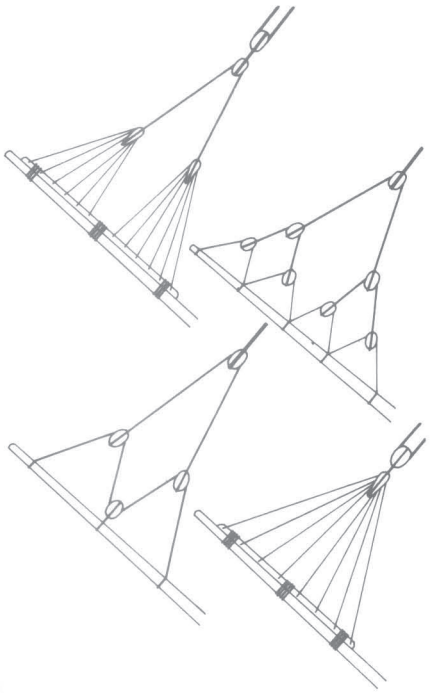
Bunt gasket for furling the sails:
1. Sennet for securing gasket to the yard (behind the sail);
2. Sennet for securing gasket to mast

French armoured corvette La Jeanne d'Arc *of 1867*
The sails furled on the yards are very finely modelled here.

Lateen sails



Mizen lifts, 16th century



Mizen lifts, 16th/17th century

First we have to differentiate between the lateen sails of the Mediterranean which were often the only sails rigged, and the mizen lateen sails of ships which were otherwise square-rigged.

The Parral
The parral was fitted with two rows of trucks, and on square-rigged ships with ribs also; ribs were not used in the Mediterranean. It was not attached directly to the yard, but instead enclosed the halyard. If it reeved through a block, then it ended in a purchase at the foot of the mast; if it reeved through a two-hole deadeye, the purchase was in many cases belayed to the yard.

The jeers
In the Mediterranean the jeers generally reeved through a sheave at the masthead. On square-rigged ships the jeers frequently reeved through blocks, which were attached to the crosstrees. The jeers were attached to a halyard, which reeved through blocks or through a kevel block.

The lift
The lift was only carried on square-rigged ships. It was attached to the peak of the yard with a more or less complex arrangement of crowsfeet, ran to the mizen topmast and/or the mainmast, and ended at the deck with a purchase.

The toggles
Almost all ropes, including the shrouds, were fitted with toggles in the Mediterranean, which facilitated rapid connection and disconnection of the ropes.

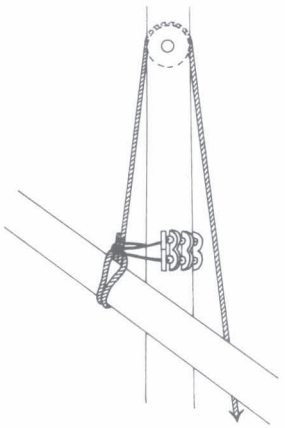
The tack tackles
The two tack tackles braced round the foot. On square-rigged ships they were attached to the aftermost main shrouds, and in the Mediterranean to the bulwarks. They reeved through blocks at the foot of the yard and belayed to belaying pins or cleats. In the Mediterranean a third tack tackle was often fitted in the centre.

The vangs
In the Mediterranean a pair of vangs was fixed to the upper third of the gaff, which were intended to prevent it bending, as they were often very long. In this case the weather vang was set up taut, and the lee vang left slack.

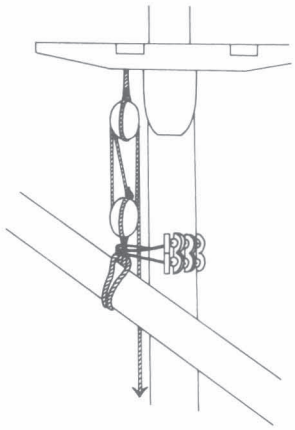
The sheet
Lateen sails were only fitted with one sheet. Its lower block was fixed to the ensign staff knee, to a ring bolt on deck, or to the outrigger while the sheet itself was belayed to a cleat.

The leech lines
The widest imaginable variety of leech lines was carried, sometimes in addition to brails, as shown in the drawings on the right.

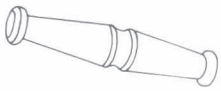
The tack
If a bonnet was carried (never in the Mediterranean!) its forward end was held by a tack, similar in form to the sheet.



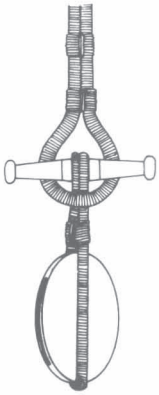
Halyard: reeved through a sheave in the masthead (used exclusively in the Mediterranean)



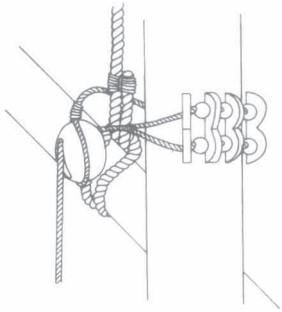
Halyard: suspended from the top with a tackle (never used in the Mediterranean)



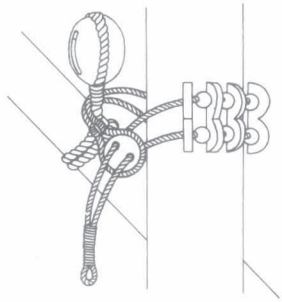
Toggle



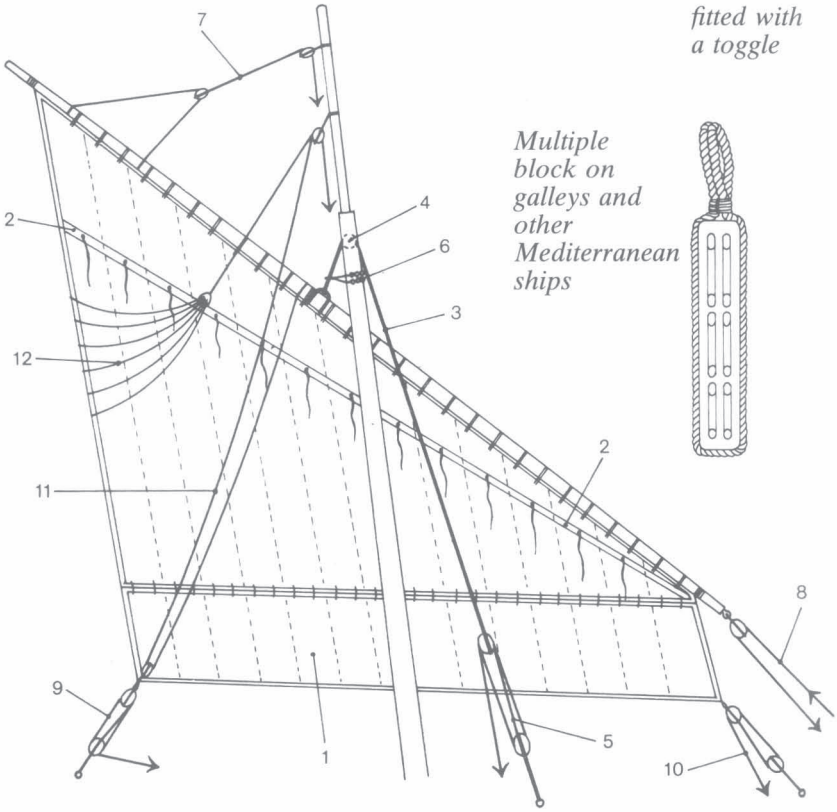
Block fitted with a toggle



Parral with block

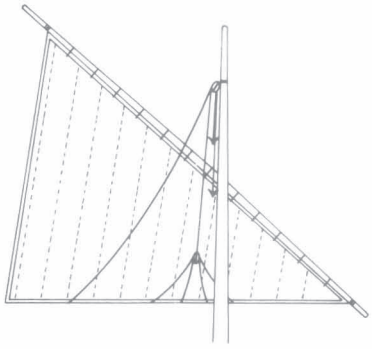


Parral with deadeye

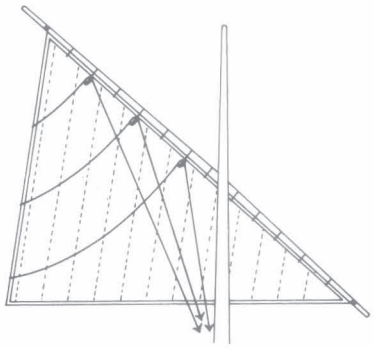


Lateen sail with 1. Bonnet (never in the Mediterranean) or 2. Reef points (always angled, never parallel to the foot); 3. Jeers; 4. Jeers sheave; 5. Halyard tackle; 6. Parral; 7. Lift (never in the Mediterranean); 8. Tack tackle (2 off); 9. Sheet; 10. Tack (only in conjunction with a bonnet); 11. Clew line; 12. Martnet

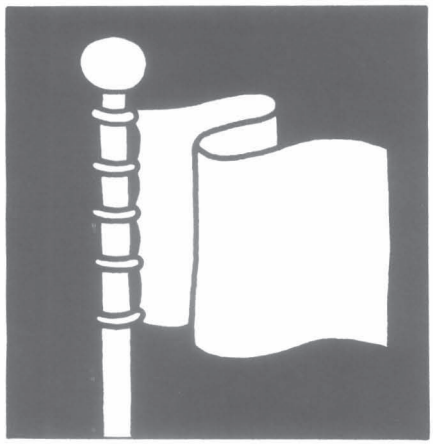
Multiple block on galleys and other Mediterranean ships



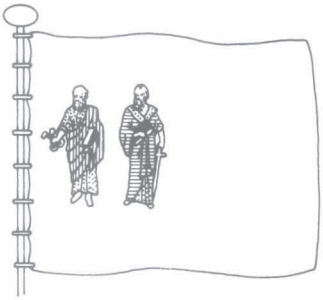
Brails



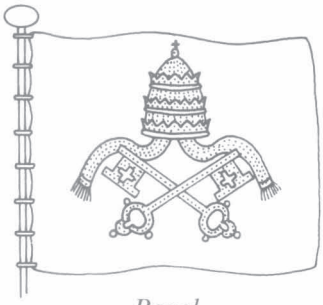
Foot brails



Flags



Papal



Papal

Flags, banners, ensigns, pennants, standards – all seafaring nations made a minor religion of these things. The model builder should also take the trouble to fit the appropriate flags and pennants to his model to finish the job off and add the splashes of colour which set the whole model off. We have to differentiate between the following:

Flags: Rectangular in shape, they were flown at the masthead. The main mast usually carried a command flag, while the fore and mizen masts flew command, regional, squadron or shipping company flags. These flags were attached with rope or metal hanks, although in some cases they were nailed up. In the 17th century signal halyards came into use, which enabled the flags to be hoisted and lowered. The sprit topmast, or later the jack staff, usually carried a state flag.

Ensigns: Also rectangular and generally worn at the stern. They were usually the state flags. Until the middle of the 18th century they were carried on large ensign staffs on the taffarel at all times, and then after the introduction of the driver boom were flown from the peak of the gaff when at sea.

Standards: This was the term for the personal or corporate flag which was often used until the 16th century, and even later on galleys. (Royal, Presidential and other standards are still in use today).

Burgees: These were long pennants, usually with a bifurcated fly. They were attached to a batten which in turn was hung on the mast head or on the yards by a thin line. Burgees were extremely popular on sailing ships from the late 15th to the beginning of the 18th century.

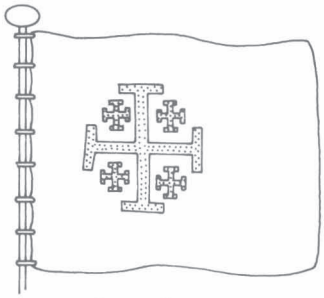
Pennants: There were three versions:

1. Short, narrow, rectangular strips of cloth. They were sometimes carried on the mizen mast instead of a flag.
2. Long, narrow and tapering, with a batten sewn into the hoist (the side nearest the mast); bent to the halyard with a 2 or 3 legged span. Warships of all the major seafaring nations, not wearing a command flag, had a commissioning pennant of this form at the mast head.
3. Long, narrow and tapering, but without a batten. They were then fitted to the flag pole or halyard. Frequently used after the mid 18th century as signal flags, in conjunction with rectangular flags. Burgees and pennants could reach considerable lengths, in some cases as long as the whole mast.

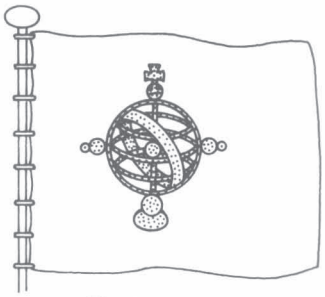
Standards and banners: Strictly speaking, these are not part of a ship's flag equipment. In the 16th century they were extremely popular. They were fitted on their own banner staffs, and then lashed to the rail to provide additional decoration.

The modeller should heed the following points in respect of flags:

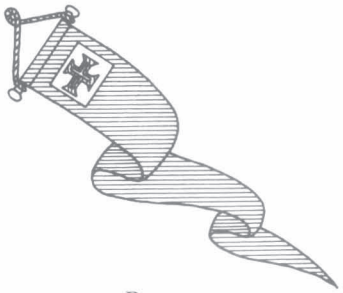
1. Choice of flags. They must, of course, be strictly correct in historical terms, in respect of their appearance and also their size and location. This is sometimes by no means easy. The appearance of the flags, e.g. in Great Britain, often altered several times over a short period; there are few reliable reference books available on this subject, and plans are also not always accurate. The safest source for the appearance of the flags is contemporary paintings and engravings.
2. Materials and fabrication. The flags are best made, like the sails, from cotton cambric (very thin silk or Japanese tissue are also possibilities). Tempera or water colour paints are used to colour in the coats of arms etc. Flags should never stand stiff and straight, but always have a slight natural wavy shape. As the material is too stiff to fold up in the right way by itself, the flags have to be moulded before fitting. Creases are avoided by rolling the flags over a pencil.
3. Arrangement. On sailing ships all the flags stream down wind, and in practice this means the direction in which the sails are swelling. If your model has no sails, the flags should be arranged aligned towards the bow along the keel line.



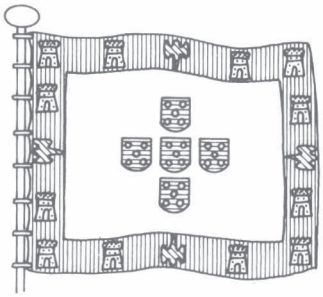
Jerusalem



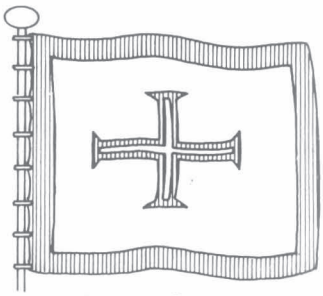
Portuguese Admiralty flag



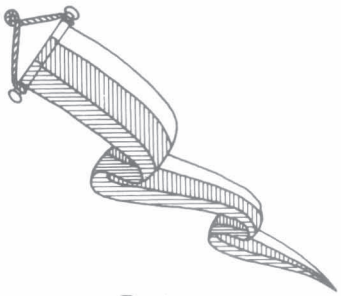
Portuguese pennant



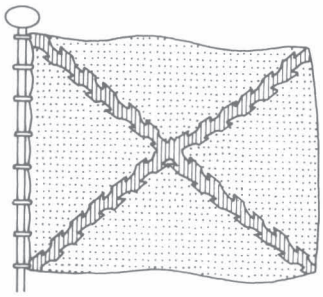
Portuguese state flag



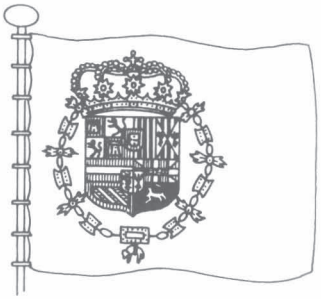
Portugal



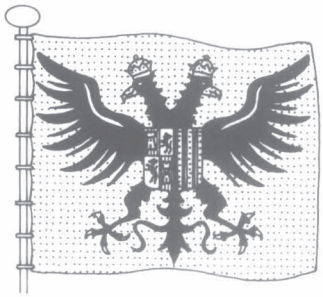
Portuguese pennant



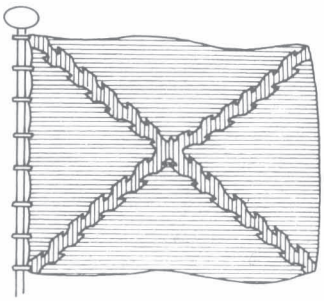
Burgundian war flag



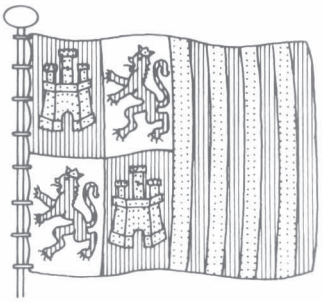
Spain, Royal flag



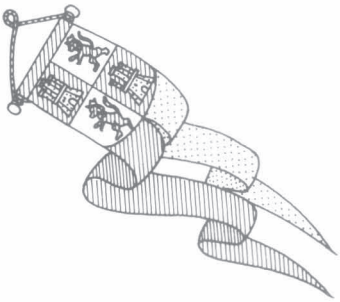
Spanish Royal flag



Burgundian trade flag

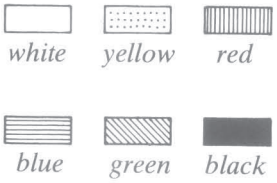


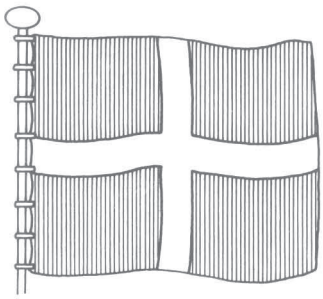
Spain, state flag



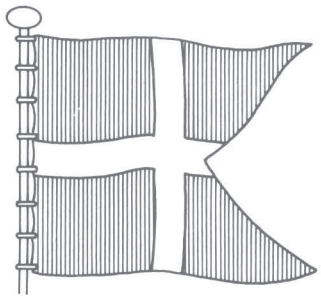
Spanish pennant

Flags

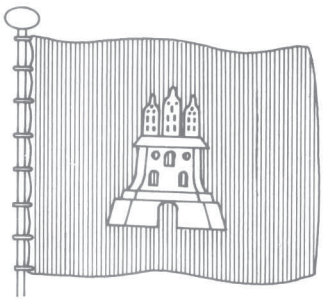




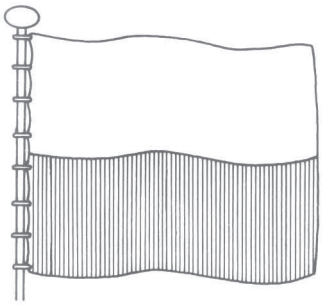
Denmark
state flag



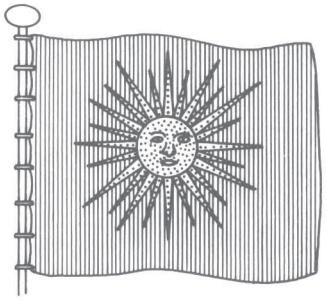
Denmark,
Royal flag



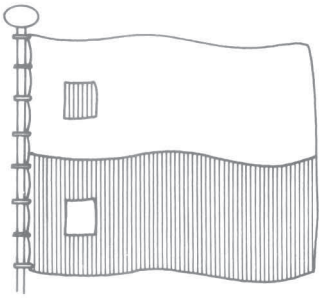
Hamburg



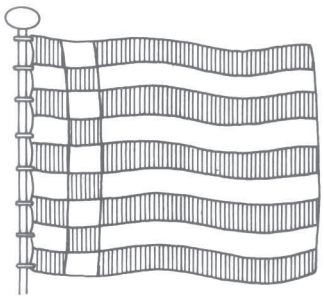
Lübeck



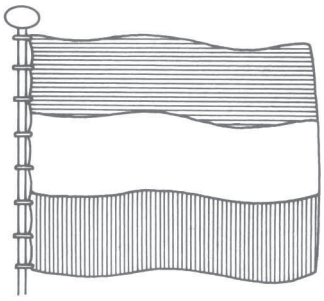
Stralsund



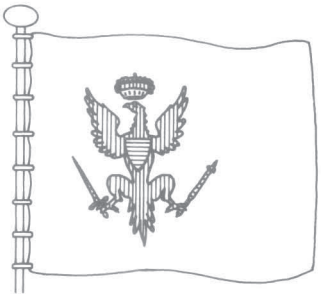
Stettin



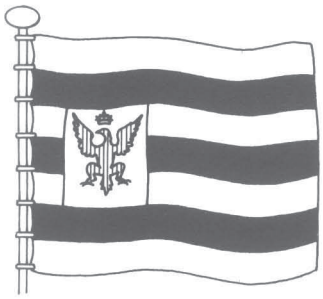
Bremen



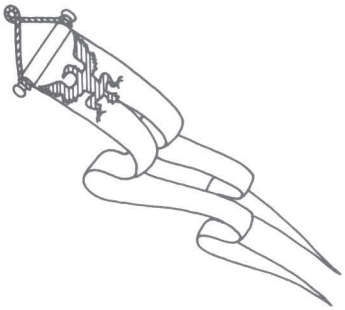
Rostock



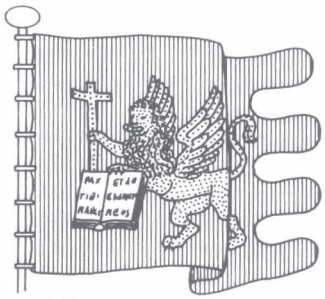
Brandenburg
principality flag



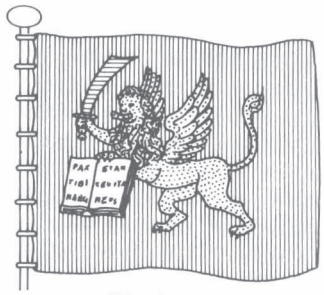
Brandenburg



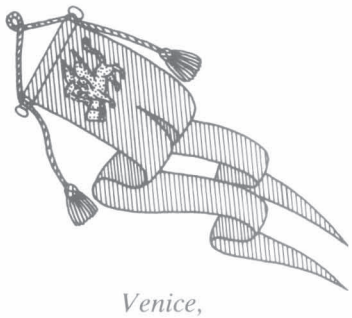
Brandenburg
pennant



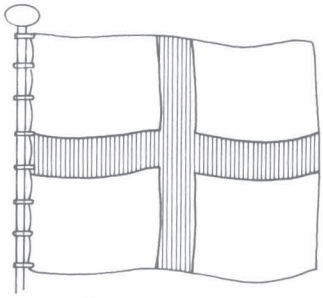
Venice,
flag of St. Mark



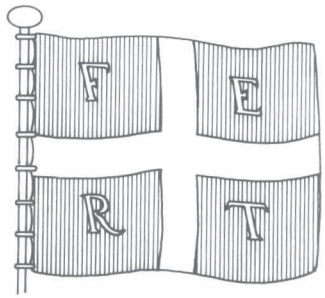
Venice,
war flag



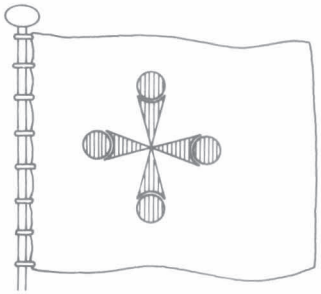
Venice,
pennant



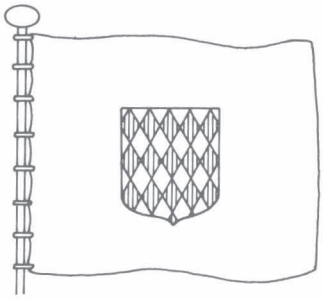
Genoa



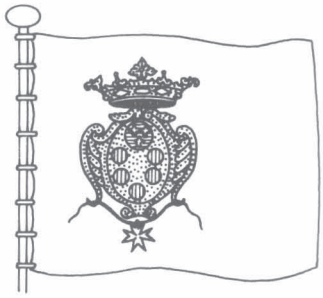
Savoy



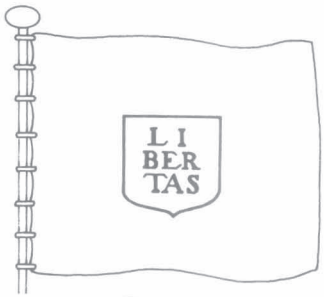
Livorno



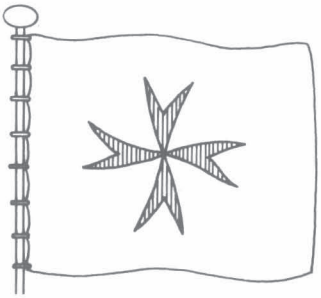
Monaco



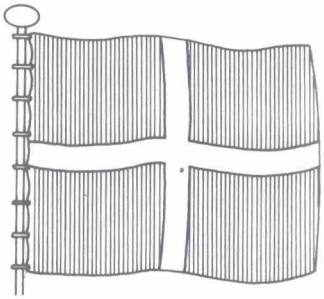
Tuscany



Ragusa



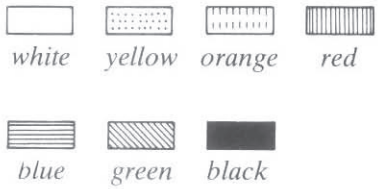
Malta,
white flag

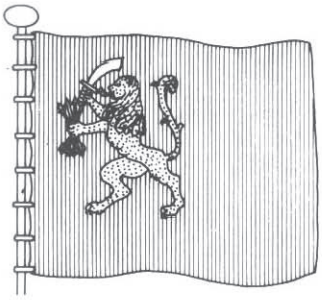


Malta,
red flag

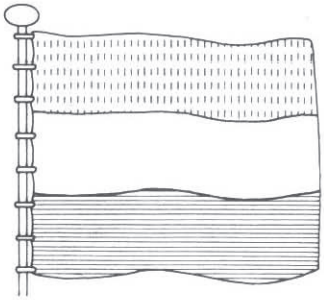
Malta,
pennant

Flags

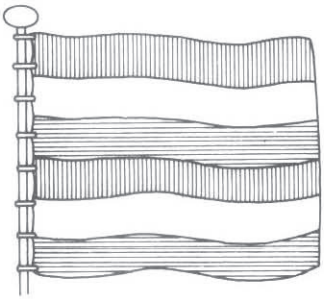




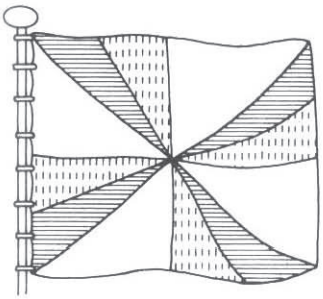
Holland,
state flag



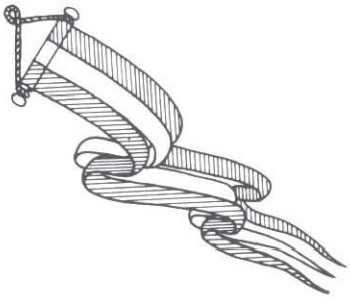
Holland,
state flag



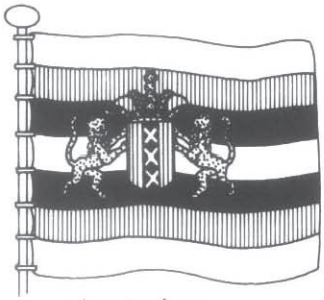
Holland,
state flag



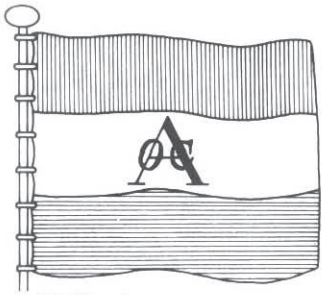
Holland,
Prince's flag



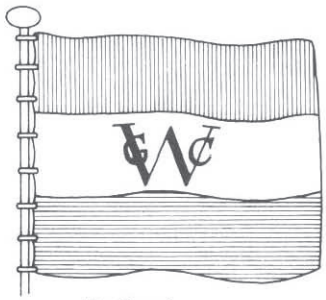
Holland,
pennant



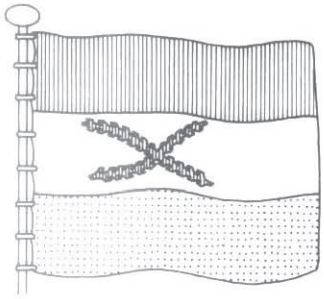
Amsterdam



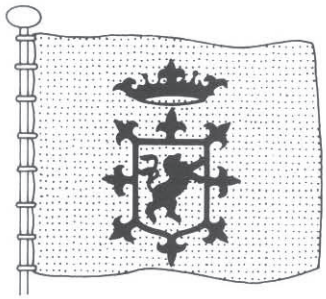
Holland,
East India Company



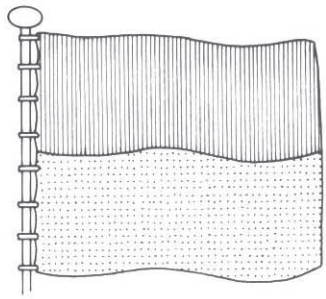
Holland,
West India Company



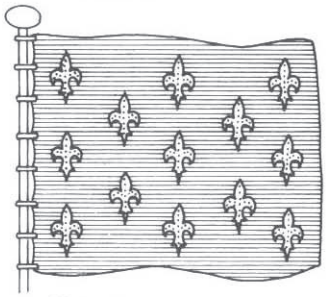
Flanders



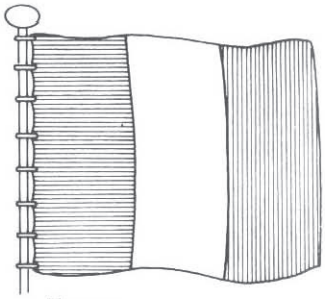
Flanders



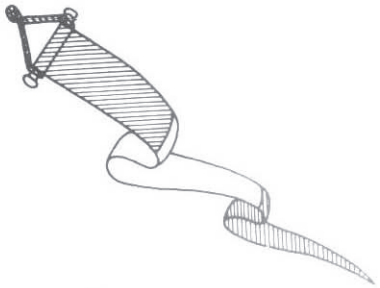
Ostend



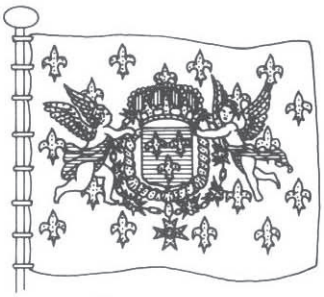
France,
Royal state flag



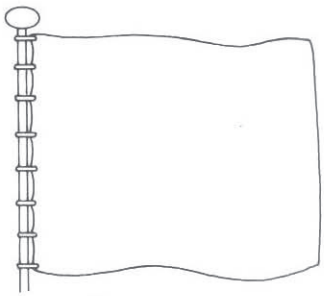
France,
Republican state flag



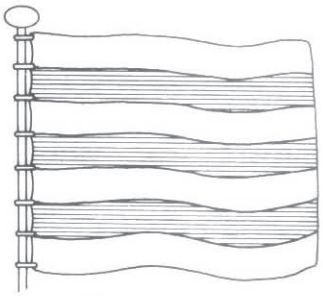
France,
Republican streamer



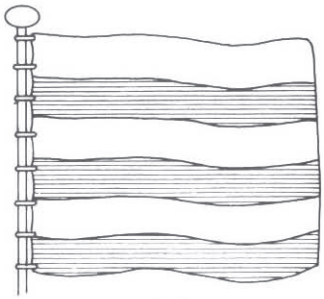
France,
Royal flag



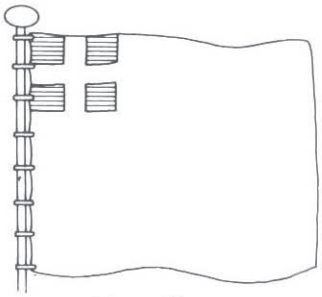
France,
war flag



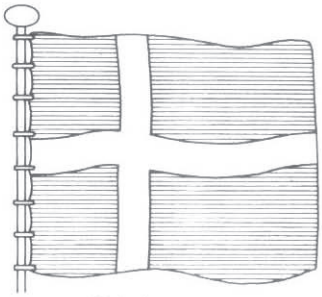
France,
merchant pennant



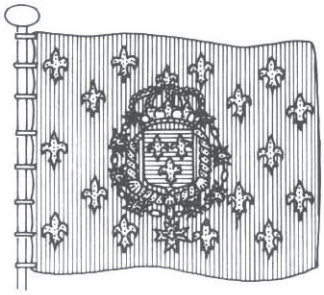
Dunkirk



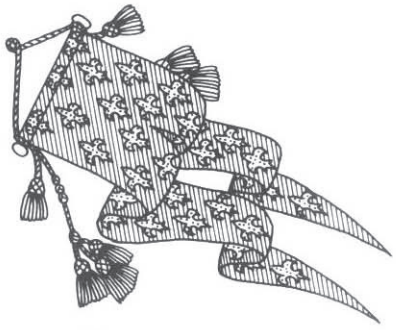
Marseilles



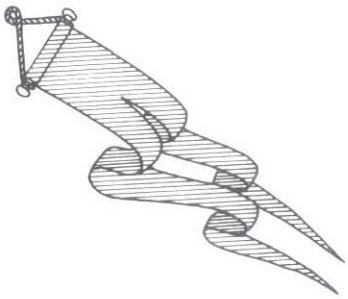
Calais



France,
galley flag

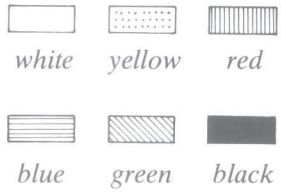


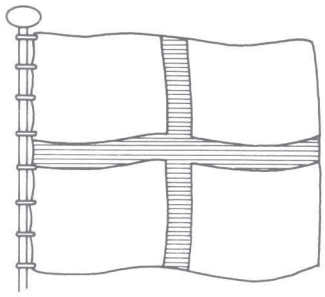
France,
galley pennant



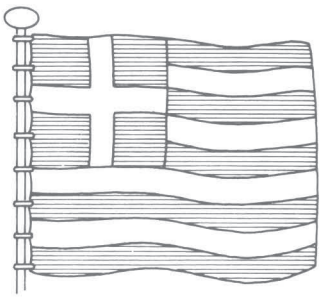
France,
merchant pennant

Flags

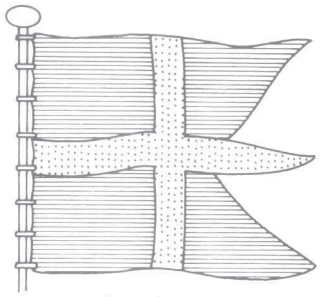




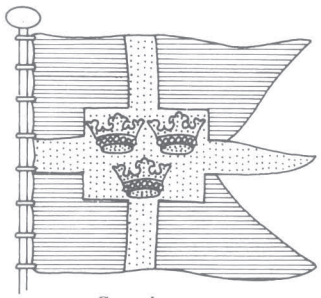
Greece,
flag used in liberation war



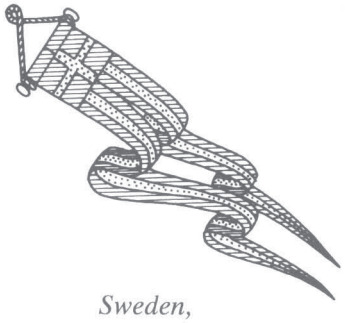
Greece,
national flag



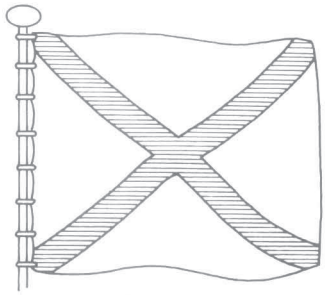
Sweden,
state flag



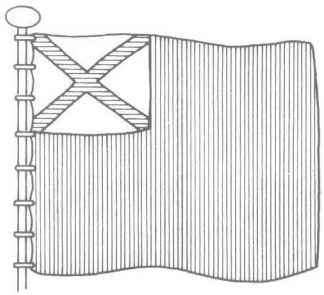
Sweden,
royal flag



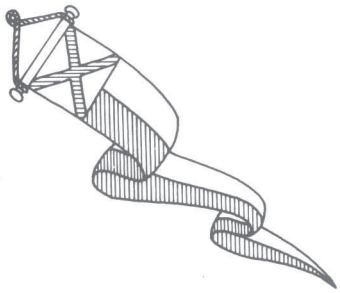
Sweden,
pennant



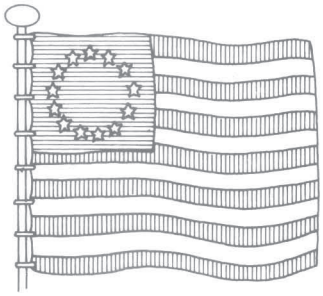
Russia,
state flag



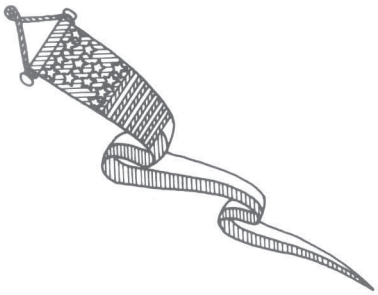
Russia,
war flag



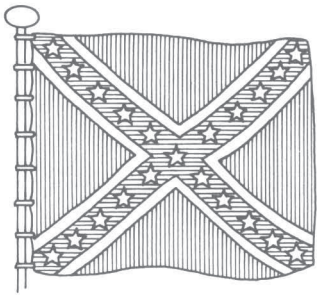
Russia,
pennant



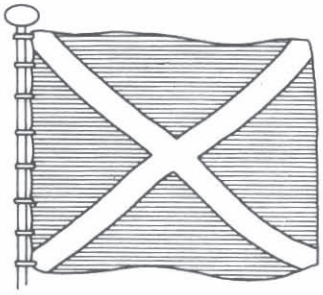
America,
state flag, 1776



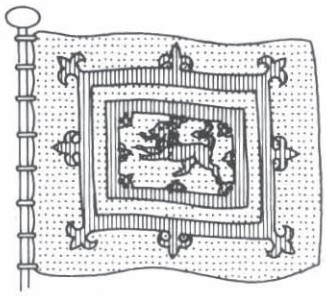
America,
pennant, 1776



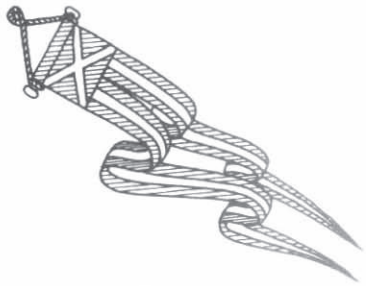
America,
Confederate flag, 1861



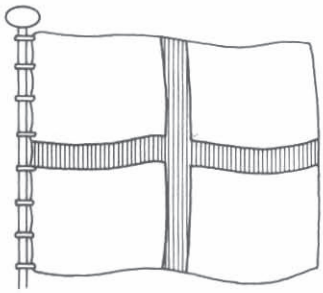
Scotland,
National flag



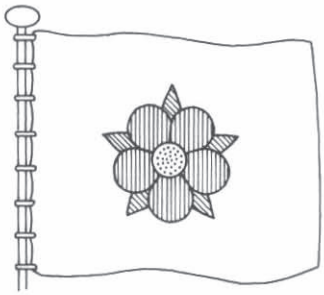
Scotland,
Royal flag



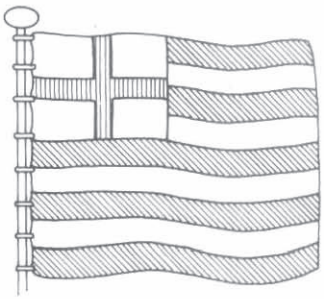
Scotland,
pennant



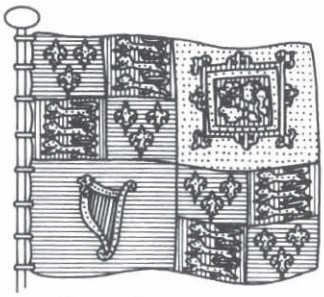
England,
National flag



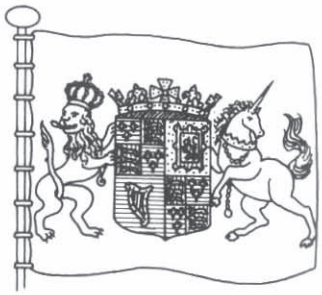
England,
Tudor flag



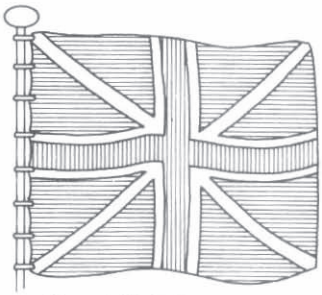
England,
Tudor flag



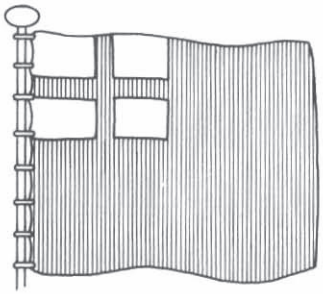
Great Britain,
Royal Standard



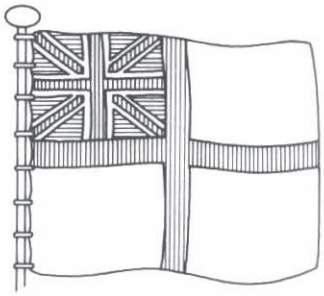
Great Britain,
Royal flag



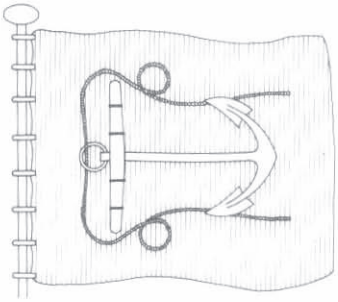
Great Britain,
Union Flag before 1803



England –
Red Ensign



Royal Navy,
White Ensign after 1803



Great Britain,
Admiralty flag