BACKGROUND

RESOURCES

for

Building 16th – 18th Century Model ships

Part 3: Chesstrees to Windows

Many drawings & photos are taken (with permission) from:
Euromodel – Division of GBM Snc
A number of photos were taken (with permission) at the
South Australian Maritime Museum

piratepete007
2016

Useful Reference Texts

1. From the 1800's – early 1900's

Anderson, R.C. (1955): ***Seventeenth Century Rigging*** [almost a complete copy of his earlier book ***The Rigging of Ships in the Days of the Spritsail Topmast, 1600 – 1720*** (1927)]

Carr Laughton, L.G.(1925): ***Old Ship Figure-Heads and Sterns***

Chatterton, E, Keble (1923): ***The Mercantile Marine***

Davis, Charles G. (1933): ***The Built-Up Ship Model***

Fincham, John (1825): ***An Introductory Outline of the Practice of Ship-Building***

Partington, C.F. (1826): ***The Ship-Builders' Complete Guide***

Peake, James (1851): ***Rudiments of Naval Architecture***

Nautical Magazine and Naval Chronicle for 1841 (p. 102, Lang's Tube Scuttle) – author unknown

2. From the late 1900's

Goodwin, Peter (1984): ***The Construction and Fitting of the English Man of War 1650-1850***

Lavery, Brian (1987): ***The Arming and Fitting of English Ships of War 1600 – 1815***

Lee, James (1984): ***The Masting and Rigging of English Ships of War 1625 – 1860***

Mondfeld, Wolfram zu (1989): ***Historic Ship Models***

Interestingly, there was a far greater depth of descriptive material to be found in the earlier books.

The following pages are a collection of comments that explain some methods used in model construction as well as in operating a ship. I have not presumed to be an authority in this area and so many comments will be lacking in both detail, time and country but this presentation grew out of a wish to educate *myself* in such matters. Hopefully, by sharing with others, some of this knowledge will prove useful. Some of the comments and many of the photos have been extracted from posts made by various members of the Model Ship World Forum and I am indebted to their giving permission to do so.

Special thanks must go to …

- **Dan Vadas** (especially from his posting for HMS Vulture)
- **Pucko** (for assistance in creating some CAD's)
- **National Maritime Museum, Greenwich, England** (for permission to use photos from their Photo Collection
- **Tadeusz43** (from his collection of photos 'Art of Period Shipbuilding')

Acknowledgement of MSW members

In alphabetical order, members who gave permission to use their photos include …

Amateur	KeithW
banyan	Marktiedens
Brian C	marsalv
Boccheroni	Michael101
canoe21	michael mott
Cobr@	mikec
danpage	Mike Y
DaveRow	mtaylor
Denis R	Navis Factorem
Doc Blake	NMBROOK
EJ_L	Ollagynot
firdajan	Palladio
Gahm	paulv1958
giampieroricci	Piet
GDM67	QA's Revenge
GuntherMT	rwiederrich
guraus	shopaholic
hornet	Sjors
Janos	Timmo
JerseyCity Frankie	tlevine
Johnnymike	Vince P
J.P.	YankeeD
keelhauled	zoly99sask

[To navigate through the contents – use 'control + click']

Contents

Illustrations

[The figures below are not hyperlinked]

HULL DETAIL

© National Maritime Museum, Greenwich, London

Figure 1: Stern Carving, *Royal Charles* (1655)

Armament Placement

Gunports & Lids

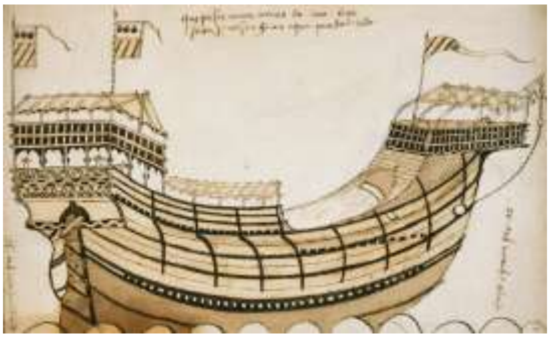


Figure 2: Drawing of a mid-15C Ship

The 15C ship of war possessed few heavy guns and these were fired over the waist bulwark with other smaller pieces mounted on the superstructures. The scheme of ornamentation/ decoration coming down from the Middle Ages – 5th. to 15th. C - provided openings on the sides of the superstructure by the free use of multiple arches that allowed window openings for cabins, positions for archers and placement of guns (Fig. 2).

Ornamentation

However, the great growth in ship ornamentation that began at the end of the 16C spread to the gun ports and from James I's reign, those ports of the main (upper) deck and above began to be surrounded with carvings such as intertwined snakes and lion heads. The more common decorations, however, were in the form of a wreath of foliage with or without fruit and flowers. On an open deck, there were usually no lids but on the main deck level, a square lid was fitted inside the wreath.

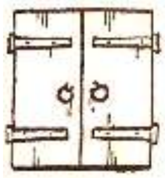


Figure 4: Folding Doors

If such ports were immediately above the channels, it was common to have their lids fitted as a pair of outward opening doors due to the restricted space behind the shrouds. Carr Laughton (1925, 222)

Figure 3: Wreath Ports; Mordaunt (1681)

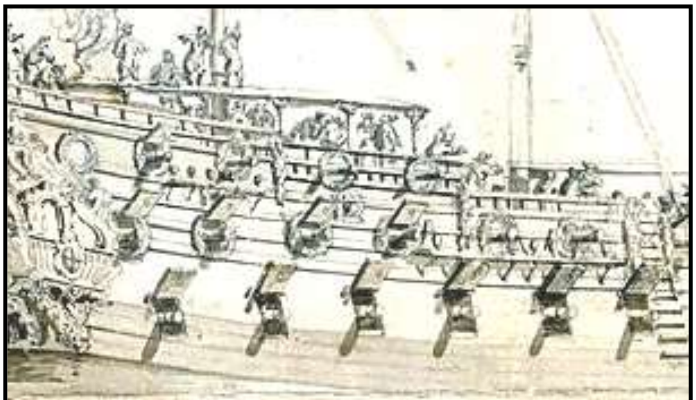


Figure 5: An Early Drawing of the *Mordaunt* (1681)

Fig. 5 – vague as it is – is sufficient to show that the port lids (if present) over the main channel are different to the other upward lifting lids shown aft towards the stern.

Wreath ports were used by a number of other countries but nowhere did they become almost universal as they did in England.

"… a painting by Willaerts, dating from 1619, shows a complete tier of wreath ports on the upper deck of a large English ship. The *Sovereign of the Seas*, however, had wreaths only to her upper deck, quarter deck and forecastle ports." Carr Laughton (1925, 222)

All large ships built under the Commonwealth (1649-1660) showed some wreath ports. The Naseby of 1655, for example had square wreaths to her upper deck ports except in the open waist, where they were round (Fig. 7).

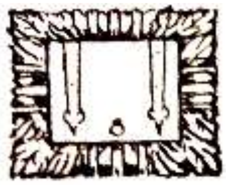


Figure 6: Square Wreath

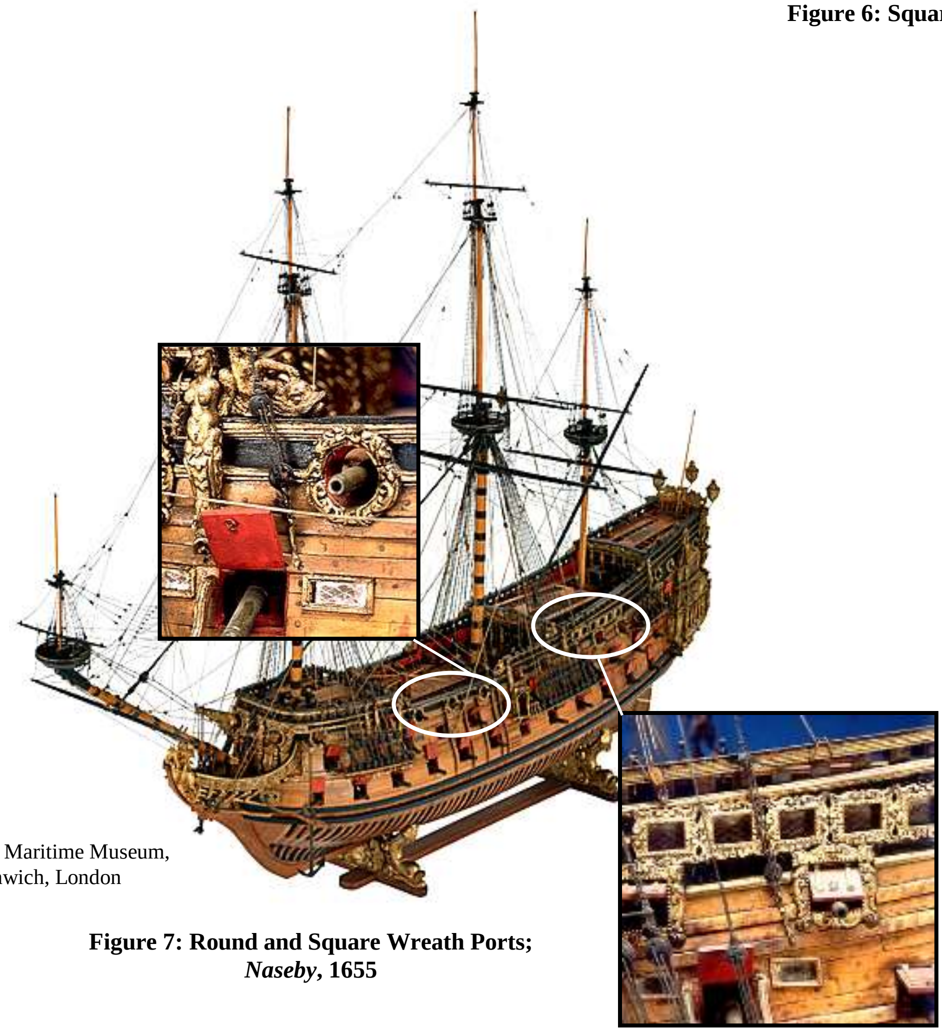


Figure 7: Round and Square Wreath Ports; *Naseby*, 1655

Many of the ships built in the early Restoration (1660 onwards) followed the Commonwealth fashion with the square wreath ports but within a few short years, the circular wreath on the upper deck and above became the universal useage. However, by 1703, with the Order banning ornate carvings, they disappeared from the upper deck but lingered for a few more years on the quarter deck and forecastle. There were a few exceptions and wreaths continued until the end of the century – such as those on the Royal yachts and the ships built in India.

Shape
Perhaps due to the cylindrical shape of the gun, there are a few very early instances where the gun port and lid were circular but these are relatively rare. So in the main they were square (or rectangular). However, there needed to be some variation within this geometric shape … the vertical sides, following the frames, would always be perpendicular to the keel BUT there is plenty of evidence to support the upper and lower sills following the planksheer curvature creating a slight parallelogram. On a large ship with largely flat decks, this would not present a problem except where the deck curves upwards at either end. On smaller ships, this curvature would be more accentuated.

Many model ship plans may not include this finer point and so all ports are drawn as square/ rectangular. As Fig. 8 shows, a distinct planksheer curvature will cause the upper and lower timber sills to be angled. Whether the builder wishes to follow this principle is another question.

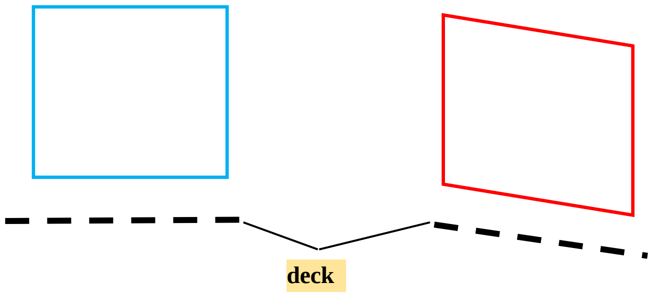


Figure 8: Planksheer and the Timber Sills

Opening Space
The typical *rectangular* gunport was formed from two vertical ship's frames and an upper and lower horizontal sill timber. The strakes were so arranged to form a partial overlap of the gunport timbers. From my observations, the majority of ports tend to be rectangular rather than square.

From Fig. 9, it can be seen that the lid will fit in the recess and therefore be flush with the exterior hull surface.

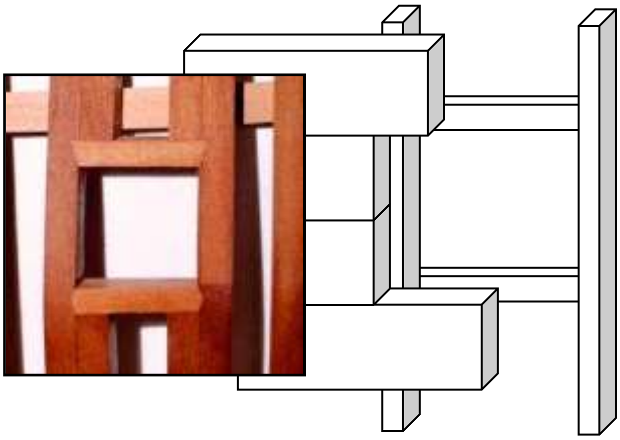


Figure 9: Gunport (diagrammatic)

In building a model ship, the exposed frame as just described will be replicated using short inserts from planking material and set in slightly from the hull surface. Having said that, some will just make them flush with the hull surface. Given that the total hull thickness is not great, *the tendency will be to go flush* to enable those replicating strips to be fixed satisfactorily against the cut-out surfaces. A small dilemma.

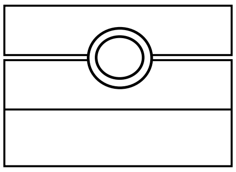
Figure 10: Gunport Lining Strips Set Back

Buckler Half Ports

On the upper deck of the major line-of-battle ships and the main deck of frigates, the port lids were of two parts; the lower one called a *bucklar (buckler)* and hung with hinges on its lower edge, and the upper part a *half port* to put in by hand. These shifting shutters were fixed in the stops of those ports.

Frequently termed ‘buckler half-ports’, they consisted of two parts:

- the ***lower part*** was in general hung with hinges at the lower edge, and kept in its place by sliding bolts. Where there were long guns, the upper edge was up to the center of the gun, when run out and levelled, as they had a hole in them that fitted close round the guns ; with carronades, to the under-side of the gun, if not too low, that they may be fixed over them. The lower piece of these half-ports was in one piece and had a rabbet on its upper edge to receive the upper part.
- **t**he ***upper part*** was again a single piece and easily slid into position (or removed) by hand. It was not at all uncommon for captains to have these upper parts removed and left on shore.



Chaser Ports

Gunport Lids

Surface Conformity

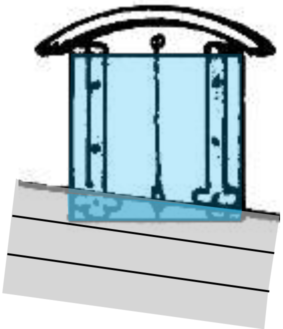
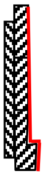


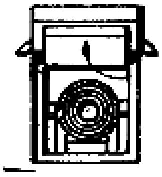
Figure 11: Lid Conforming with a Wale



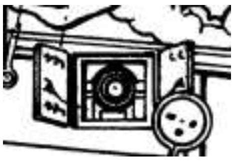
It was the usual practice to build the port lid so that it conformed with the hull surface. In Fig. 11, the lower portion of the lid is thicker to create a uniformity in thickness with the surrounding wale. The two hinges will then be shaped around this shape. In so many builds, the port is cut out and flat lids are fixed in position irrespective of any change in the surrounding surface.

Opening Types

1. **Single Door**

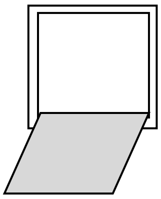


2. **Double Door**



3. **Half Lids**

4. **Drop Lids**



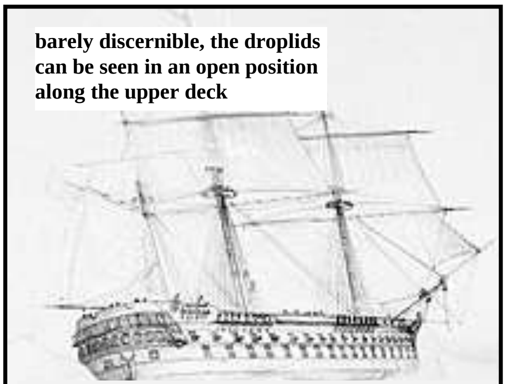


Figure 12: HMS *Albion*, (1763)

Rigols

The very word 'rigol' has virtually disappeared from the English language as a nautical term and its non-appearance both in drawings and on models indicates its small size rather than its use, common as it was. Its function was to act as a gutter/ channel to divert water away from the port entrance. It is *very* difficult to find much authoritative comment on the rigols and what places on the hull they were used. To me, it seems logical to place them over each port but maybe it had something to do with the different curvatures of the tumblehome along the hull as to whether in some positions they were not used.

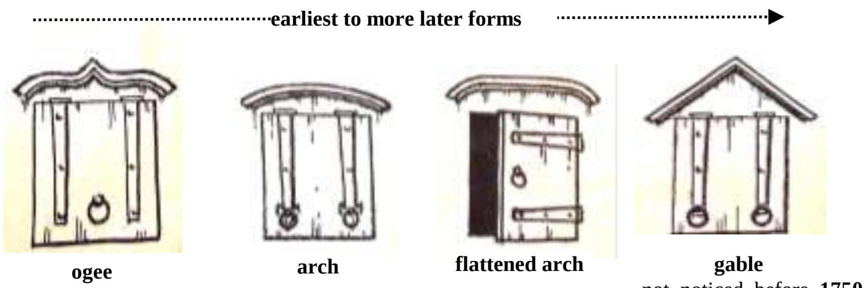


Figure 13: Rigol Shapes

Port Tackle

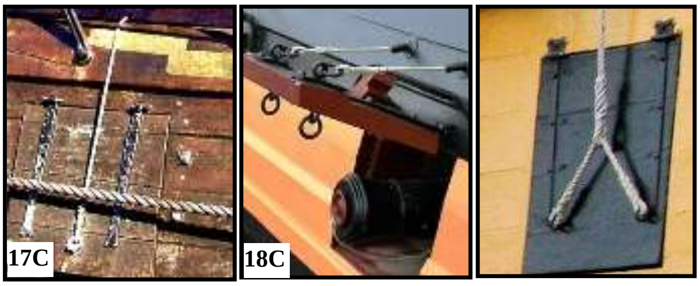


Figure 14: Span (rope) Variations

Figure 15: Port Lid Tackle

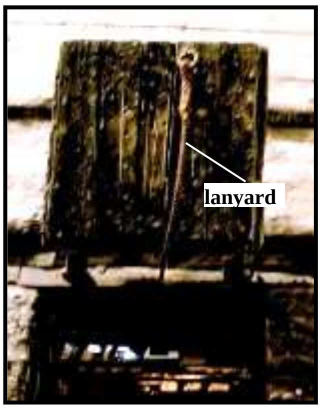


Figure 16: Gunport Underside

Initially, the two outside span ropes, passing through the hull, were joined together to create the ***single tackle***.

The ***double tackle*** appeared on the lower deck levels around 1705 and by the 1750s, often fitted to the upper decks of larger ships and on the main deck of frigates.

The port tackle, operating on a closed port, had little leverage to open it and so ***a bar was used to open the port lid*** about half way creating then a mechanical efficiency to enable the lid to be raised fully.

Tackle fall ropes were generally 2 inch (50.8 mm.).

Span (or pendant) ropes varied between 2 – 2.5 inches (50.8 – 63.5

Lid Construction

In an effort to categorise lids according to different periods, some authors make a distinction between the type of hinge straps present on the lid exterior. In fact, so many variations were discovered that to say less about this is the best way to go. However, in my opinion, the one standout feature seems to be that in the 17C, the extreme ends of the hinges finished in a 'flory' (cross with flowers on the ends) whilst the 18C were just basic straps with square ends – compare Figs. 64 and 65. Another variation with time was the change from one ring to two rings. As the lids became heavier, the port tackle changed from a single to a double form, requiring the two rings.

17C Lids

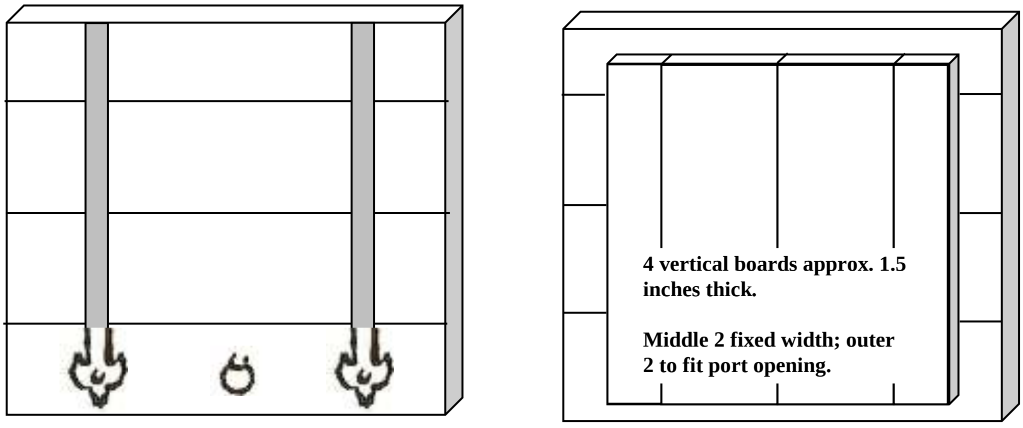


Figure 17: Lower Gun Deck Port Lid, 17C

18C Lids

In the late 18C, ***scuttles*** allowed the gun rammer to push the ramrod through the opening in order to load the gun *when it was run in* during bad weather in preparation for battle as well as enabling both air and light to filter into the lower deck area in more peaceful times making conditions more habitable. The ***illuminator*** was in line with the gun sights so the enemy's ship could be sighted without the port being open.

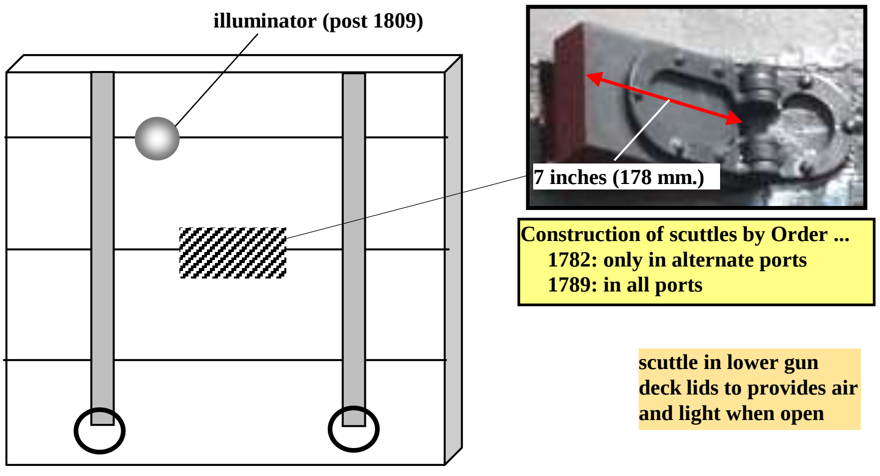


Figure 18: Lower Gun Deck Port Lid,

19C Lids

There was little evidence that the illuminators continued to be a feature on the lids. For ventilation and lighting of the deck spaces, scuttle tubes ('Lang's tube scuttles') were installed *between* the ports. In the same time period, such lights cut into the sides were largely replaced by windows.

An extract from Nautical Magazine and Naval Chronicle for 1841…

Lang's Tube Scuttles

During the long war, commencing in the year 1793, and ending in 1815, our sailors suffered much from want of light and air in all ships, more particularly in the smaller classes, on their lower decks, for where the crew were berthed in these, it was total darkness, unless lighted by candles; not only this, but it almost amounted to suffocation in hot climates from want of ventilation; and the same was the case on the orlop decks of line-of-battle ships, and even on their lower gun decks when the guns were housed, and the ports shut. Here the crew were much inconvenienced by the muzzles of the gun being secured to the clamp above, thus obstructing the light from the old square scuttles which were placed in the ports. With a view to afford the accommodation so much needed, and to remedy the evil various methods were tried from time to time, without producing the desired effect.

About eighteen years ago (approx. 1823), Mr. Lang, then assistant-surveyor of the Navy, invented a tube scuttle of a conical form, perfectly water tight, to be drawn in, or put out from the inside of the vessel when required for air, and always under all circumstances in the worst weather affording light. This was fitted in a sloop-of-war on the West India station, as an experiment, and being found to answer the purpose, it was afterwards introduced in several ships and vessels of various descriptions, and in 1831, was placed in the Thunderer, of 84 guns, on her orlop deck, on the Vernon frigate's lower deck, Magicienne raze corvette, and other smaller vessels, by which such great benefit and comfort to health of ship's companies have been obtained, that, we understand, an order has been given directing that all ships of the line shall have them fitted on their orlop decks similar to the Thunderer. This ship, in consequence, of having these scuttles, and a more complete arrangement of the orlop deck, than is usually fitted, was enabled, in addition to her crew, without displacing a gun, to accommodate a regiment of soldiers, on the said orlop deck, and convey them to Gibraltar, when, on the contrary, the Revenge, 74 guns, was obliged to take out her lower deck guns, and leave them in England to enable her to effect a similar conveyance of troops, her orlop deck being like those of line-of-battle ships, without ventilation or light, encumbered with store rooms, etc, thus reducing the ship in her armament to that of a frigate, until her return to England, for her lower deck guns. In fact, the advantage that will now be gained by the general adoption of this system of ventilating in the British ships-of-war is incalculable, and these tube scuttles being placed between the lower deck ports of line-of-battle ships, will give the necessary light, and air, over the seaman's mess tables, when the lower deck are housed, and the ports closed. Thus the refreshing breeze is introduced between decks, instead of the former humid atmosphere.

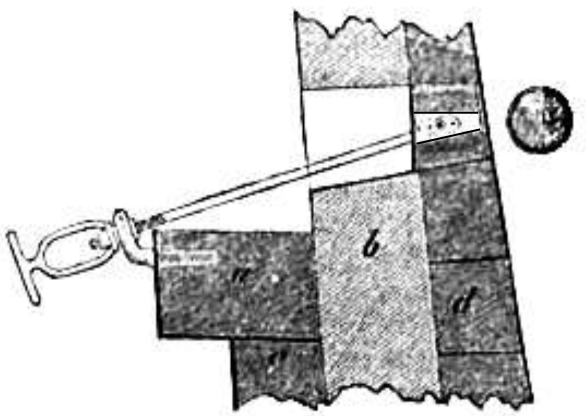


Figure 19: Lang's Scuttle Tube

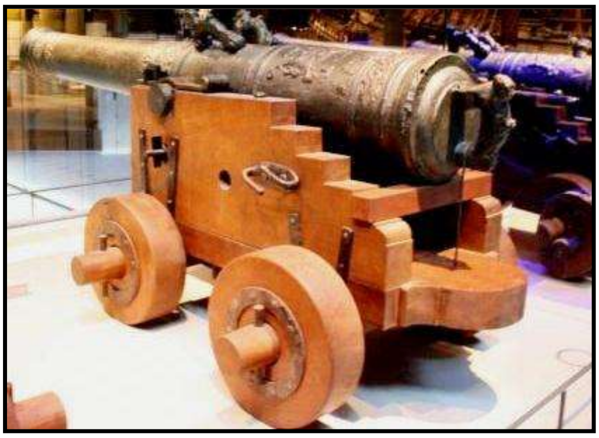
The scuttle tube consisted of a conical copper tube glazed on the outboard end with thick glass (a 'bull's eye'). A heavy fabric was bound tightly around the outside of the tube and sealed with tallow to make it waterproof. It would admit light at all times and the tube could be mechanically pulled inboard to open the aperture and freely admit air.

Tube diameter:

frigates	***6 inches (152 mm)***
sloops	***5 inches (127 mm.)***
smaller vessels	***4 inches (102 mm.)***

Armament

Carriages



Rigging

Breeching

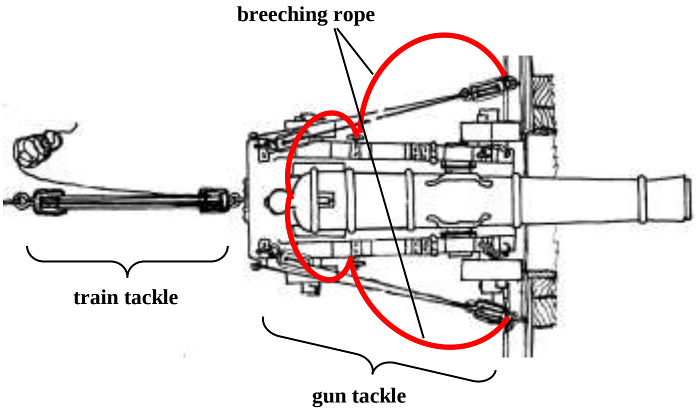


Figure 20: Firing Position

According to Lavery (1987, 139), the recoil of a 32-pounder with normal charge and a level platform was 11 feet (3.35 m.). With limited deck space, this recoil was restrained to a smaller area using thick breeching rope (shown in red in Figs. 68). The excess rope shown is in readiness to absorb the recoil shock after firing.

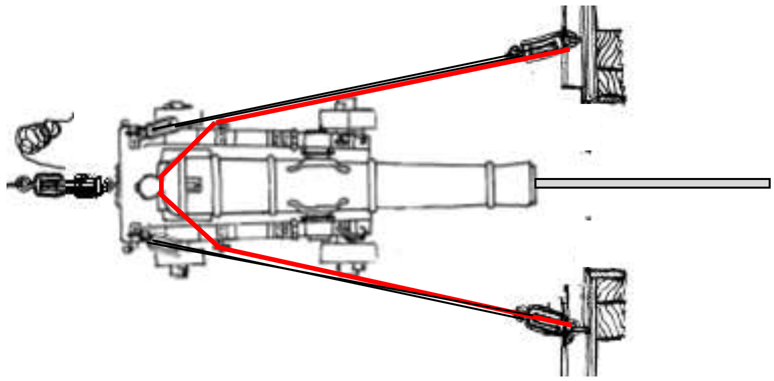


Figure 21: Loading Position

Figs. 68 & 69 show that the rope was …

- eye-spliced to a ring bolt either side of the gun on the hull,
- passed through a ring bolt on each side of the carriage, and
- either spliced to a cascabel, or passed through a ring, at the rear of the cannon

The approx. ***length*** of the breech rope was = 3 x cannon length …. and expressed to the nearest foot. This would have been the supplied length so some allowance would be made for splicing.

Figure 22: Breeching Spliced to Cascabel ... or Passed Through a Ring

Breech rope size was determined as follows (with metric conversions included) …

	pounder size	**circumference** (inches/ mm.)	**diameter** (inches/ mm.)	e.g. **scaled** 1:72 (mm.)
1716	6 – 9	4 / 101.6	1.27 / 32.3	0.45
	12 – 18	5 / 127.0	1.59 / 40.4	0.56
	24 +	6 / 152.4	1.91 / 48.5	0.67
1780	12 – 18	5.5 / 139.7	1.75 / 44.4	0.62
	32 - 42	7 / 177.8	2.23 / 56.6	0.79

Gun & Train Tackle

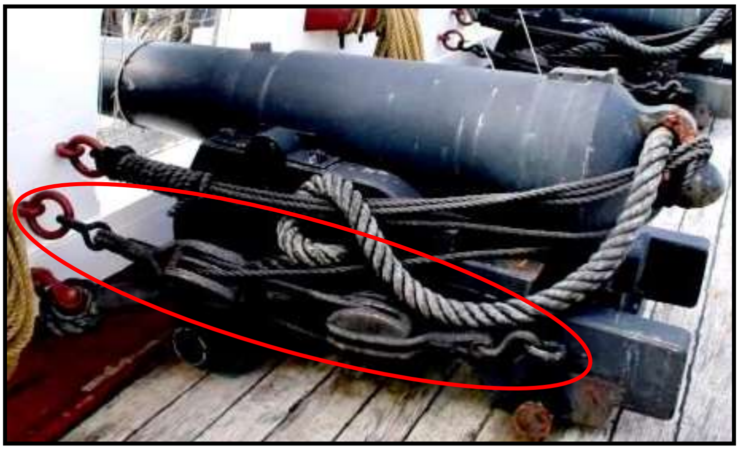


Figure 23: Gun Tackle

Figure 24: Train Tackle (inboard and outboard)

Alternative/ Modern Names:
Whether these names were an alternative or a more modern name is unknown.

- ***train tackle*** as '***relieving tackle***',
- ***gun tackle*** as '***port tackle***' or '***side tackle***'

Most kits do not supply blocks of a small enough size but for the avid builder, there are blocks 'out there' of a suitable size such as 2.5 mm. or 3.0 mm.

In Figs. 72 and 73, the eye bolts and rings are shaded yellow.

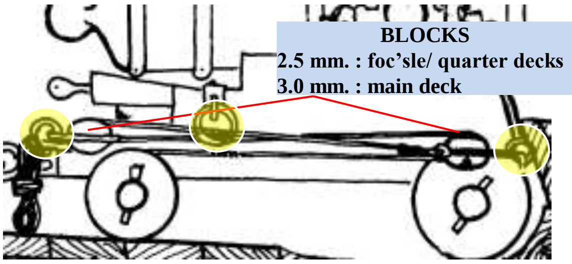


Figure 26: Gun Tackle

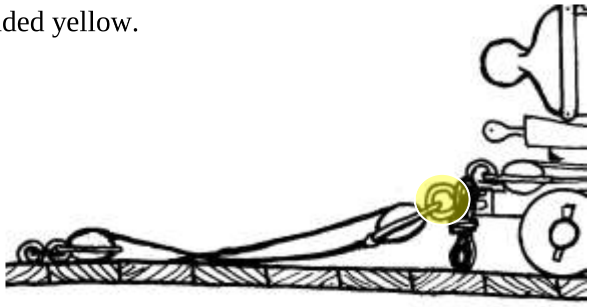


Figure 25: Train Tackle

Tackle rope sizing …

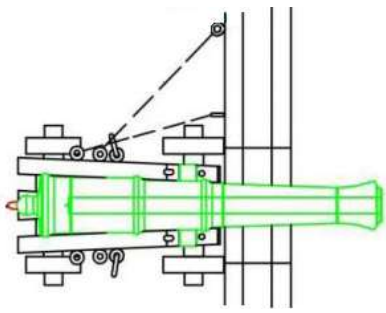
	pounder size	circumference (inches/ mm.)	diameter (inches/ mm.)	e.g. scaled 1:72 (mm.)
1716	< 24	2.0/ 50.8	0.64/ 16.2	0.22
	24 +	2.5/ 63.5	0.80/ 20.2	0.28
1780	6 - 9	2.0/ 50.8	0.64/ 16.2	0.22
	24	2.5/ 63.5	0.80/ 20.2	0.28
	> 24	3.0/ 76.2	0.95/ 24.2	0.34

Block sizing …

Lavery (1987, 141) states that blocks used in such rigging as this were either '8 or 6.5 inches'.

block size (inches/ mm.)	**length** (inches/ mm.)	e.g. **scaled** 1:72 (mm.)
'8 inches'	8.0/ 203	0.11/ **2.8**
'6.5 inches'	6.5/ 165	0.09/ **2.3**

Figure 27: Block Splicing to Ringbolt



Improvements to naval gunnery pioneered by Sir Charles Douglas in the 1780's included the location of another eye-bolt in the bulwark that was further away from the gun port with the aim of making it possible to traverse the gun through a wider arc of fire. Previously the eye-bolts had been much closer to the sides of the gun-ports.

also perfected the flintlock firing mechanism by using priming tubes of goose quill, rather than thin metal (which could fly out as razor sharp fragments on firing) and introduced flannel cartridges (which left no burning residues in the barrel after firing, and so were much safer, and enabled a faster re-load)

Loading Tools

The handles of the tools had to be long enough to reach into the entire length of the bore plus have enough length for a sailor to hold with two hands. With the gun run all the way in, there was not enough room to get the tool into the barrel unless it was taken outside the hull, presumably through the gun port. The recoil forced the cannon far enough inboard, restrained by the ropes, to clean and reload.The object was not so much to clean but swabbing with a wet sponge to extinguish any embers and to force out any remaining explosive gasses, then to load, ram, run out, prick and prime.

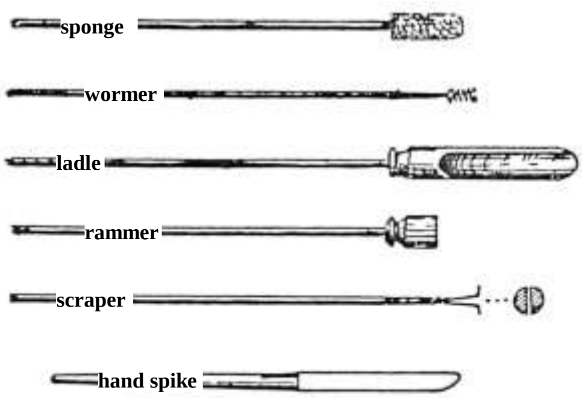


Figure 28: Loading Tools

Armament Protection

Pavesades - Pavises/ Pavesses

Figure 29: Shields, 9C Viking Long Ship

Figure 30: Large Pavesse, 17C Dutch Ship

When fore and aftercastles were first used, they were generally surrounded by a battlement bulwark for the convenience of the archers stationed on them. There was a regular practice for a long period of time to place painted wooden shields (pavesses or pavises) along these superstructures except in the waist of most ships.

The rise in heraldry gave a new impetus to this use of shields displaying the armorial bearings of men of note on board – projecting a martial air as well ornamentation. The change from using shields to pavesses – large wooden shields (Fig. 93) fixed to the sides and bulwarks of the ship - is not clear, but by the end of the 15th. C this had developed into a standard practice.

Ships not involved or connected with the English navy had a few pavesses forming a bulwark (Fig. 94) to what is now called the quarter deck. They bore the arms of the nobleman or port to which the ship belonged.

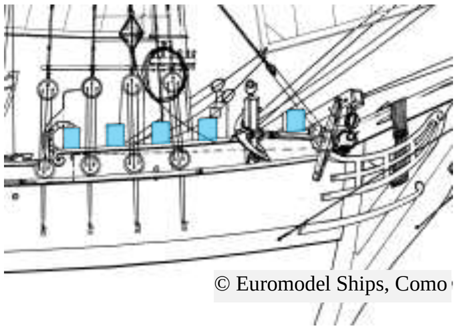


Figure 31: Pavesses, 18C English Schooner

In English men-of-war by the start of the 16th. C, the Saint George's cross was commonly used but often in association with royal badges. On the other hand, French ships of war displayed little national colour owing both to the right conceded to the admiral of France to display his own colours and symbols in the ships under his command as well as the fact that France was not yet a unified kingdom. Due to a wide lack of agreement, there is now much confusion on what was commonly displayed on French ships.

Towards mid-16th. C, they had been introduced in the waist of great ships, being placed wide enough apart to allow them to serve as gun ports. Fixed to an open timber rail, they were made of poplar, a timber which does not splinter and were thick enough to be musket-proof. They were in common use until the latter part of the 16th. C.

Armings

When pavesses were no longer used, heavy and rough woolen cloths called ‘armings’ were spread along the open rails to give some protection to the crew. Of national colours, the English armings were red but towards the end of the 17th. C, white edgings were added. The Dutch also used the same combination of red cloth with white edging. The French adopted a blue coloured cloth with fleurs-de-lys and initially they had a white edge during the 17th. C but this disappeared in the 18th. C.

Hammocks

In the 18th. C, folded hammocks were stored in such a way as to form a barricade around the decks – especially in the waist. It is not known how early the hammocks were stored in nettings on deck but a paper of 1746 [Navy Board to Admiralty, 26 September, 1746] shows that they were commonly used as such though without keeping them dry. They were later covered by painted or tarred canvas and for a while, the coloured ‘armings’ continued to be spread over these covers, even when their issue stopped.

Berthing

Within a few years of using hammocks to barricade the sides, the hammock stanchions were boarded up but were still called ‘nettings’ following on from the actual nettings used.

Chesstrees

Chesstree / Chess-tree / Ches-tree

Figure 32: Chesstrees: *Halve Maen* (1609) - Dutch

In early ships, the sheet tack would have come in through a hole closed to the gunwale and was certainly the case with two deckers in 1600's. Even when the hull grew higher with the three deckers, the chesstree remained to the mid 1700's on the middle gun deck. In the 17C, it was nothing more than a block of wood with a central hole although in a number of instances, in the late 17C, a thickened foremost fender became the 'chesstree' with the tack being reaved through the fender on a sheave and then through another sheave in the hull side (Fig. 37). This was more typical of the two-deckers. In some prominent ships, it was made bigger and more ornamental with typically a lion's head carving and the tack passing through the mouth (Figs. 36 & 37). Less common was a drop hancing piece.

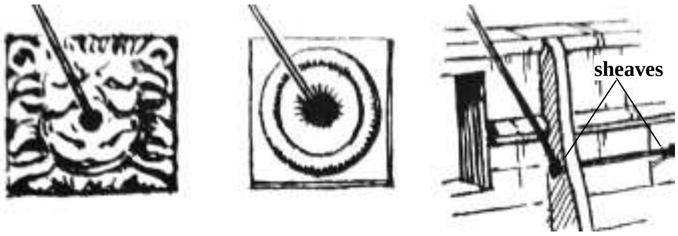


Figure 33:English Chesstrees

In the first half of the 18C, the chesstrees of the three-deckers became slightly ornamental holes on the middle deck. By 1750, these ships also followed the simplified fender-type chesstree and this continued as long as there were fenders fitted.

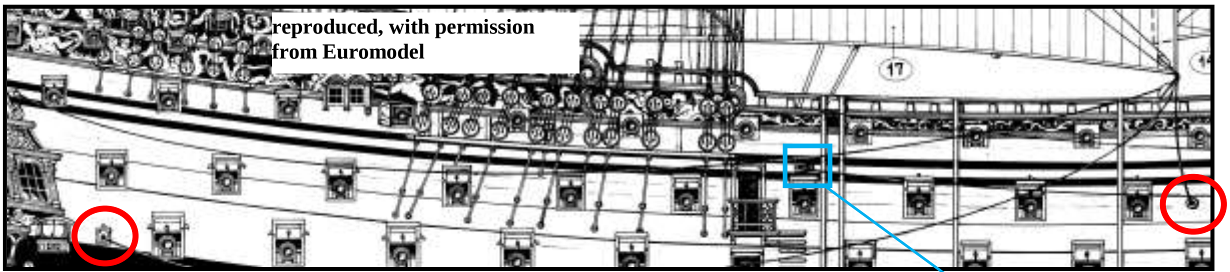
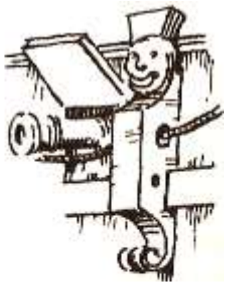
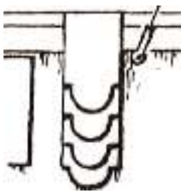


Figure 34: Chesstrees, *Royal William* (1670)

The Practice of Other Nations





Entering Ports & Entering Places

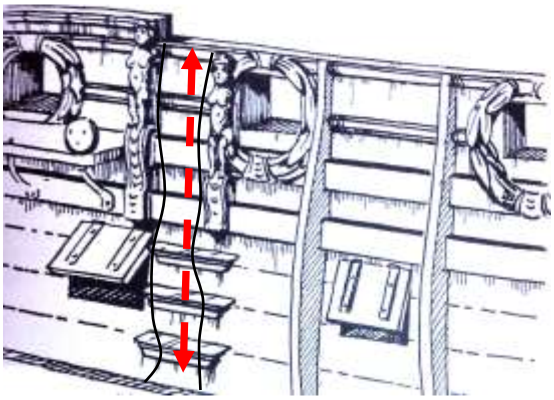


Figure 35: Entering Place; *Mordaunt*, 1682

Entering Place

In early times when the side of a ship was only a deck or two high, crew were able to climb from the lowest point and enter the ship via the gunwale of the waist. Ropes were hung down either side to make the climbing easier and safer. The entering place on the main deck had little or no ornamentation but sometimes a drop hancing was placed either side from the top edge of the bulwark as shown in Fig. 36.

Entering Port

The entry port was used in the taller three-decker, giving access to the middle deck. Appearing during the Stuart Period (1603 – 1714), it was first noticed in the *Prince Royal* of 1610 at the fore end of the main channel … but the details are so obscure, it is not sure whether this took the place of one particular gun port. The early Stuart practice as evident in both the *Constant Reformation* (1619) and the *Antelope* (1651) was to install entering ports on the middle deck of all three-deckers, no matter how small. Elaborate carvings were common but without the wide projecting canopy so much in evidence later.

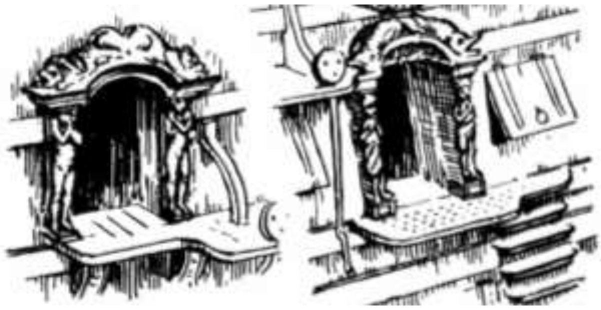


Figure 36: Two Early, Non-Canopied Entry Ports

Confusion reigns over whether there was only an entrance port on the port side since that seemed to be the artistic preference in all paintings and drawings. However, the first actual model to clearly show two ports was the *Royal James* (1671). After this date, it appears that all first rates had the two entering ports whilst the second rates had either one or two without following any pattern. After 1690, ships were authorised to have entry ports fitted on both sides.

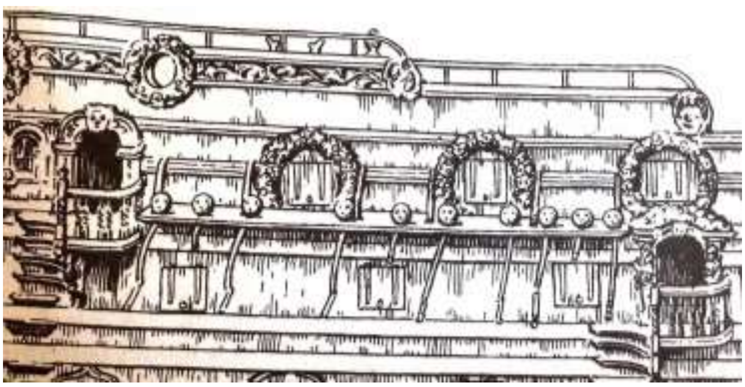


Figure 37: Four Entering Ports; *Royal Anne*, 1704

Fig. 38 is an unusual example showing four entering ports, two per side. "*These consist of a pair on the middle deck in the normal position, between the 6th and 7th gun ports from aft, and of another pair on the upper deck made out of what should be the 4th gun ports from aft*." (Carr Laughton, 1925, 231)

Figure 38: Plain Archway

With regard to the ornamentation, the drawings and paintings available of the entering points are too small and almost exclusively confined to the limited group of three-deckers. There are only a few models in existence that show this feature.

In the 17C, there was always an arch (generally with some ornamentation) over the port. Fig. 39 shows a plain arch supported by two *caryatids* (thin columns in a female form – in this case, the figures look more of the male form ?).

Models from other ships in the same time period show a pair of lions and a pair of dolphins lying on the arch. The supporting columns in these cases are definitely termed caryatids.

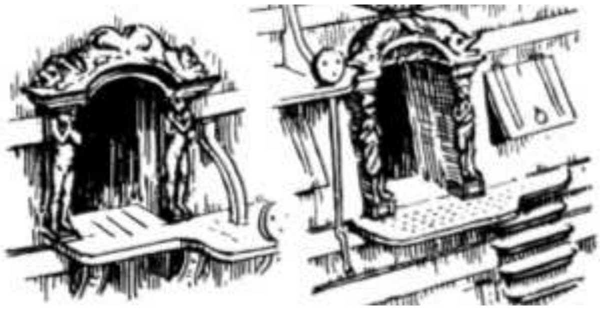


Figure 39: Animal Ornamentation & Caryatids

1703 Order to greatly reduce carved works... this did away with the lions and other beasts with which the arch had been overloaded.

Figure 40: *Victory*, 1737

The flat arched canopies of the 18C were supported on their outboard side by turned or square pillars, the heels of which rested on the side of the ship due to the large tumblehome of the middle deck. At the base of the port, there was a small landing stage (sponson) consisting of a grate and supporting brackets although this often became an integral part of the end of the main channel (Fig. 42 shows this latter point).

Figure 41: *Victory*, 1765

Around 1740, a canopy of crossing arches became the usual form (Fig. 42).

Figure 42: Late 18C and 19C Canopy

Following the large reduction of the tumblehome towards the end of the 18C, the wide canopy was replaced by a narrower single arch supported by carved brackets (Fig. 43) and this continued to be the norm well into the 19C.

The Practice of Other Nations

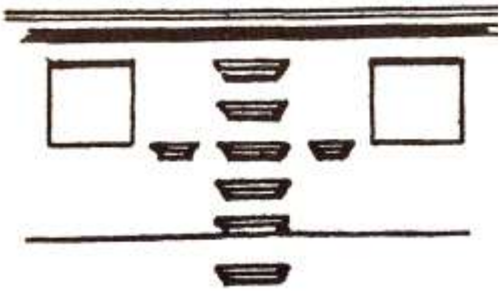


Figure 43: Dutch Entering Steps

The Dutch never used entering points as their focus was on ships smaller than the three-decker. Entry weas up to the bulwark and on to the gangway.

The French, whilst building many such large ships, almost ignored the use of entrance ports. A drawing by Goussier shows an entry port on the starboard side of the middle deck in a ship around 1700 and supposedly it was the *Belin* – but there is a general belief that this was simply a drawing and not an actual ship. Until mid-19C, the French entering place was always at the gangway and again, there is another drawing showing an arched doorway rising above the bulwark and the netting (Fig. 45). In the 19C, there is evidence of a middle deck entering port such as that in the *Valmy* of 1847 where the opening was covered with folding doors. Although supposition, this innovation would support other three-deck French ships having entering ports in that time period.

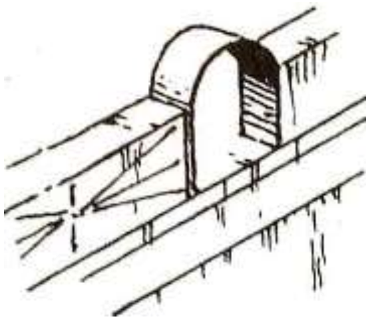


Figure 44: Arched Doorway

Fenders

Figure 45: Portugese Carrack

Fenders were vertical sections of hard-wearing timber such as oak or elm that were located on the hull surface (and conforming to the tumblehome) that prevented the fouling of the wales during the lifting of items prior to embarkation. Abreast of the main hatchways at the waist (Fig. 52) and between the fore and main channels, they '*might be seen as having evolved from the vertical stiffners present on the 14th – 15th C ships such as the carracks'* (Fig. 50).

The ***First Anglo-Dutch War*** (1652 – 1654) was between the Commonwealth of England and the United Provinces of the Netherlands due to disputes over trade and resulted in the English Navy gaining complete control of the seas around England forcing an acceptance on an English monopoly on the trade between England and her colonies.

However, it would be more logical to recognise that they did appear around the time of the First Anglo-Dutch War. This was the time when the ship's boats were first hoisted in and out of the waist instead of being towed astern. At first, ***two*** were fitted and widely spaced to take the chafing of the boat.

Soon after their introduction, ***three*** and then ***four*** became the rule. When there were three, a pair would be placed near the entering steps and towards the fore end of the waist. By the end of the century, it became standardised with a pair near the steps, one well forward (often with its upper end fitted as a chesstree) and the fourth between the steps and the other single one. This remained the case until the protruding wales disappeared. In the *Brittania* of 1682, the entering steps were placed between the pair of fenders, thus forming a ladder.

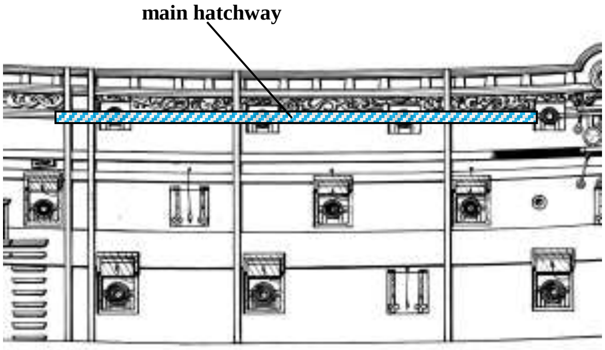


Figure 46: Fenders, 1670

There were ***four or five fenders*** on the larger ships (first, second and third rates) but only three on the lesser ships. By the early 1700's, the fifth fender had disappeared and according to Goodwin (1984, 184), the remaining four were distributed at equal intervals. He also states that by 1736, the fender number was reduced to only three with two fitted close together to form a guiding 'track' for items being hauled aboard.

Figure 47: Fenders, *Royal William* (model, circa 1740)

Interestingly ...

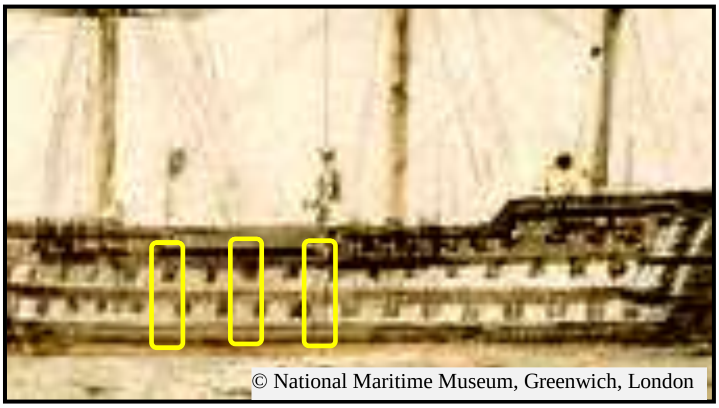


Figure 48: Fender Drawing, Early 1700's, *Royal William*

- Fig. 53 shows four barely discernible fenders arranged as that shown in Fig. 51. Some credence is given to this drawing which by the writing on the figure but now cropped, it appears to be a genuine drawing of the actual *Royal William* ship.
- The model shown in Fig. 52 was built around 1740 and just maybe the close alignment of a fender pair as described by Goodwin as happening in 1736 reflects the time rather than the actual ship.

There were no fenders amongst the 17th. C Dutch ships but with Dutch influence decreasing in the 18th. C , French ships began adopting the English fender style. By the 19th. century, all vessels became smooth-sided and fenders were no longer necessary.

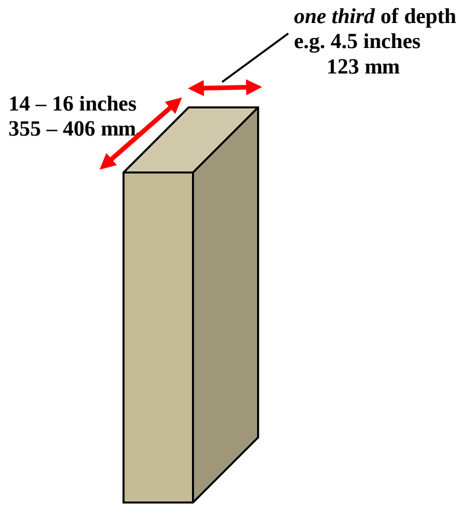


Figure 49: Fender Dimensions

Dimensions:

With the switch back to only three fenders in 1736, the fender pair discussed previously were set at approximately 2ft. 9 inches (838 mm.) apart.

Fig. 54 compares depth with the width.

Goodwin (1984, 184) states that '*about 1780, the single fender forward of the fender pair was shortened and fashioned to receive sheaves for the main tack and therefore adopted as a modified chesstree*'.

Utilising the Paired Fenders:

The two fenders placed close together, sometimes called the 'skids', acted as a type of guiding track for hoisting in barrels, boxes and other items. Fig. 55 illustrates the method of '***parbuckling***' - the hauling up of rounded objects such as barrels.

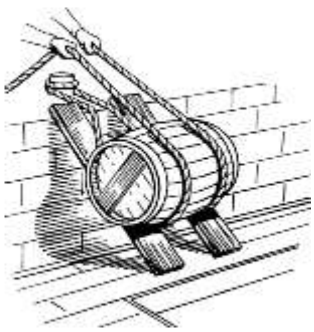
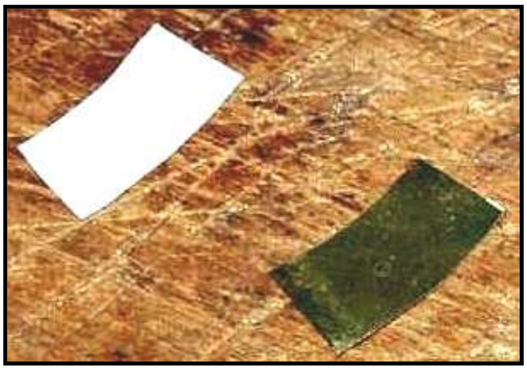
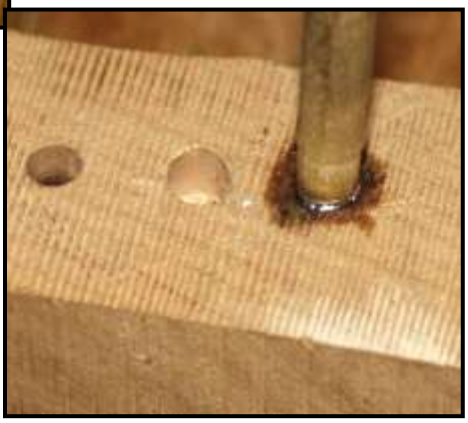
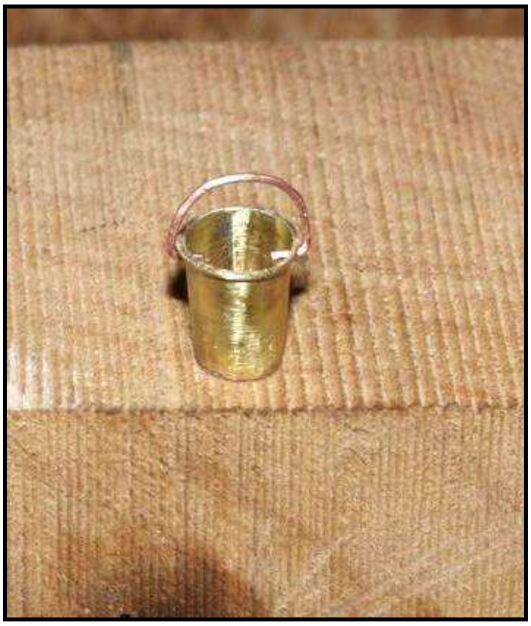


Figure 50: Modelling 'Parbuckling'

Fire Buckets







Hatchways & Scuttles

There is some confusion over the terms '*hatchway*' and '*hatch*' … from some reading, there seems to be a consensus that the former refers to the space and latter to the physical structure. There were a large variety of hatch covers but this article only describe the basic ones that were typically flat or slightly curved.

Hatchways varied in size according to their function but the significant one was the main hatch (slightly afore of the main mast) which had a clear run through all the underlying decks. Since the fore/aft length was determined by the distance between the supporting deck beams, some beams were curved to maximize the hatchway length (Fig. 95). Even so, multiple numbers of hatches were commonly fitted. Also in the waist of the ship was the fore hatchway located just aft of the focs'le deck break. Other hatches with ladders allowed for the movement of men between decks. Another feature were the steam gratings fitted over small hatchways in the focs'le deck forward and above the stove(s) to allow for venting of steam.

Generally, the kit builder is presented with a number of hatchway openings over which a grate or a series of grates (or a solid hatch) of a slightly larger size are directly added onto the deck surface (Figs. 93 & 94)

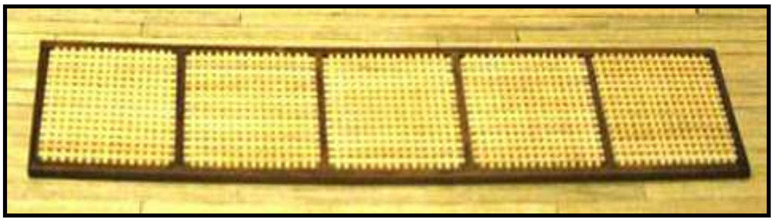


Figure 51: Main Hatchway (simplified approach)

Figure 52: Outer Frame Constructed

In both Figs. 93 & 94, the main hatchway is covered by grates directly fixed onto the deck surface. The latter one is an attempt to simulate the coamings and ledges that surround the separate grates.

Framework Historical Detail …

- raised above the deck surface from 3 - 12 inches (***76.2 – 304.8 mm***.), depending on the size of the ship.

  [This was to reduce the amount of sea water spilling onto the decks below and as a safety factor for persons walking along the deck].

- fore and aft head ledge pieces were supported by the deck beams.

  .

- side coamings were supported by carling/ carline timbers.

- head ledge pieces had a camber approx. 1.5 inches (***38.1 mm.***) greater than the deck camber.

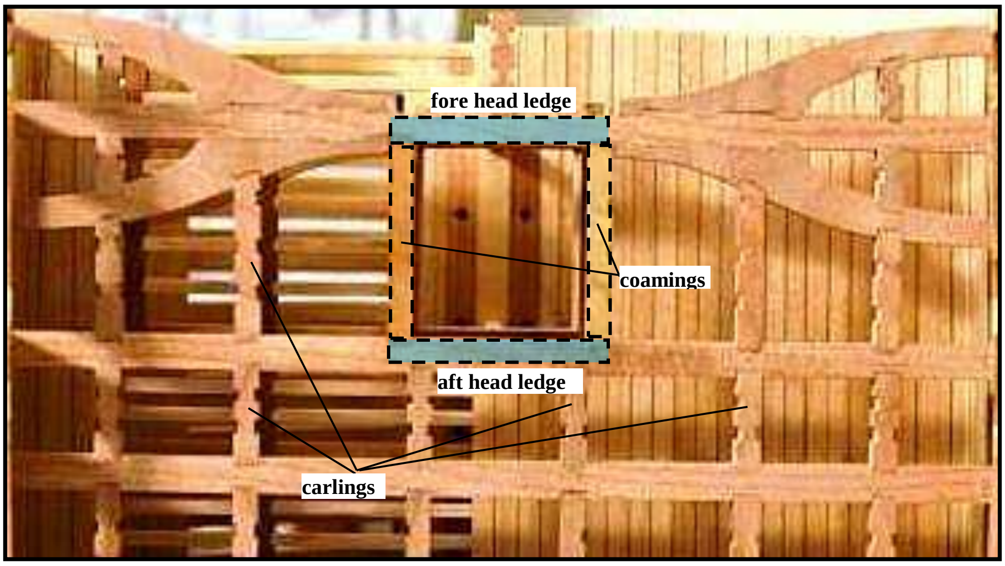


Figure 53: Supporting the Hatchway Frame

Frame Construction

Fig. 96 shows the angle joint often used which was designed to offer the greatest strength in holding the four sides together. Two bolts (indicated by the broken red lines) held opposite sides down onto deck beams locking the other two firmly in place.

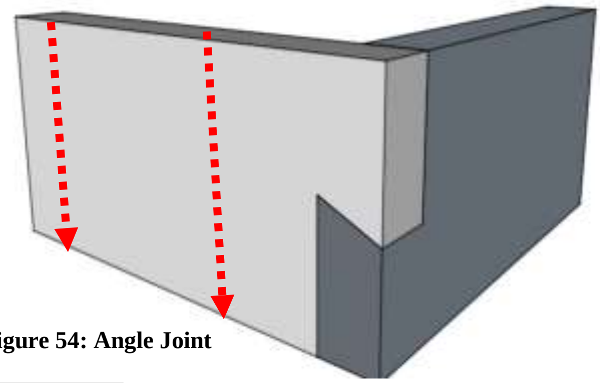


Figure 54: Angle Joint

Figure 55: Simplified Joint

Hearths & Stoves

Figure 56: VOC Amsterdam (1748)

Fire was an ever present danger in these wooden ships. In the early seventeenth century, these heavy brick hearths were well down in the ship for stability and consisted of enclosed pits over which cauldrons were suspended or set on iron grills.

Figure 57: VOC Batavia (1628)

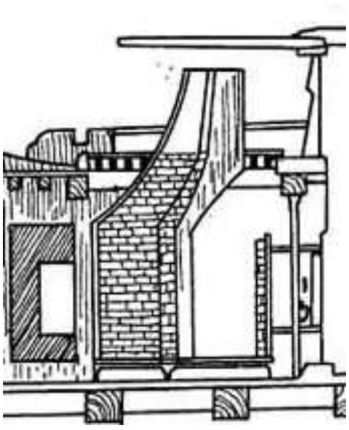


Figure 58: Hearth Under Foc'sle Deck on the La Renommee

This position deep down afforded the galleys great protection from shot but also meant their close proximity to the ship's magazine. Another disadvantage was the difficulty in venting the heat and cooking odors. Towards the end of the seventeenth century, efforts were made to locate the galleys under the forecastle deck (Fig. 100) or at the fore end of the middle gun deck in three deck ships and although easily damaged during conflicts, these galleys were now distant to the magazines. They also were easily vented either through actual chimneys or just an open grate Stability was not an issue due to major structural changes in the bow that broadened the ship.

French Hearths & Stoves of the 18C

74 gun ship, 1780
L'Aurore, 1784
Le Requin, 1750
Boullonge, 1758
L'Aurore, 1784

As a builder of Navy Board type ship models, Olivier Bello ('Arsenal Modelist') between the years 1989 – 2011 produced five different models of French ships to an exceptionally high standard. They are ...
On his website - http://www.arsenal-modelist.com/index.php?page=ship,

1. The 'articles' for the *Boullonge* build are exceptional in their detail and certainly worth reading [a few photos to illustrate his work would have been included here but attempts to contact Olivier Bello to seek his permission have been unsuccessful].

2. The 'accessories' section gives some very enlightened information about cooking equipment on French ships during the 18C http://www.arsenal-modelist.com/index.php?page=accessories and includes the following sub-topics …

- **the kitchens** (which refers to the following points)
  A number of annotated slides showing the elementary formation of the two kitchen timber walls reinforced by X-beams. The floor is covered with metal plates, a layer of salt and then a layer of bricks. The internal walls (side walls and separating wall) are of brick held by mortar as well as metal straps. One slide shows a curved ***twin*** smoke stack/ 'stack' arrangement which would vent through an open hatchway or possibly a grate. In either case, the stacks would need the capacity of being rotated dependent on the actual wind direction.

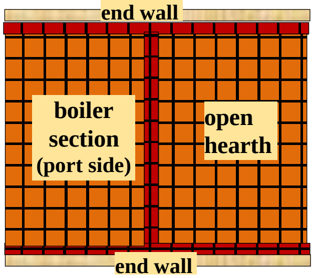


Figure 59: Plan View of Kitchen

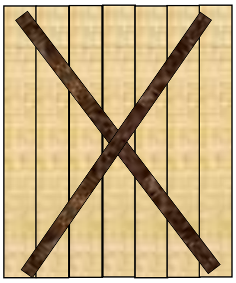


Figure 60: End Wall

- **metal kitchens** (which refers to the following points)
  A number of annotated slides showing the all metal stove found on a 19C ship and so is not applicable to this discussion.
  -
- **superposed kitchens and ovens** (which refers to the following points)
  A number of annotated slides showing an all-metal oven found in the French East Indian ship, *Boullonge*. Of rather an unusual curved design, it has no actual flue and was mounted on a deck below the general kitchen area.

- **stove** (which refers to the following points)
  A number of annotated slides showing the difference between catering for the general crew and the officers. Three additional stoves (on a typical 74 gun ship) were provided for the officers … "located on the second deck, two on the port side between the first three guns and one between the kitchen and the pastry oven" (Olivier Bello, accessories, part 33). There is a belief that none of these lower deck ovens were flued through to the top.

Just to add to the above comments, this comment appeared on MSW from Special Contributor, Mark Taylor …*"Sometimes the information (about such structures) is highlighted and other times you find them on a plan sheet where you least expect it … the French kitchen/stove/fireplace … unlike the larger frigates, the eight pounder frigates had half the fireplace on each side of the main bitts and between the first two gunports. I stumbled across this in the* Belle-Poule *monograph"*. [La Belle Poule – Frigate – 1765 by Jean Boudriot & Hubert Berti, Ancre Monograph]. The arrangement either side of the main bitts is not the case in this ship model (Fig. 103).

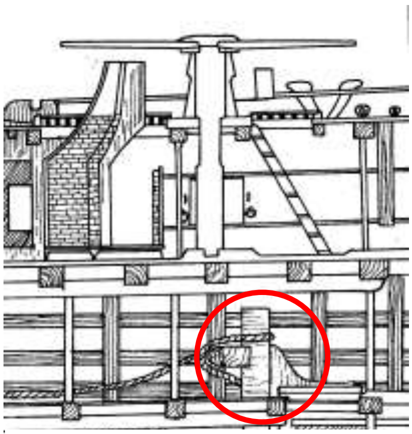


Figure 61: Kitchen Above Main Bitt

English Self-Contained All-Metal Stoves

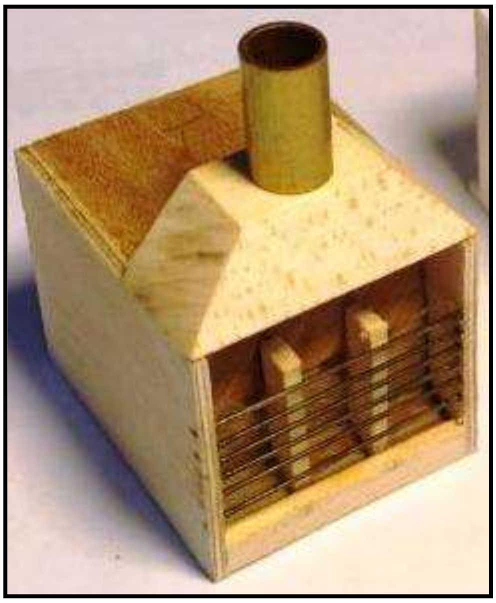
Figure 62: HMS Victory (1765)

Between 1650 and 1850, galley fire hearths underwent a significant change from brick hearths to self-contained iron stoves, the most used being the Brodie Stove.

Figure 63: HMS Warrior (1860)

There are a number of excellent examples of model stoves being constructed by members of the MSW ...

http://hmsfly.com/brodieGalleyStove.html
http://modelshipworld.com/index.php/topic/10979-armed-virginia-sloop-patrick-henry-by-docblake-lauck-street-shipyard-scale-132-pof-admiralty-style/page-5
[for some reason, this link does not work but will enable a manul link to be made within the forum]



From the last reference (by Doc Blake, with permission), these photos well illustrate the type of possible outcome ...

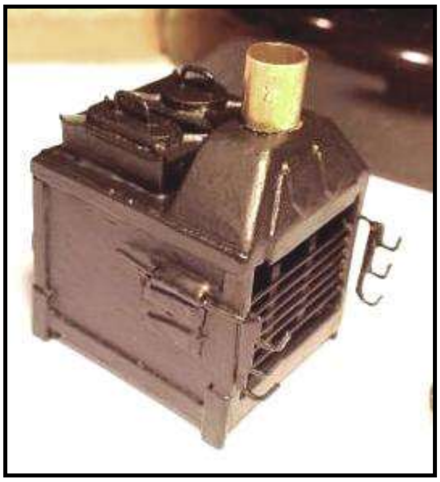


Figure 64: Brodie-Style Model Oven

Knee of the Head

The '*knee of the head*' is a **continuation of the stem** (stem post) and is a large flat piece of timber supporting the ornamental figure placed underneath the bowsprit. Being extremely broad at the upper part, it is composed of many parts.

It is secured to the bow of the ship with horizontally mounted knees ('*cheeks of the head*') at the lower end (Fig. 107).

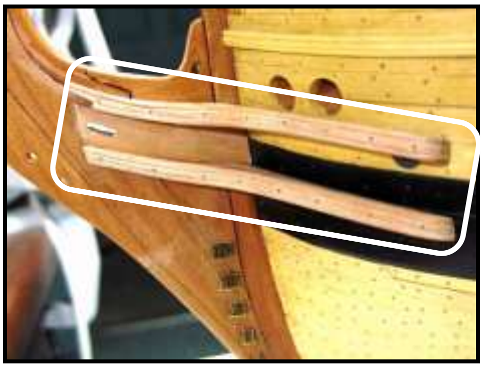


Figure 65: Cheeks of the Head

The upper end is secured to the stem by another knee, the *standard* (Fig. 108).

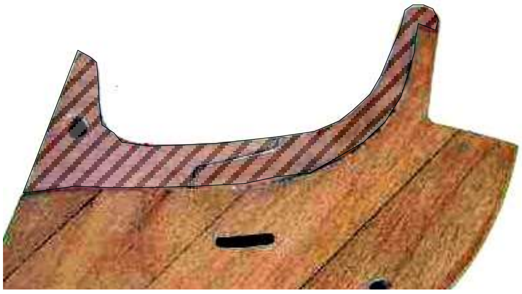


Figure 66: Standard (& Extension)

Interestingly it appears that the term '*knee of the head*' was one used by the designers/ builders but the seamen referred to it as the '*cut-water*'. [Falconer: http://nla.gov.au/nla.cs-ss-refs-falc-0769]

The typical kit build supplies a blank piece (Fig. 109) for the knee of the head and from my own observations, that is how it is used. It seems a great shame to ignore the representation of individual timbers used in this knee and with a little effort, scribed lines could be created to good effect.

Figure 67: Laser-cut Knee of the Head

Having said that, it must be remembered there was a great variation in how the timbers were put together in different periods of ship building as well as between different shipyards. So the pattern scribed onto a blank piece could be quite variable.

However, there are some key elements to this pattern:

- ***cut-water pieces*** – the most forward part of the knee, formed of a collection of several pieces of timber, creating a wide upper part, where it projects forward from the stem to open the body of water as the ship sails through [Falconer: http://nla.gov.au/nla.cs-ss-refs-falc-0405]. Due to its being a number of timbers, the actual configuration in relation to the whole knee is distinctly variable.

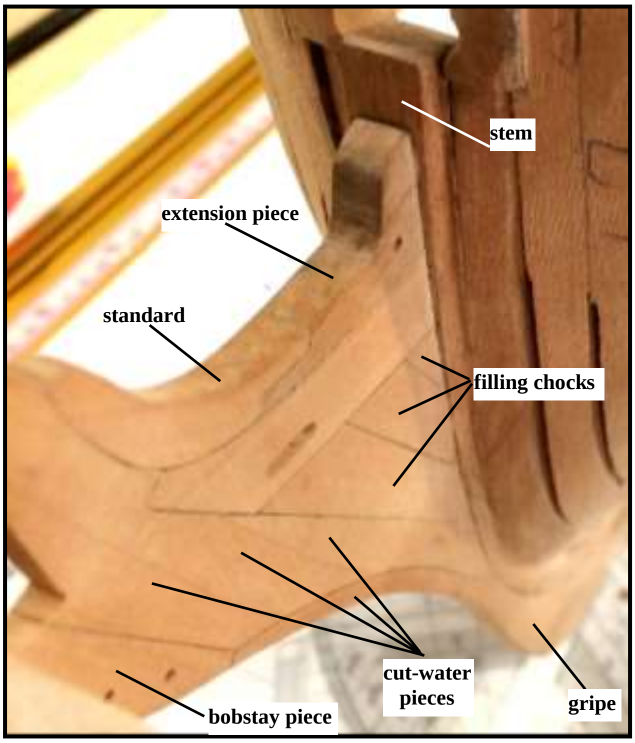


Figure 68: Knee of the Head Components

- ***standard*** (often with an extension piece)
- ***bobstay piece***
- ***forefoot*** (or ***gripe)*** - is connected by a scarf to the extremity of the keel with the other end curved upwards and attached to the lower end of the stem [Falconer: http://nla.gov.au/nla.cs-ss-refs-falc-0559]. As Fig. 111 illustrates, variations in configuration were widespread and here the stem (pink) is set back behind the cut-water (grey) but still scarphed into the forefoot (yellow).

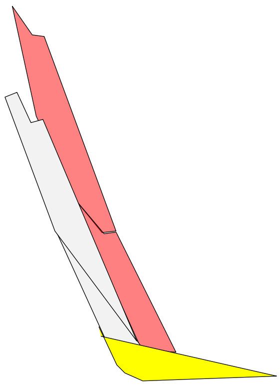


Figure 69: Forefoot & Stem

Figure 70: Forefoot (or Gripe)

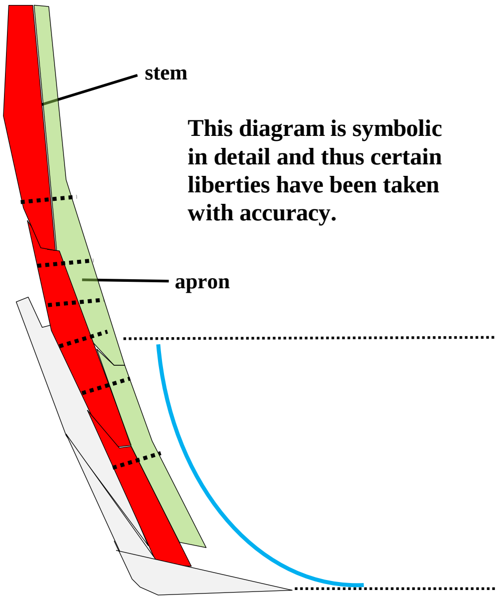


Figure 71: Stem & Apron

- ***stem (stem post)*** – usually consisted of three pieces of timber (Fig. 113, red); the lower section had a distinct curvature between the lower gun deck and the keel. The upper secion was near perpendicular.

- ***false stem (apron)*** – due to the inherent weakness of the stem pieces and the joint it forms with the keel, a false stem consisting of two pieces was placed aft of the actual stem in such a way that its joints were offset to the stem joints – the stem and the apron then being bolted together.

Boxing & Coaking

Originating from the term 'boxsum', an earlier shipwright's term, *boxing* refers to the joint formed between the fore end of the keel and the heel of the stem. Whilst plain scarphs were used, a coaked scarph was more commonly used in the second half of the 17C and the first quarter of the 18C. [*coaking* employed either a square or round section half embedded (Fig. 115) in both pieces forming the scarph; this prevented the two pieces sliding longitudinally or laterally]

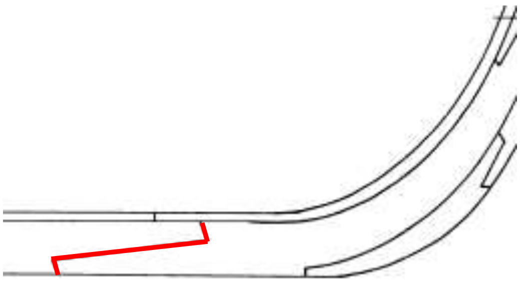


Figure 72: Boxing

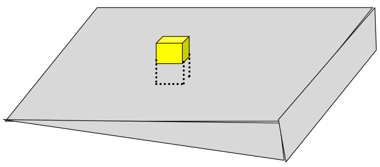


Figure 73: Coaking

Before the boxing joint was secured, a ***layer of flannel soaked in tar*** was placed between the two joining surfaces. The joint was then secured with six to eight copper bolts, similar to those used in the head of the knee assembly. At least in this joint, a dark line would be visible and I wonder whether a similar process was used in all of the head of the knee joints.

…and a beautiful assembly of pieces (reproduced by permission) for the follower of scratch builds …..

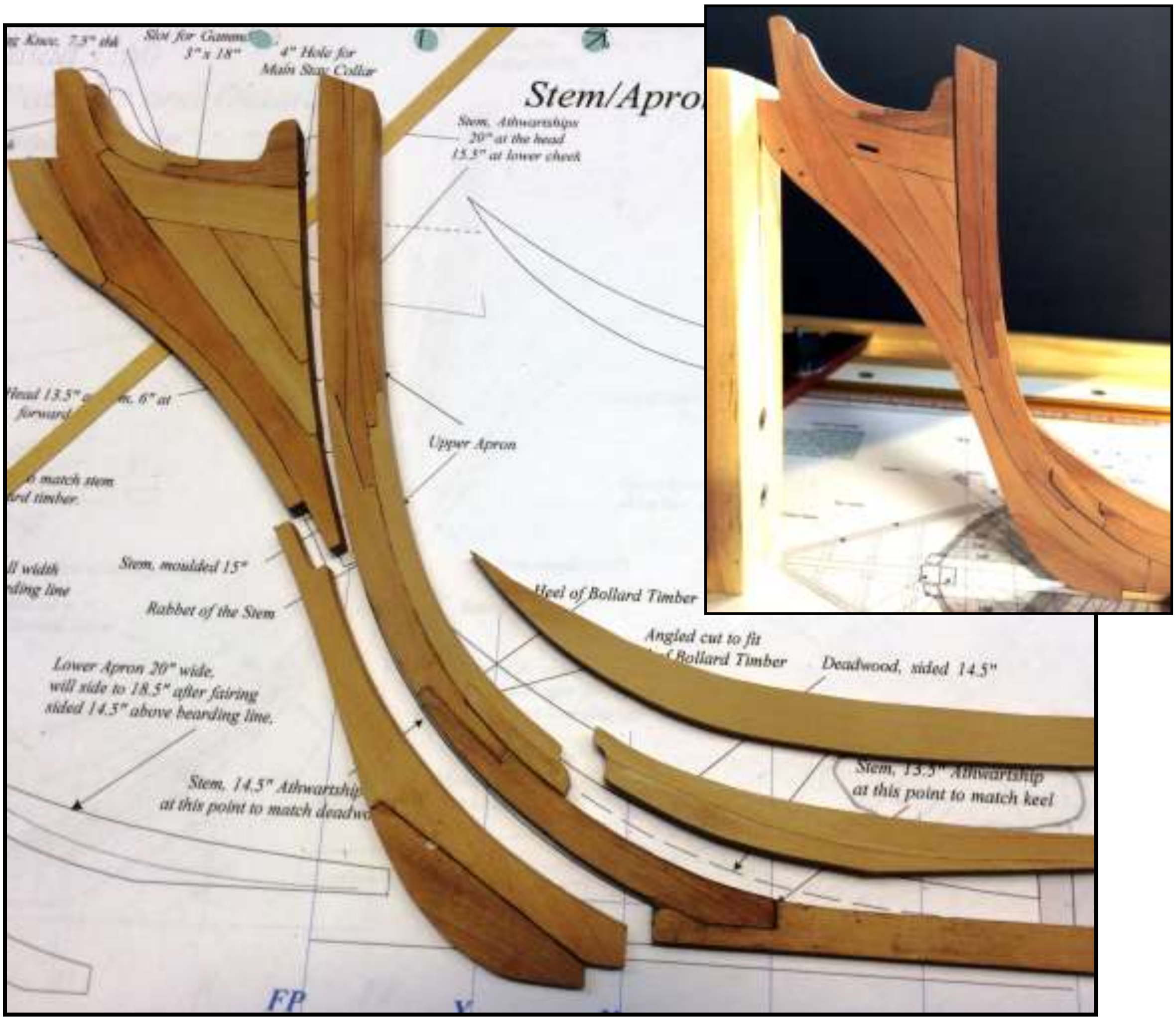


Figure 74: The Beauty of a Scratch Build

Lanterns

From William Falconer’s Dictionary of the Marine, the description for an early British lantern (read as ‘lant horn’) is described as follows ... *“**LANTHORN, a well-known machine, of which there are many used in a ship, particularly for the purpose of directing the course of other ships in a fleet or convoy: such are the poop and top-lanthorns, &c.**” The windows that allowed the tranmission of light were made from animal horn – a tough material less likely to break than glass.*

There is a classic piece of construction of a ship’s lamp to be seen on Model Ship World Forum [search for …*L'Amarante by giampieroricci]*. This goes beyond the skills of many people but nevertheless is interesting to read.

Figure 75: Two Stages of a Lantern Construction

It has been suggested that lanterns at the stern were first introduced at the end of the 16th C and in use until the end of the 18th C [Goodwin, 1987, 205].

Ship lanterns frequently burned whale oil, often refined from the blubber of a Right Whale but the odour was rather unpleasant. The Bottlenose Whale provided an alternative oil (sometimes called "Arctic sperm oil"). It was cheaper but inferior to true sperm oil.

Sperm oil (actually a liquid wax) was highly valued for this purpose since it burned far longer for a given mass, created no odour and produced a much brighter flame than the other oils. However, its relative scarcity made it more expensive, which is why it was mainly used in naval vessels where the governments were able to afford the additional cost.

Figure 76: Octagonal Lantern, *Batavia* (1628)

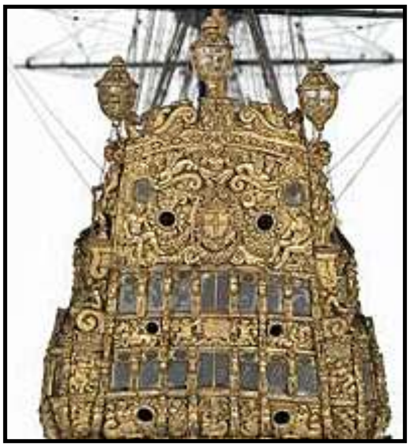
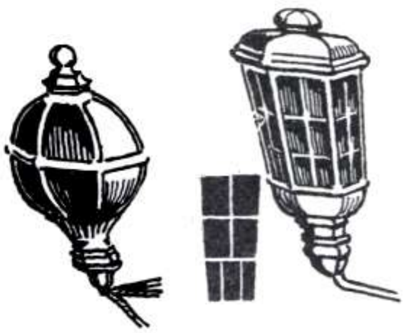


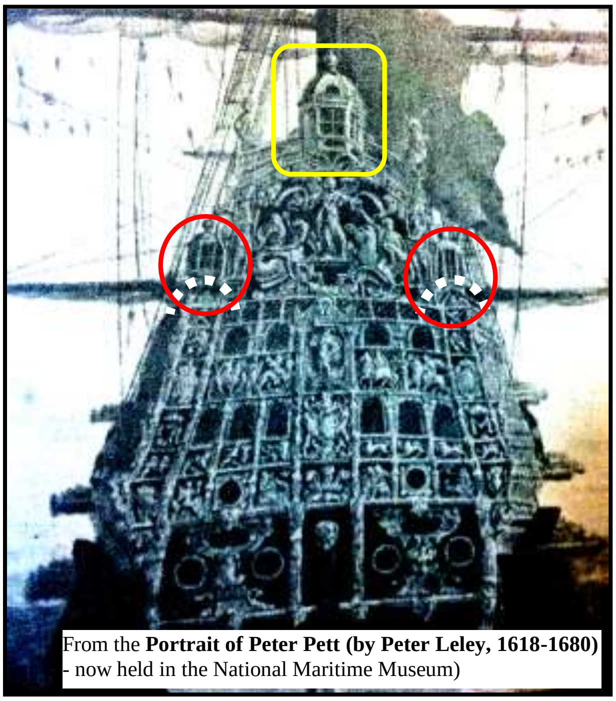
Figure 77:Conoid Lantern with Heavy Top Ornamentation, Royal Katherine (1664)

Figure 78: Heptagonal Lanterns, *Victory* (1765)

Figure 79: Lanterns, *HMAV Bounty* (1784)

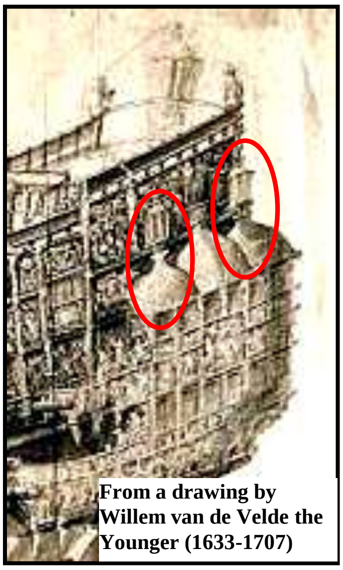


The positioning of the lanterns during the Stuart period (1603 - 1714) is of interest due to the narrow width of the stern and this is confirmed in Leley’s painting in 1637 of the Sovereign of the Seas. The central lantern was suspended from the poop deck but the side lanterns could not be fixed to the narrow taffrail of the transom to create a suitable separation. So two lanterns (per side) were fixed onto both the fore and aft domed roof structures of the quarter galleries (Fig. 76).



From the **Portrait of Peter Pett (by Peter Leley, 1618-1680)** - now held in the National Maritime Museum)

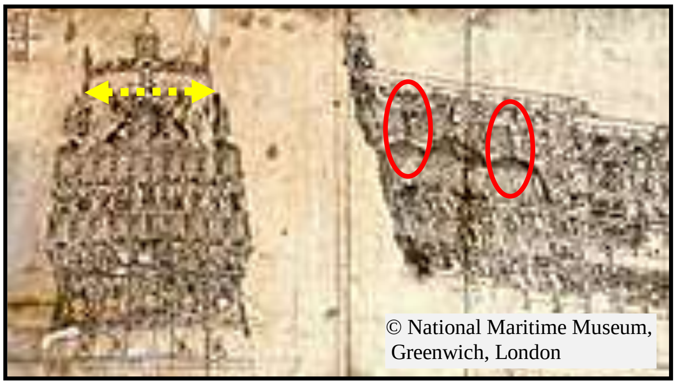
Figure 80: Stern Lights of the Sovereign of the Seas, 1637



From a drawing by Willem van de Velde the Younger (1633-1707)

Figure 81: Quarter Gallery Triple Domes

The plan refers to the ship as the *Royal Sovereign*, which was her name after the 1659-60 rebuild.



Mast Partners

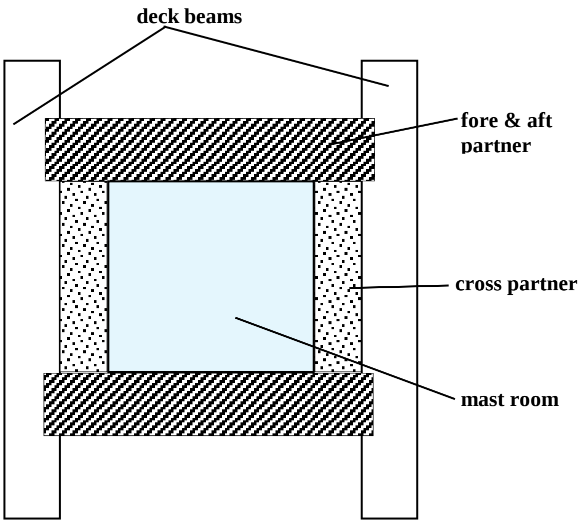


Figure 82: Surrounding Partners

The partners were those timbers at deck level through which the mast passed …

- ***fore & aft partners*** (deck carlings)
- ***cross partners*** (baulks)

They also included (Fig. 97) …

- ***chocks***
- ***wedges***

The fore & aft partners had increased scantling with a breadth = 0.5 x mast diameter.

The athwartship distance between the carling faces (& cross partners) was determined by the mast diameter to which was added 10 – 12 inches. This extra space allowed for the fitting of wedges around the mast. [The term '***mast collar***' is sometimes, but incorrectly, used to describe the ring of wedges.]

Chocks were set into the faces of both the fore & aft and the cross partners. When first fitted in their undressed state, they were oversized but were then dressed back to produce a rounded out diameter, equal to that of the diameter of the mast plus ***10 – 12 inches*** (***254 – 305 mm.***). This generally left a space of approx. ***4 – 5 inches*** (***98 – 122 mm***.) around the mast. The wedges were driven in from the top but care had to be taken with the shape of the fore and aft positioned wedges to allow for the mast rake.

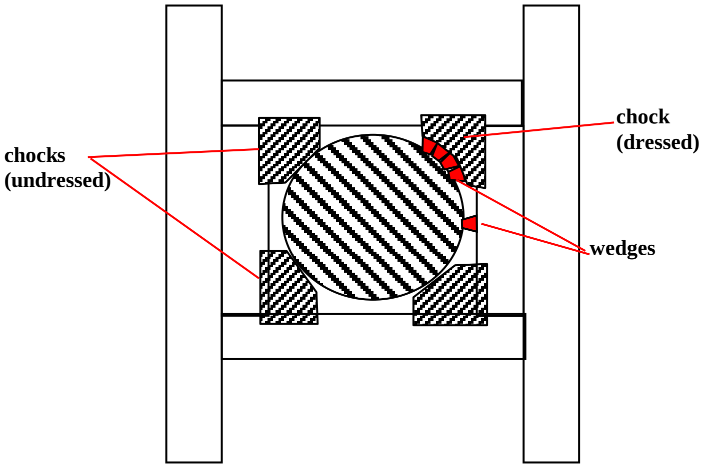


Figure 83: Chocks & Wedges (simplified diag.)

Figure 84: Wedges

A ***canvas cover*** or '***apron***', sometimes called the '***mast coat***' was generally used to cover over the wedges and was either nailed or secured with rope to the mast and a second rope pulled in at the bottom. Its function was to create a water-tight seal around the mast and the cover was usually coated with tar. The bottom rope could easily be removed to allow inspection of the wedge integrity around the mast. Movement of the wedges could be expected after going through a severe storm or even staying on the same tack for prolonged periods of time. In either case, the severe strain would cause some loosening of the wedges.

Navigation

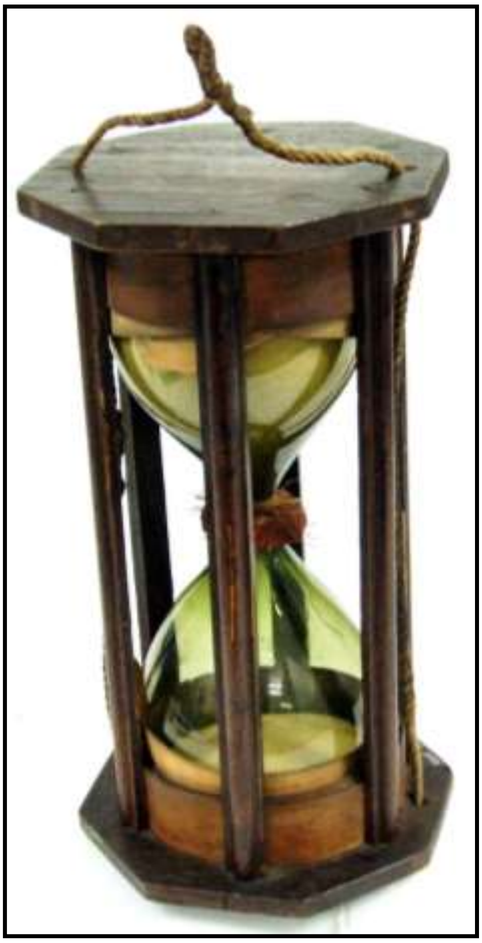


Figure 85: Watch Glass © National Maritime Museum, Greenwich, London

The Watch

Watches were organised so that crew could be rotated through tasks that required constant attention throughout every twenty four hour day that the ship was engaged on long voyages.

In the sailing ship era, time was measured by the turning of a sand glass by the Midshipman of the Watch every half hour with the start of each day cycle being determined when the Sun reached its daily zenith. The ship's bell was rung every half hour in such a manner that the crew could determine how long they had been on duty and when the relief was due to take over.

The crew could be divided into either a two-watch ('starboard' and 'larboard/port') or three-watch ('fore', 'main' and 'mizzen') system. The latter gave the crew a full eight hours off but was not widely used.

The 24 hours were divided into seven watches:

- five ***4- hour watches***, and
- two ***2-hour watches***.

The inclusion of the two shorter watches had the effect of swapping the crew around so that the same people were not always on duty at the same times. The watches were …

Afternoon Watch - 1200 to 1600 (noon to 4 pm)

First Dog Watch - 1600 to 1800 (4 pm to 6 pm)

Last Dog Watch - 1800 to 2000 (6 pm to 8 pm)

First Watch - 2000 to 2400 (8 pm to midnight)

Middle Watch - 2400 to 0400 (midnight to 4 am)

Morning Watch - 0400 to 0800 (4 am to 8 am)

Forenoon Watch - 0800 to 1200 (8 am to noon)

During these watches the bell was rung each half hour with the number of rings being increased by one each time.

0.5 hour into the watch	= one bell	**8 half-hour segments**
1.0 hour	= two bells	
1.5 hour	= three bells	
…		
watch ending	= eight bells	

[N.B. dog watch ended at four bells]

Figure 86: Maritime Compass

Compass

Given the scale of model ship building, most builders will not be constructing the actual compass. Sufficient to say that it consists of a magnetized needle pivoted freely over a compass card. The needle is sensitive to the earth's magnetic field and will align itself with the north and south magnetic poles. This then provides a reference alignment for the navigator.

Compass made by Sawtell, Nautical Optician, Divett Street, Port Adelaide, South Australia – photo with permission from South Australian Maritime Museum

Chronometer

Figure 87: Marine Chronometer © National Maritime Museum, Greenwich, London

Sextant

Figure 88: Sextant, circa 1790 © National Maritime Museum, Greenwich, London

Estimator Log & Line

Figure 89: Estimator Log & Line
© National Maritime Museum, Greenwich, London

The log-reel, line, ship's log and sand-glass were used for determining a ship's speed.

To do this, the log was dropped overboard and the line allowed to pay out from the log-reel for a set time from the sand-glass (28 seconds). As the line paid out the number of knots in the line that passed through the hand was counted, thus giving a measure of the ship's speed. The log and line was first described by William Bourne in 1574 and was used for measuring ship's speed into the 20th century, although mechanical speed logs were introduced from the 19th century. © National Maritime Museum, Greenwich, London

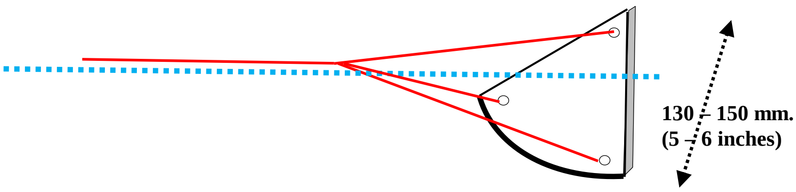


Figure 90: Log in Use

The log was partially submerged in the water and its position was kept relatively upright by the use of the three support ropes as well as a strip of lead along the bottom edge (and just visible in Fig. 79).

Lead Line

Figure 91; The Leadsman, © National Maritime Museum, Greenwich, London

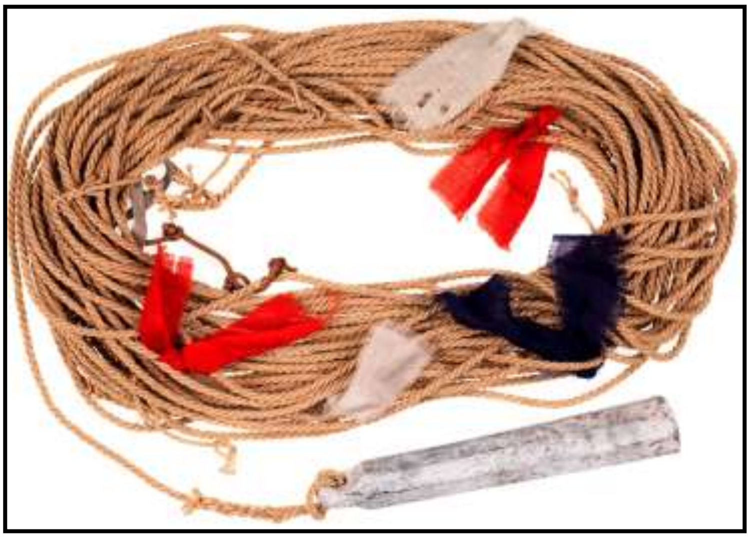
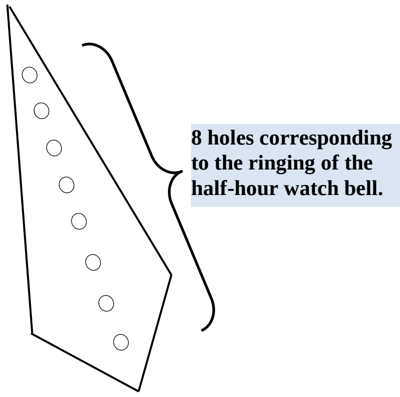


Figure 92: Sounding Lead & Line, © National Maritime Museum, Greenwich, London

Traverse Board

Figure 93: Traverse Board, *Batavia*, 1628



The board was a memory aid formerly used to record the speeds and directions sailed during a watch. It could even be used by crew members unable to read or write and was used in northern Europe from the 16C.

Upper Portion (direction)
Shaped in the form of a rosette, this circular form had a series of holes along lines marking the points of the compass. Fig. 82 is more basic and has only 16 points but Fig. 83 (from a later time period) has 32 points. Pegs were attached to the board by string and placed in the correct hole for the course being steered, normally one hole for each half hour of the watch.

Lower Portion (speed)
Also, each hour, a peg was inserted in the bottom portion of the board to represent the speed (using a log and line) sailed during the hour. If the speed for the first hour of the watch was 10½ knots, the crew member would count over 10 holes in the first row and place one peg, then place another peg in the column marked "1/2". In the second hour of the watch, the crew member would use the second row of pegs, and so on until all 4 rows were used.At the end of each watch the records were written down, either by the ship's master or navigator, and the pegs pulled out ready for the next watch.

Figure 94: 32-Point Traverse Board,
© National Maritime Museum, Greenwich, London

Pumps

Rails

A number of specific strakes, but identified as rails, were to be found fitted along the upper part of the ship’s length. They all followed the sheer of the ship and most carried one of a number of different designs on their outboard faces. They were …

- sheer rail
- waist rail
- drift rail
- planksheer
- fife rail

Sheer Rail

Above the upper wale came ‘*great rail*’ which traversed the whole length of the ship following the sheer and soon became known as the ‘*sheer rail*’. Although it could be confused as being the upper part of a wale pair, it is readily distinguishable by its ornamental appearance (Fig. 88) when compared to a wale which traditionally was plain. Its chief use was officially described as a demarcation line above which there was commonly ‘black work’ sometimes with ornamental friezes.

After the Restoration (i.e. post 1785), the sheer rail ran through the line of upper deck ports and so it added nothing to the strength of the ship. This point is also illustrated in Fig. 88.

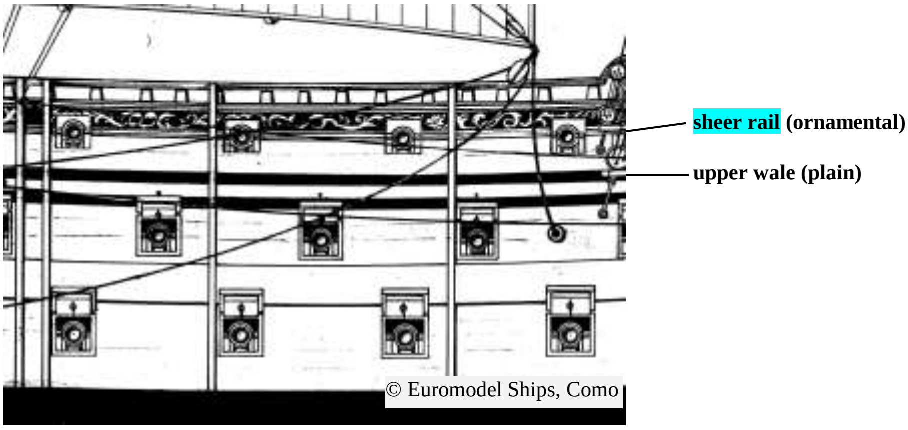
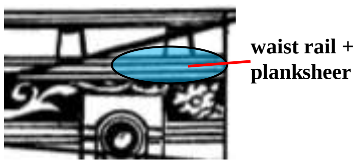
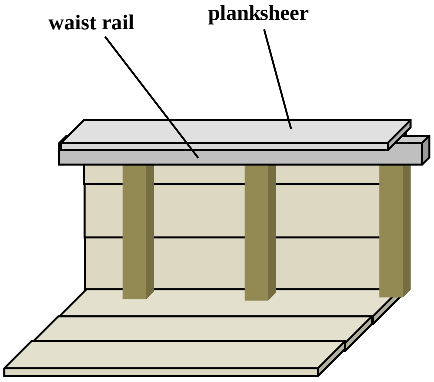


Figure 95: Sheer Rail & Upper Wale

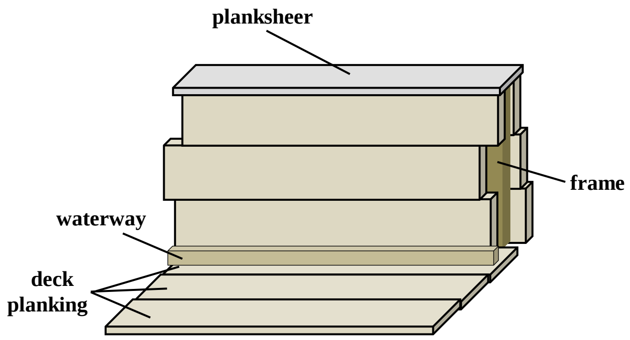
Waist Rail

Above the sheer rail came the waist rail which was mortised over the heads of the top timber frames in the waist and covered by the planksheer (Fig. 89).





Prior to the mid-1500’s, the planking was carried out on the outside only to a height of approx. 2 feet (590 mm.), leaving the timber frames exposed.



By the mid-1500's, planking was carried out on *both sides* of the upper frames. Construction principles were similar in both the large merchant ships and war ships.

However, by the mid-18th. C, the interior bulwark planking in the merchant ships began to be omitted. By the 19th. century, the top frame timbers were only extended as far as the waterway and covered over by a 'covering' board. Bulwark stanchions were added by fixing to the frames underneath – but only to every alternate one.

The length of the waist rail varied enormously over time and between individual ships. There was an initial tendency to make it run from fore to aft but by the Restoration, it was often stopped short at some distance from the stern (ending at the poop deck hance or the quarter deck hance). Shortly before 1700, it reverted back to the whole length. So the waist rail arrangement was of little help in identifying the date of a ship.

During the period of the shipbuilding establishments, the waist rail often hanced up under the quarter deck hance and was therefore continued at aft but at a higher level. The *Royal William* (1670) is a classic example of the use of hancing to create a ***continuous waist rail*** from cathead to stern.

HANCING PIECES

A 'hance' is a step made by the drop of a rail at the top of the ship's side to a lower level. Thus there is a hance where the poop rail ends, another for the quarter deck and others at the end of the waist. These breaks were initally square brackets but soon became covered by elaborate ornamentation.

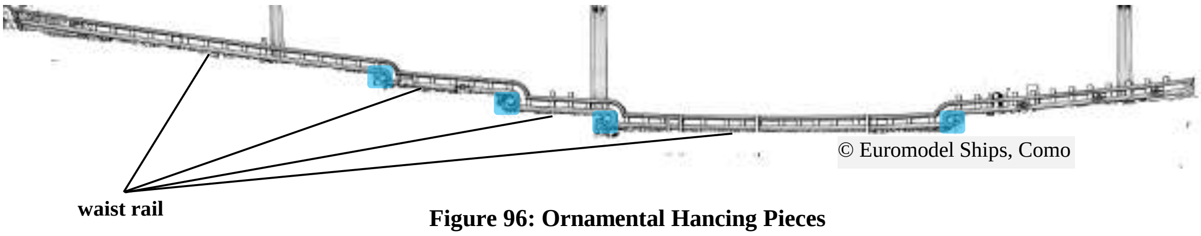
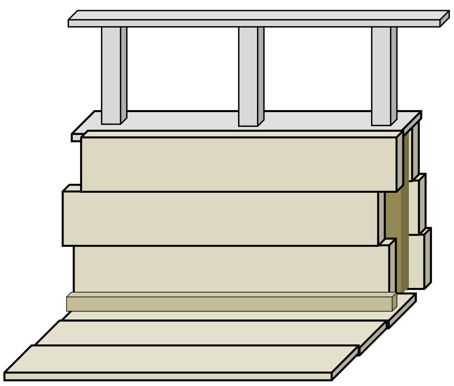
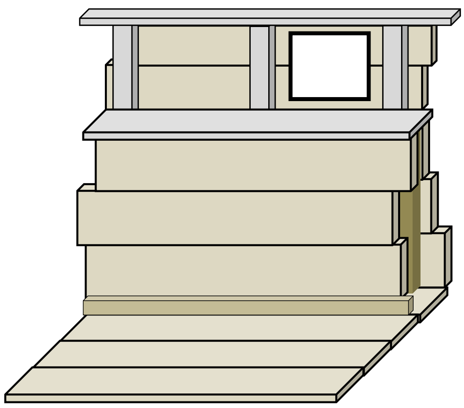


Figure 96: Ornamental Hancing Pieces





Drift Rail

Sanitation

There is a discussion on this topic ... http://nautarch.tamu...mons-MA1985.pdf (the file ***is*** safe!). Carr Laughton (1925, 218) adds an entirely different aspect not covered by the previous pdf file when he states … *" the 'little houses' in the main chains, which though not very often shown in pictures, and never in models was a regular feature of the ships in the 17C. About 1705 – the exact date has not been determined – it was entirely superseded by the round houses of the head."*

Provision for sanitation divided the ship into different categories …

- totally sheltered & private (roundhouses on Prow Deck for midshipmen)
- sheltered but not private (Quarter Deck for officers), and
- totally exposed and not private beakhead grating for the general ship's company.

Seats of Ease

Roundhouse

Figure 97: Portside Roundhouse

For much of the eighteenth century, roundhouses were a feature of naval vessels. The function of these semi-circular structures fitted to the fore side of the Prow Deck bulkhead was to *provide heads for the midshipmen.* They gave more privacy and also protection from exposure to the weather.

They were generally sited between the last two foc'sle stanchions giving the base a slight overhang of the ship's side (Fig. 102 does not show this essential overhang). The 'seat of ease' was secured on the interior outboard side which allowed waste to pass straight out from the ship.

The following photos (with permission) are from a posting by a member of the MSW – collectively they give a stimulating idea of approaching this type of construction.

Figure 98: Round House Construction

Height Estimation for the Seats

In the 18C, the average height of men in the English military services was 65.3 inches.[John Komlos und Francesco Cinnirella: European Heights in the Early 18th Century Munich Discussion Paper No. 2005-5, Department of Economics University of Munich].

Given that current toilets/ lavatories/ WC bowls in Australia are approx. 400 mm. (16 inches) above floor level in height and that the average height for men is approx. 1756 mm. vs 1658 mm back in the 18C, it would seem reasonable to provide seats of ease around 377 mm. in height. Thus at a scale of 1:72, this would mean approx. ***5.2 mm.***

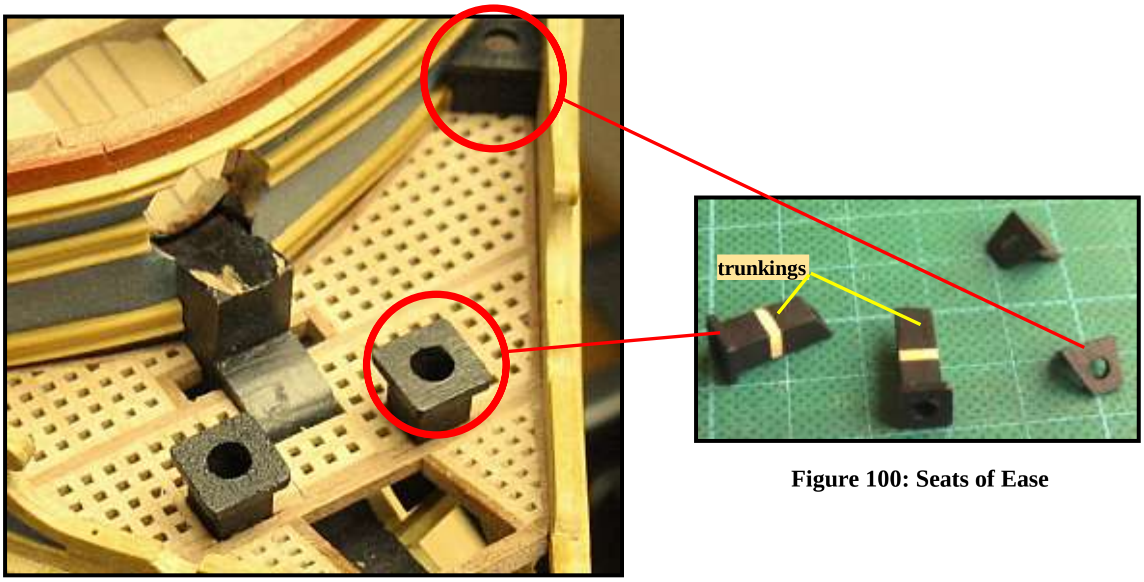


Figure 100: Seats of Ease

Positioning of General Seats of Ease

The seats were generally multiple in number and each seat often had accomodation for a number of persons at the same time. Where they were sited was very much at the whim of the carpenters whilst the ship was being constructed and so no specific detail can generally be found. On some ships, the seats of ease were placed out on the fore part of the fore channel. Fig. 125 shows a single seat of ease out in the open over the beakhead grate but also wedged in between the bowsprit and the bulwark. Fig. 124 illustrates the more common multiple seats of ease.

Figure 101: *Jylland* Seats of Ease

Figure 102: *VOC Batavia* Seat of Ease

It was quite common to have chutes (trunkings) underneath and the cleanliness was dependent on the action of waves breaking over that trunking area. Whilst in port, the trunkings were extended down towards the water level by the temporary addition of flimsy (canvas ?) tubes.

Pissdales

Figure 103: Pisshole; *Jylland*

Steerage

Hand Tiller

The hand tiller was a horizontal lever that traversed left and right creating the turning motion for the rudder. Ash was the preferred timber as it would not crack under normal conditions. They were square in cross-section along their entire length – at the aft end where it entered the mortise in the rudder stock, it was one half of the athwartships width; at the fore end, it was considerably less. Iron tillers were introduced in the second decade of the 19th century.

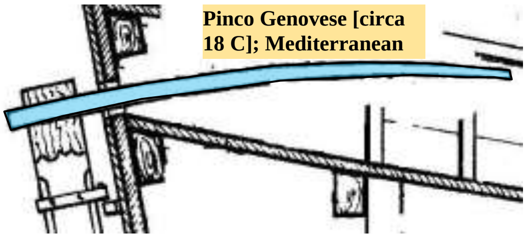


Figure 104: Tiller

Whipstaff

This system consisted of two levers – the whipstaff itself and the tiller arm. The tiller arm was set in a horizontal plane and again made from ash with its aft end fitted into a mortise in the rudder stock. The rudder blade movement produced a transverse movement in this beam … so up to this point, it behaved exactly the same as the tiller arm by itself (as described above.).

The whipstaff (usually made from ash) was set in a vertical plane. This beam rotated around point A (Fig. 128) which was so positioned to create a large mechanical advantage. The lower end of the whipstaff engaged with the fore end of the tiller, creating a network of levers between the helmsman and the rudder. The maximum angle of rudder that could be achieved in either

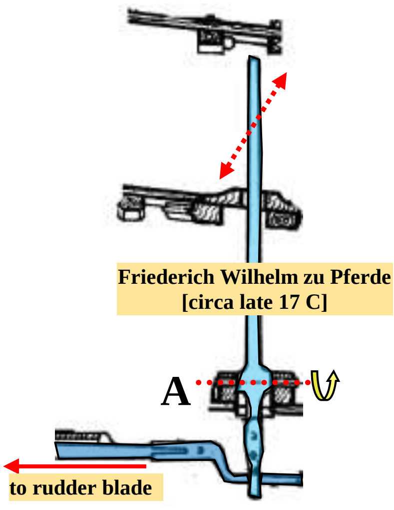


Figure 105: Whipstaff

direction was 20º (although with block and tackle, it could be increased to 30º). The operation was simple in that the whipstaff was turned in the same direction as it was required to turn the ship. The whipstaff was circular/ octagonal in cross-section, tapering towards the top end.

The whole system was far from being robust and so headsails were a necessary part of manoeuvring the ship – the rudder only being used for the finer aspects of steering. To gain extra leverage – especially during rough seas - on the massive tiller arm, a system of tackles were often added (Fig. 130 below).

Figure 106: Tiller and Whipstaff

Figure 107: Tackle System Added to Tiller

Ship’s Wheel

As a precursor to the ship’s wheel, a windlass with its axis sited athwartships was introduced onto English ships in the first decade of the 18C. Detachable crank handles were used to turn the drum windlass and a single continuous rope extended down to the tiller fore end via a set of blocks and sheaves. With blocks and rope, a more precise control and a greater mechanical advantage control made this form of steerage easier than with the whipstaff. Being out on the Quarter Deck, response to orders was more rapid and perhaps the greatest advantage was the 60^{o} rudder blade change in either direction. Disadvantages included not being able to view the change in direction when manning the crank handles, the drum diameter was small and therefore required many turns and causing injury through the sudden transmission of ‘whipping’ by the rudder blade in heavy seas.

Soon after the introduction of this windlass, it was decided to turn the whole assembly 90^{o}, dispense with the crank handles and introduce a large spoked wheel followed by a second wheel a few years later. This system had many advantages …

- larger turning diameter of the wheel allowed more effective control,
- rudder whip unlikely to cause injury,
- helmsman could watch both the sails and the ship’s heading,
- larger diameter drum meant fewer revolutions to turn the rudder

Figure 108: Wheel from HMAS Protector

Figure 109: Double Ship’s Wheel; VOC Amsterdam

Figure 110: Under Poop Deck; HMS Victory

Initially, the wheel was aft of the mizzen mast but in the latter part of the 18C, it was shifted forward of that mast (Fig. 133).

On large ships, the wheel had a maximum diameter of just over 5 feet (approx. 1.53 m.) that allowed it to just fit under the Poop Deck. The centre of the wheel consisted of a metal spindle which was surrounded by a cylindrical timber barrel that was generally cylindrical but by the end of the 18C the barrel had a larger diameter at its end which compensated for slack in the tiller ropes. In the early 19C, these barrels were given grooves to hold the ropes in position.

Figure 111: Covered Tiller Head; replica HMB Endeavour

As a result of the natural hemp rope stretching, a number of innovations in the tackle system below decks were required to overcome this slackness but the actual mechanics involved are left for some further reading.

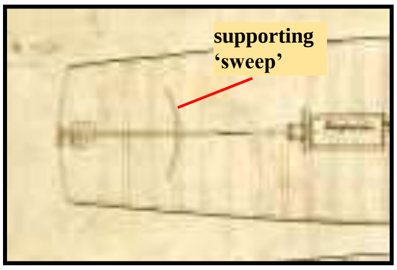


Figure 112: Portion of an Old Plan for the HMB Endeavour

On smaller ships in the 18C, the steering head was covered by some small structure but the remaining parts of the steering system were left unprotected. The tiller arm would obviously place a great stress on the rudder post and in many ships, such an arm was supported by a sweep mounted underneath. Such a device is suggested in the following old plan for the HMB Endeavour but not shown in Fig. 135.

That the sweep was shown in a diagram and not included in a replica of that ship generated an interesting discussion on the MSW forum.
http://modelshipworld.com/index.php/topic/13109-hmb-endeavour-tiller-and-steering-question/page-2?hl=rudder

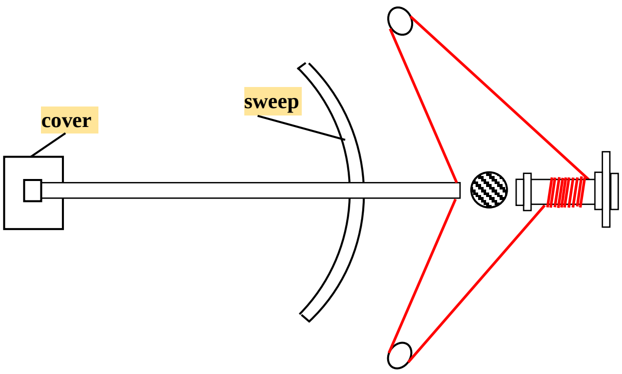


Figure 113: Steering System for a Small Ship

Rudders

Tillers & Rudder Pendants

Stem Post (refer to Knee of Head)

Windows

Creating Spaces

With the many metal components involving window panes available for model ships, the majority will be 'in-filled' with the metal as one solid piece. It is common for builders to paint the window panes a light blue colour to simulate reflection of the blue sky.

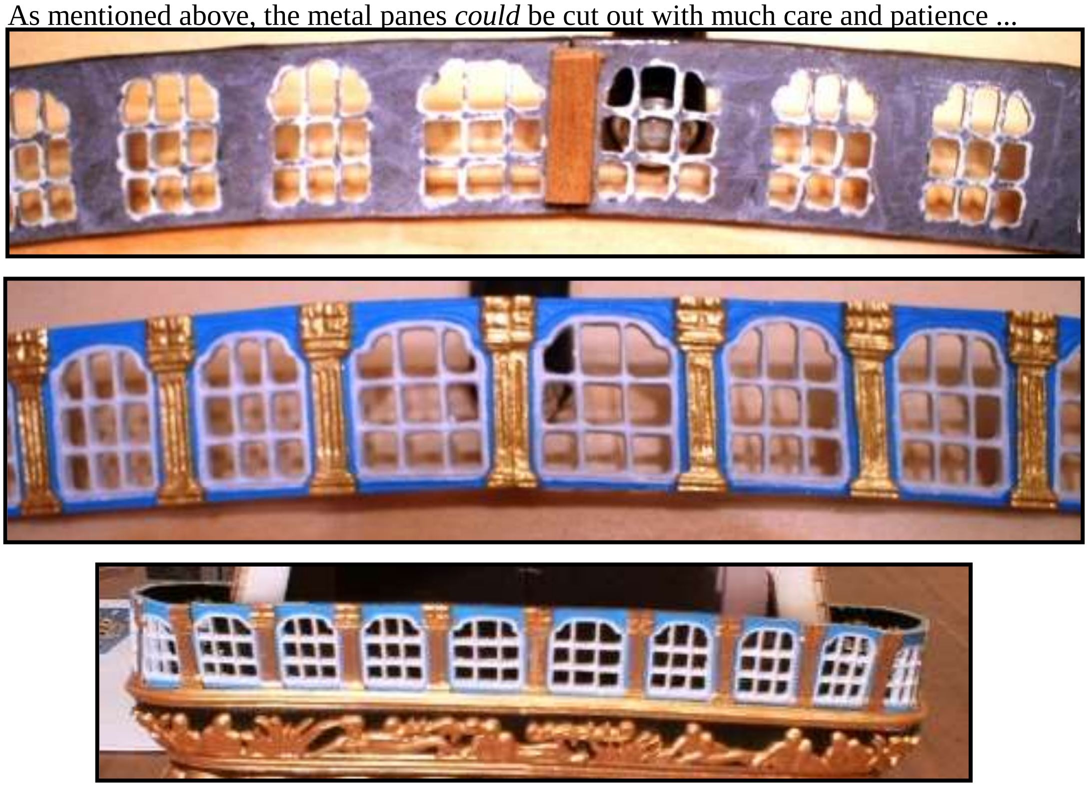
Figure 114: Spun Glass Panes

This section is included for those ardent enthusiasts who go to the trouble of milling/ filing out the panes and then infilling with some transparent material. The methods are numerous and varied but two are offered here out of general interest.

Up until the early 19 C only spun glass was available for glazing, limiting pane size (a large bubble of glass was attached to a glass spindle, spun at high speed, producing a flat disc of glass – a window pane was cut from that disc].

Most panes during this time period were only about ***15"*** high (approx. ***5 mm***. at 1:72). That would correlate well with the many ship models seen.

As mentioned above, the metal panes *could* be cut out with much care and patience ...



A hole was drilled in the centre of each window pane. The holes were then opened up with a #11 exacto knife & really small files. The metal is just soft enough that it can be cut with a sharp blade.

Figure 115: Steps in Milling Out the Panes

Filling Spaces

Method 1: Fixing small microscope glass cover slips
Method 2: Fixing in flexible transparent plastic sheeting

Methods 1 & 2 are simple to execute. Method 3 creates a PVA film ‘in situ’. In all three cases, the resultant pane is set back further than it should be but to the casual observer, that is of little consequence and so, unsurprisingly, all these methods are commonly used.

Method 3: Utilising PVA (based on a posting by ‘Janos’ on the MSW Forum; with permission)

Requirements:

- PVA glue – a common woodworking glue,
- flat working surface such as glass or plastic sheeting,
- sharp blade

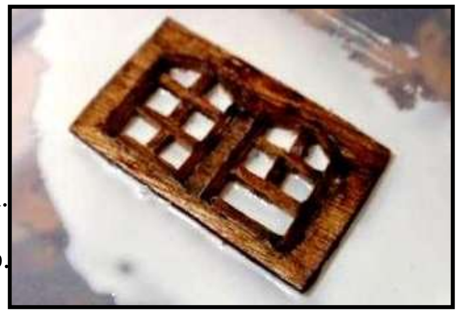
The 'glassing' can work on pre-fabricated windows (the one shown is old and damaged) or it can be used to just 'manufacture' glass panels which are then cut into the right size with sharp scissors or blade.

a. place a drop of the adhesive (can be also slightly diluted) on the flat surface,

b. smooth it out with a steel ruler or knife blade,

a.

b.

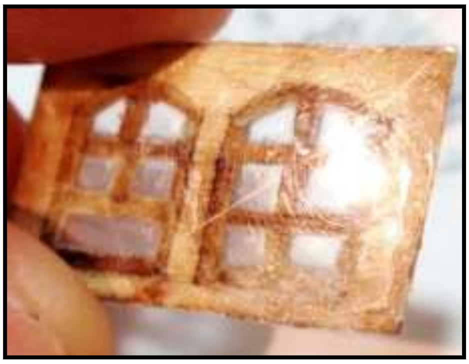


c.

c. the 'panel' is ready now or if making glass applied directly to a window, then the back of the window is gently pushed into the glue (don't oil the frame beforehand),

d.

d. wait until it gets thoroughly dry (approx. 24 hours),



e. with a sharp blade, slice off the panels and cut to size or remove the window from the surface

f. for any surface apart from a flat one, the formed separate panels are flexible and can be glued on using a few drops of the same adhesive.

Figure 116: Two-Pack Expoxy

Method 4: Epoxy Application

Window panes can be produced 'in-situ' by pouring a liquid plasticised mixture into each window frame space. There are many similar craft products available - Craft Smart Liquid Gloss is one such example available at Spotlight in Australia.

Requirements:

- two-pack epoxy resin
- flat or contoured work surface
- mixing container & stirrer
- straw

The slow drying mixture allows time to fill/flow into the window panel spaces. When the two packs are mixed, the heat will generate some bubbles but these are easily removed by using a straw to blow across the surface after pouring. As with similar compounds, it contracts slightly on drying, often leaving a hollow in the middle. This then is similar to the window pane example shown above; or it can be filled with a second application.