BACKGROUND RESOURCES for MODEL SHIP BUILDING

Part 2

The majority of photos used are taken (with permission) from ***Model Ship World*** postings.

piratepete007
2016

Useful Reference Texts

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)]

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

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

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

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 (if I have overlooked somebody and not acknowledged their name, I sincerely apologise and please let me know).

In alphabetical order, they include …

Amateur
banyan
Brian C
Dan Vadas (especially from his posting for HMS Vulture)
DaveRow
Denis R
Doc Blake
GuntherMT
guraus
hornet
Janos
JerseyCity Frankie
J.P.
KeithW
Marktiedens
marsalv
Michael101
mikec
Mike Y
mtaylor
Navis Factorem
Ollagynot
Pucko (for assistance in creating some CAD's)
QA's Revenge
shopaholic
Tadeusz43 [from his collection of photos 'Art of Period Shipbuilding']
tlevine
Vince P
zoly99sask

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

Contents

Illustrations

[The figures below are not hyperlinked]

HULL DETAIL

Anchors and their Operation

Manufacture

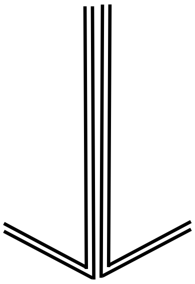


Figure 1: Metal Strips Forming an Anchor

A popular belief is that anchors would be a single casting but in fact that metal form would have little strength. Small anchors were sometimes made by forging a bloom of metal but the larger ones were formed from a ***multitude of metal strips*** 'forge welded' together by intense heating and hammering. This is portrayed symbolically in Fig. 21. In 18C, the technique of forge welding a number of thin pieces into one mass was often inaccurate leading to internal weaknesses. The 18C saw vast improvements in manufacture and even though the Navy Board required the maker's name and date of completion to be included on the anchor, it was invariably omitted due to concerns of blame coming back to the workers involved in the manufacture.

For a detailed discussion on anchors, there is an excellent article by H. Jobling, 1993. *The History and Development of English Anchors* http://nautarch.tamu.edu/pdf-files/Jobling-MA1993.pdf

From the H.M.S. Buffalo (a ship that took early colonists to settle in South Australia), an anchor was salvaged and careful examination of the lines on the anchor surface in Fig. 22 clearly depict the process of forge welding.

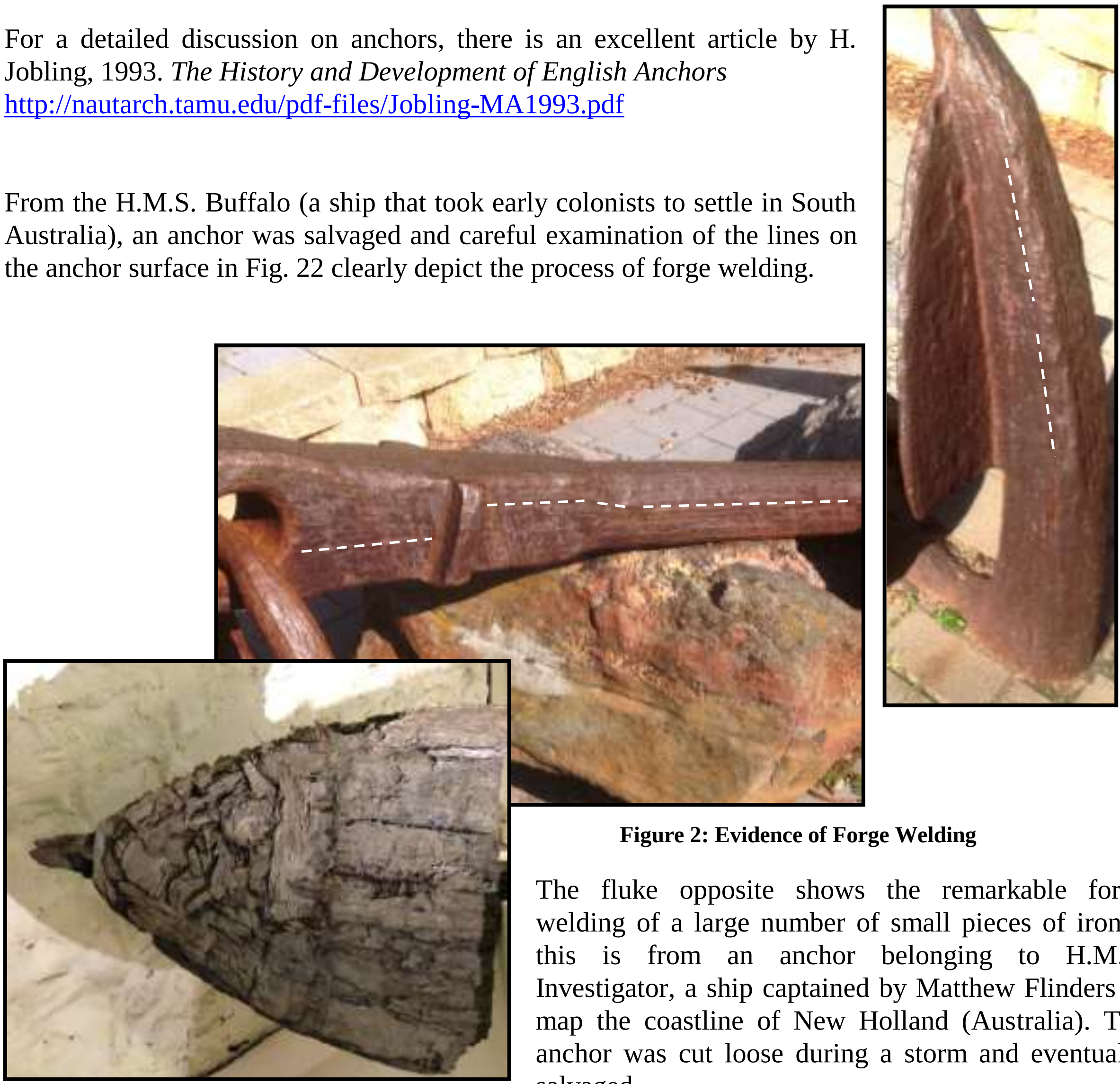
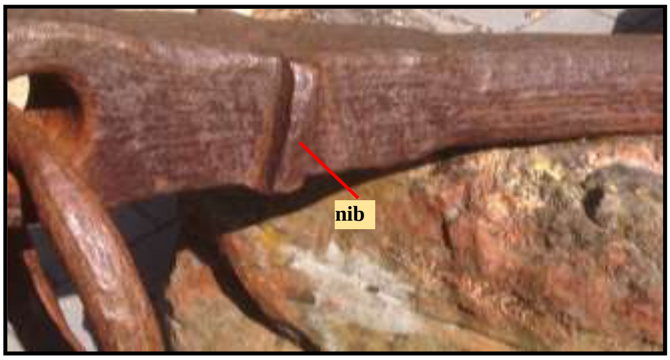
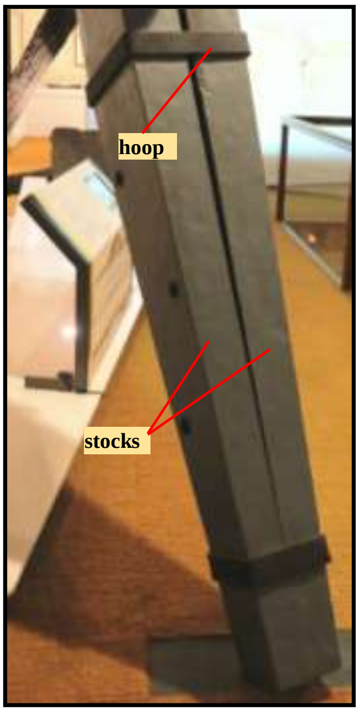


Figure 2: Evidence of Forge Welding

The fluke opposite shows the remarkable forge welding of a large number of small pieces of iron – this is from an anchor belonging to H.M.S. Investigator, a ship captained by Matthew Flinders to map the coastline of New Holland (Australia). The anchor was cut loose during a storm and eventually salvaged.

Terminology





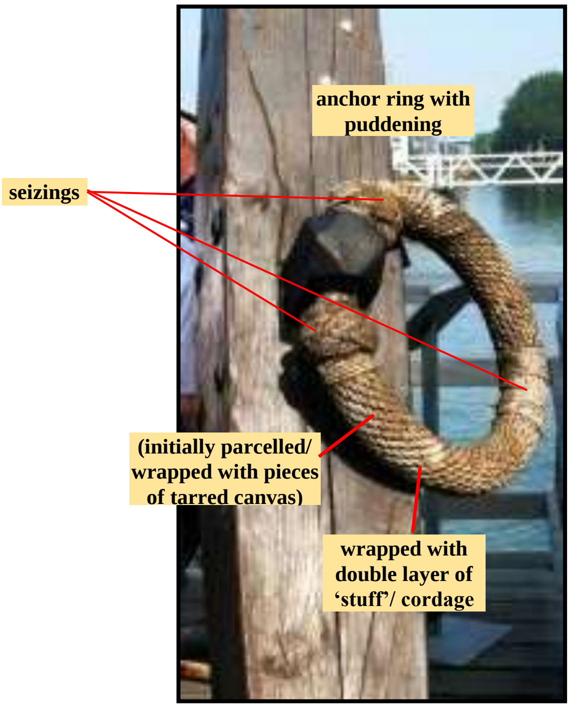


Figure 3: Anchor Features

Types

Bitts

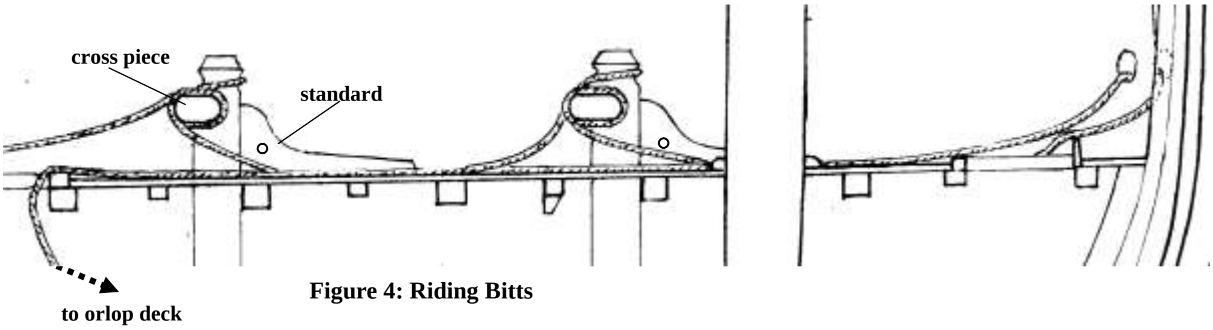


Figure 4: Riding Bitts

Figure 5: Ridding Bitt, *Batavia*

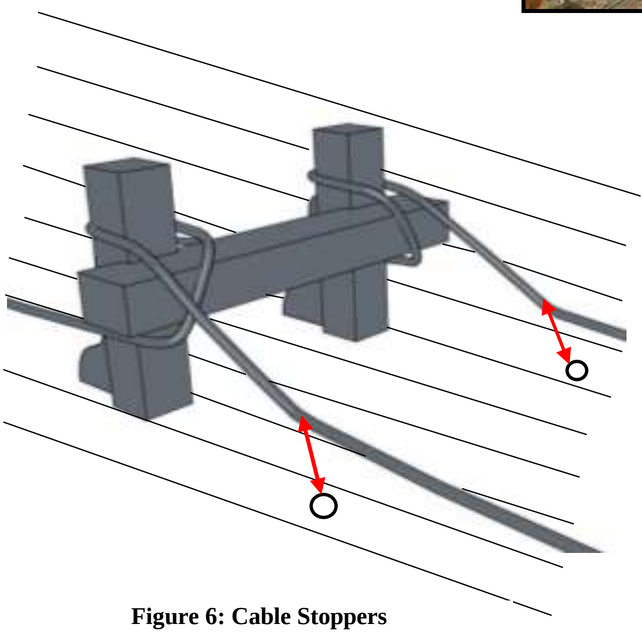


Figure 6: Cable Stoppers

Cables, Hawse Holes & Timbers

[N.B. This discussion is partly based on the drawings for the Euromodel Royal William]

First rate ships in the 17/18 C typically had 19 inch hawse holes which at a scale of 1:72 would be ***0.26 inches/ 6.7 mm.*** The cable was variable in diameter but for a 19 inch hole, 8 inch cable would have been typical [i.e. ***0.1 inch/ 2.8 mm.***]. The kits supply ***1.5 mm.*** as the maximum diameter – not surprising considering what is available after a search of suppliers; sizes larger than this have limited use. However, there are a few larger choices out there in the market but they are expensive. Another choice to be made.

Example Calculation - 12.8 m as the Beam Width
Using V.R. Grimwood (2003), *American Ship Models and How to Build Them* and
Peter Goodwin (1984), *The Construction and Fitting of the English Man of War 1650-1850*

i. **circumference of cable** in inches = vessel's absolute width in feet / 2
[e.g. 12.8 m beam is 41.99 feet; 41.99/2 = 21.0 inches]

ii. **diameter of cable** = cable circumference / 3 (i.e. approx. vale for 'pi')
[e.g. 21.0 inches / 3 = **7.00 inches = *2.5 mm* at a scale of 1:72**]

iii. **diameter of hawse hole** = cable diameter x 5/2
[e.g. 7.00 x 5/2 = **17.2 inches** = ***6.07 mm.*** **at a scale of 1:72**]

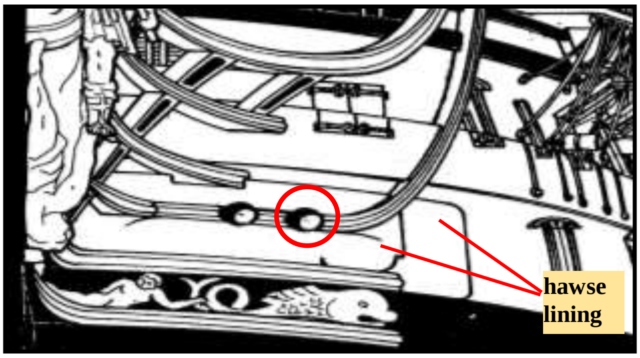


Figure 7: Hawse Plates

Historically, there were a number of different timbers:

- large hawse lining/ plate
- timber segments of oak lining the hawser hole interior surface
- a second, smaller hawse lining/ plate.

Figure 8: Hawse Holes From a Different Model

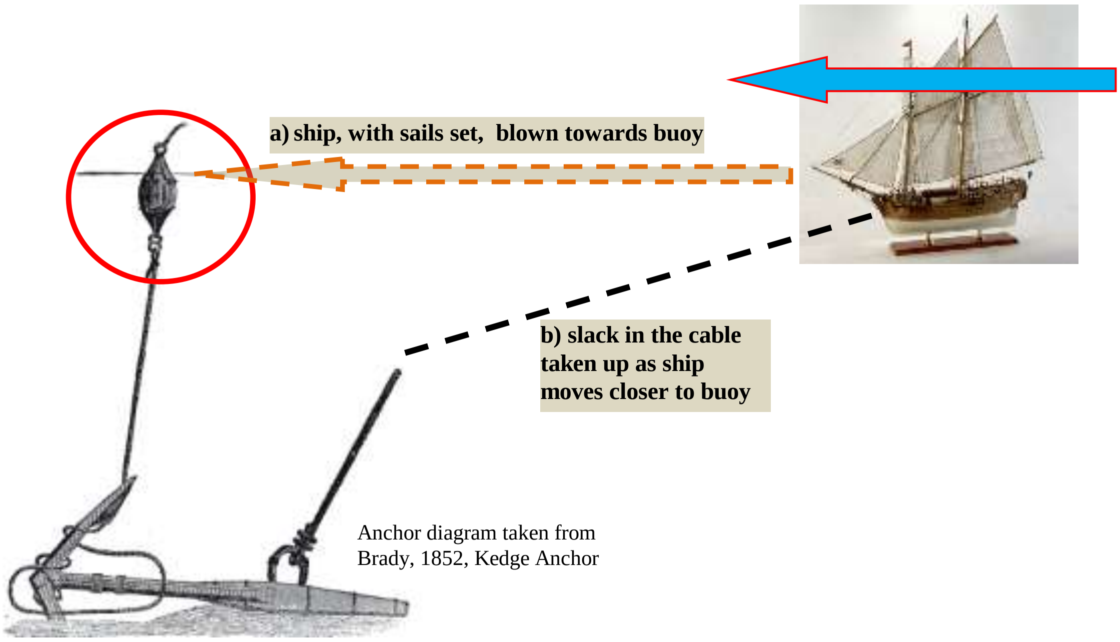
The outer hawse lining in Fig. 27 is shown butting onto the top edge of the upper cheek – how this works out is very dependent on the placement of all the rails. Both plates were made from the nominal '1 mm.' thick planking timber. In this build, that thickness was approx. 0.9 mm. The outer lining shape will depend very much on its relationship to adjacent rails.

- bolsters, with a strong radius on the lower edge were commonly used to reduce chafing of the hemp rope. Sometimes found on the interior surface of the hull as well.

Weighing Anchor

Weighing anchor and getting the ship underway is often and incorrectly thought to involve rotating the capstan and dragging the ship along on its cable before the release of the anchor from the seabed.

Step 1: Utilising Wind to Drive Ship Towards Anchor Buoy

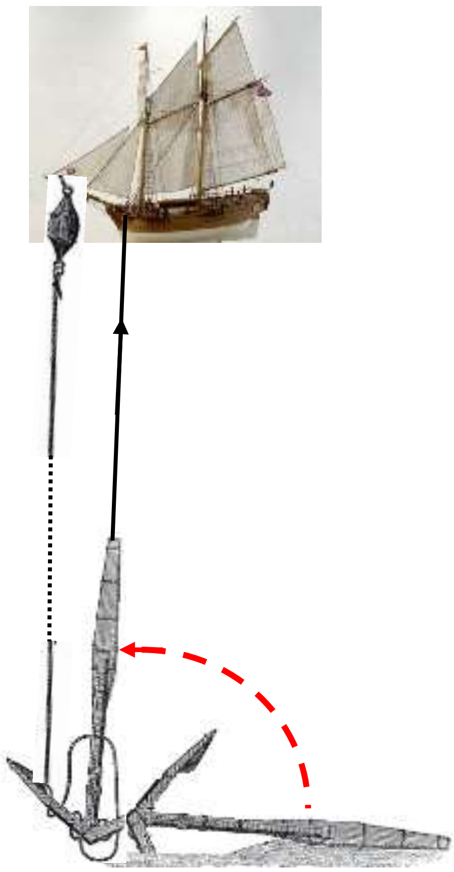


Anchor diagram taken from Brady, 1852, Kedge Anchor

Anchor and Buoy

Step 2: Anchor Raised to ‘Up and Down’ Position

With the forward momentum of the ship – and a stronger pull on the capstan when the ship was close to being over the anchor – the flukes would be freed from the sea bed and the anchor lifted to a vertical position.



Step 3: 'A Hawsing' (Hauling)

Using the pulling force of the capstan, the anchor and cable are lifted upwards in a vertical path.

To haul in the anchor cable, a 'messenger' rope system came into common use in the 1730's and 1740's when the main capstan became a double capstan enabling a greater power input from two sets of men rotating the capstan. The large anchor cable was temporarily attached to the messenger rope via a number of nipping ropes tying the two together. As a nipping tie approached the hatchway through which the cable was passed down onto the orlop deck, a team of ship's boys were engaged to untie the nipping and then run it back to the forward end where the cable was meeting the messenger rope. A new tie was made and that was followed along by each boy in turn. Working well, these boys were termed "good little nippers".

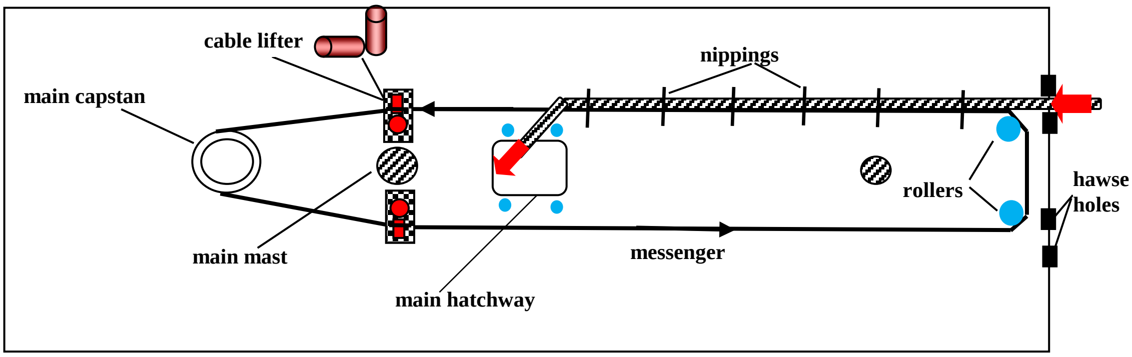


Figure 9: Messenger System

Fig. 28 is diagrammatic but portrays the essentials of the messenger cable system used to haul in the anchor cable.

- A few of the rollers that enabled the smooth flow of the cable through the hatchway are indicated by blue dots but there are more rollers included within the hatchway space as well as on the orlop deck itself.
- Approx. four turns of the messenger cable were passed around the capstan barrel and that was kept at the correct height by a pair of ***cable lifters*** fitted with both horizontal and vertical rollers (refer to Fig. 28 above).
- Essential to the smooth flow of the anchor cable itself were a pair of large, vertical ***rollers contained in the manger area*** immediately adjacent to the hawser holes (Figs. 29 & 30).
- Whilst the hauling part of the messenger cable would taut, the returning part would be slack.

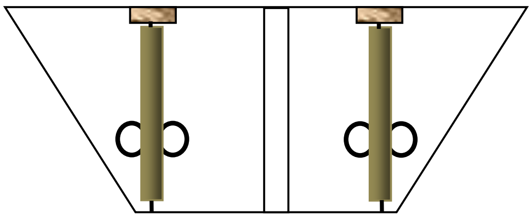


Figure 11: Manger Area with Rollers

Figure 10: Stowage of Anchor Cable

Modelling of HMS Victory's Capstan - http://nautarch.tamu.edu/model/report2/

Step 4: Connecting the Cat Tackle

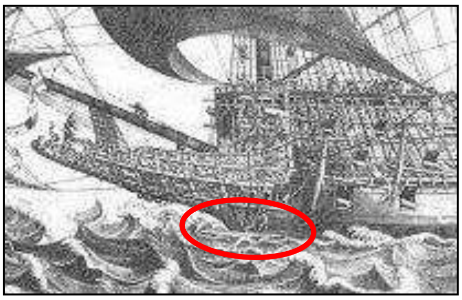


Figure 12: Cat Hook and Anchor Ring Are Joined

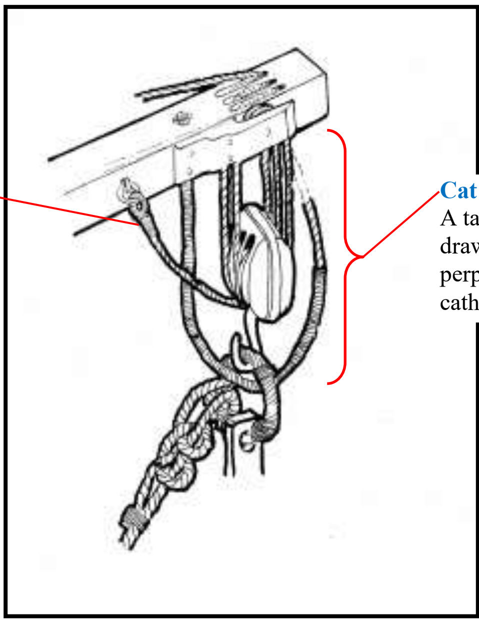
As the timber stock of the anchor breaks through the water, The hook of the cat tackle is connected to the anchor ring. Fig. 31 illustrates this rather precarious task where a sailor standing on the anchor stock can just be seen (although the resolution is rather poor).

Step 4: Catting

The anchor is raised out of the water and vertically up to the cathead using the cat (cathead tackle system)

Cathead Stopper

This rope, anchored with a knot above the vertical hole extending through the cathead, passes through the anchor ring of the bow anchor, over the cathead sheave on the side & hence to a timberhead or similar fixing point on the nearby bulwark.



Cat [Cathead Tackle]

A tackle system used to draw the anchor up perpendicular to the cathead.

Figure 13: Generalised Cathead & Tackle

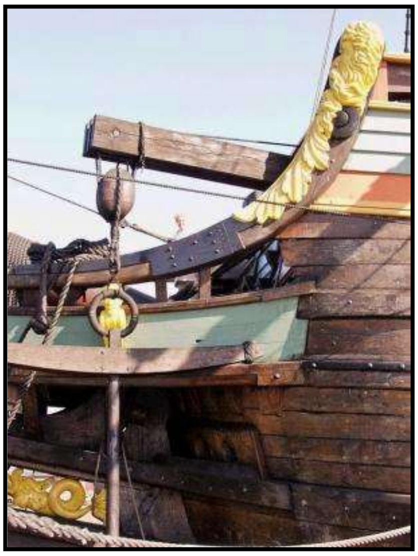


Figure 14: Anchor Catted

The problem at this stage then is to haul the anchor into a position against the hull side where it can be safely and securely stored ...

Step 5: Fishing

Lifting of the anchor into a roughly horizontal position where it can be stowed was achieved by a number of different means including secondary catheads, anchor davits or fish davits. The latter was common and is described as follows ...

Fish Davit

1650 – 1740 ... in this time period, a square-sectioned timber davit with a length equal to the full breadth of the ship with a large block and tackle used to lift the anchor into a horizontal position. There were many methods of davit support including sliding through stanchions already present below the fiferail (Fig. 34), specialised cleats (Fig. 35) or timberheads.

Figure 15: Full-Length Fish Davit

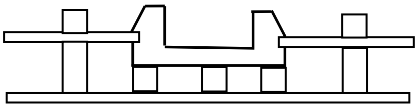


Figure 16: Fish Davit Cleat

In use, the davit was extended out beyond the confines of the vessel with the other end being secured by deck-fitted eyebolts which prevented any movement as well as enabling the anchor weight to be taken.

Required movement of the davit were enabled by two special adaptations:

- ***two eye-bolts*** on the upper face (one each side) allowed the topping lift to take the weight,
- ***a hand-rope*** was formed along both the fore- and aft- sides to allow for manipulation.

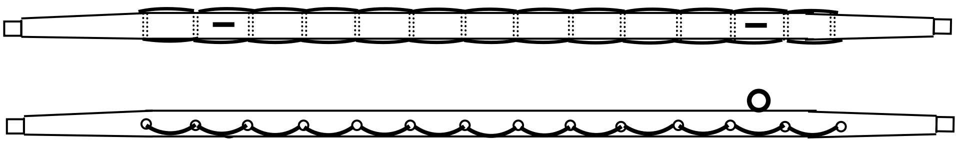


Figure 17: Top & Side View of Fish Davit

1733 onwards ....

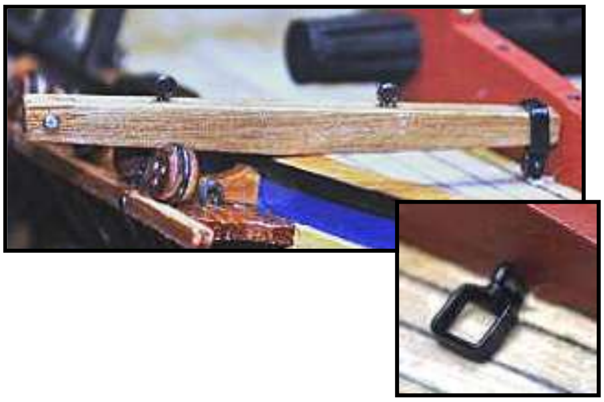


Figure 18: Cathead and Angled, Short Fish Davit

Anchor Lining

Capstans

Figure 19: Large Number of Crew Used on the Bars

At chest height, up to 8 - 10 men could push on each bar – and with possibly 12 – 14 bars fitted, nearly 100 men could be employed to rotate the capstan. This could be viewed as over 200 men if considering a double capstan operating on the one vertical shaft. Flat pieces of timber called whelps (Fig. 39) projected from the vertical barrel increasing the barrel circumference as well as the friction to hold the rope securely.

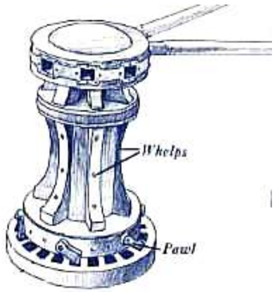


Figure 20: Whelps

Whilst the main capstan was used to raise the anchors, the jeer capstan (between the fore- and main masts) was used for hoisting in stores, guns, boats, raising topmasts, yards and hoisting the lower yards on their 'jeer tackle' (rigging attached to large bitts on the deck adjacent to the masts)

Surrounding the capstan base were pivoting metal pawls that prevented the capstan from surging backwards when the pressure on the cable was uneven.

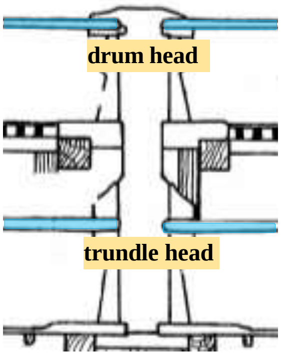


Figure 21: Double Capstan

The advantage of the double capstan was that there were two sets of bars (shaded blue) – at two different deck levels - that could be used on the one capstan barrel. This obviously increased the possible turning power.

It was common practice to use the bottom capstan to actually haul the anchor cable in (via the messenger cable) with the actual rotating force needed coming from the sailors operating the upper capstan. Thus the men would not need to step over the ropes.

Here are some useful/ interesting links ...

Capstan Tutorial: MSW Forum
http://modelshipworldforum.com/resources/furniture/CapstanTutorial.pdf

Capstan Articles from MSW Forum
http://modelshipworldforum.com/resources/furniture/Capstans%20Articles.pdf

Catheads

These brackets – or davits - were used from the early 1600's to raise the ship's anchors into a vertical position adjacent to the bow prior to their being stowed. Often made from oak, these heavy timbers were inclined in both the vertical (15-20 degrees) and horizontal (45 degrees). They were generally square in cross-section.

The outer end of these catheads contained two or three sheaves for the cat-block tackle and the very extremity was fitted with a carved cap of richly carved timber. So fitted, the cap provided both decoration and weatherproofing for the end grain. The inboard section was known as the cat-tail and its design was related to the way it was fastened to the ship. There were four main methods of fastening the cat-tail:

- vertical,
- transverse,
- diagonal, and
- longitudinal.

Figure 22: Vertical Fastening (on smaller ships)

Transverse cathead fastening shown in Fig. 42 was common in ships with a square beakhead bulkhead. The timber for this cathead was specifically from compass oak (large hedgerow oaks) and was not at all common making its selection difficult. The inboard cat-tail was fitted in three different ways – either as parallel, tapered or short but together with the surrounding scantlings, it formed a massive beam across the deck.

Figure 23: Transverse Fastening

The transverse fastening of the cat-tail fell into two main categories – *parallel* and *tapered* – as shown below. A feature often overlooked is the use of a covering plank over the cat-tails to reduce the intrusion of water and subsequent weathering of the timber joint. In times of timber shortage, the parallel cat-tail consisted of very *short* pieces with a longer section in between.

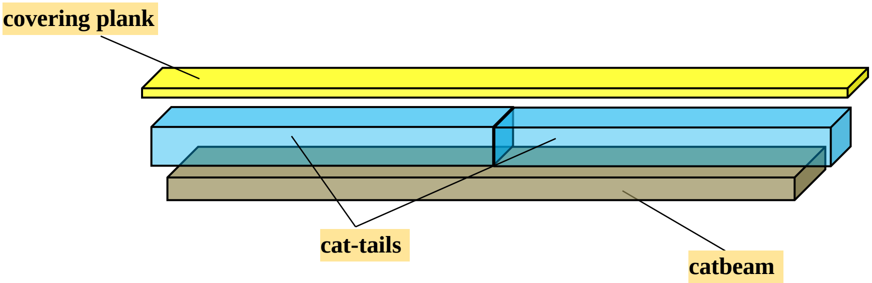


Figure 24: Parallel Cat-Tail

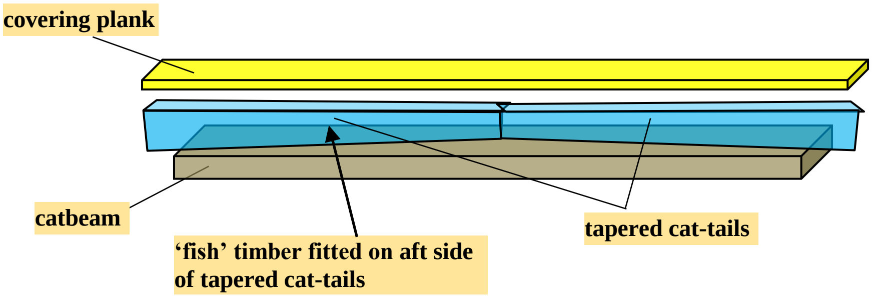


Figure 25: Tapered Cat-Tail

Figure 26: *Underlaid* Diagonal Fastening

Diagonal catheads ...
underlaid,
overlaid, or
straight

... made their appearance with the introduction of the totally curved bow.

Figure 27: Diagonal 'Straight' Fastening

Longitudinal Cathead ...

Figure 28: Longitudinal Cathead

Channels

In a kit build, the positioning, length, width, thickness and end shape of the channels will be pre-determined. However, the following information is provided for those who wish to ammend and/or check what is provided.

The channels were long boards fitted to the ship's sides to act as securing points (and spreaders) for the deadeyes and their chain plates forming the lower part of the shrouds. The dimensions shown below come from Goodwin, 1987, 184. He also describes in detail the lengths of channels used in various rate ships.

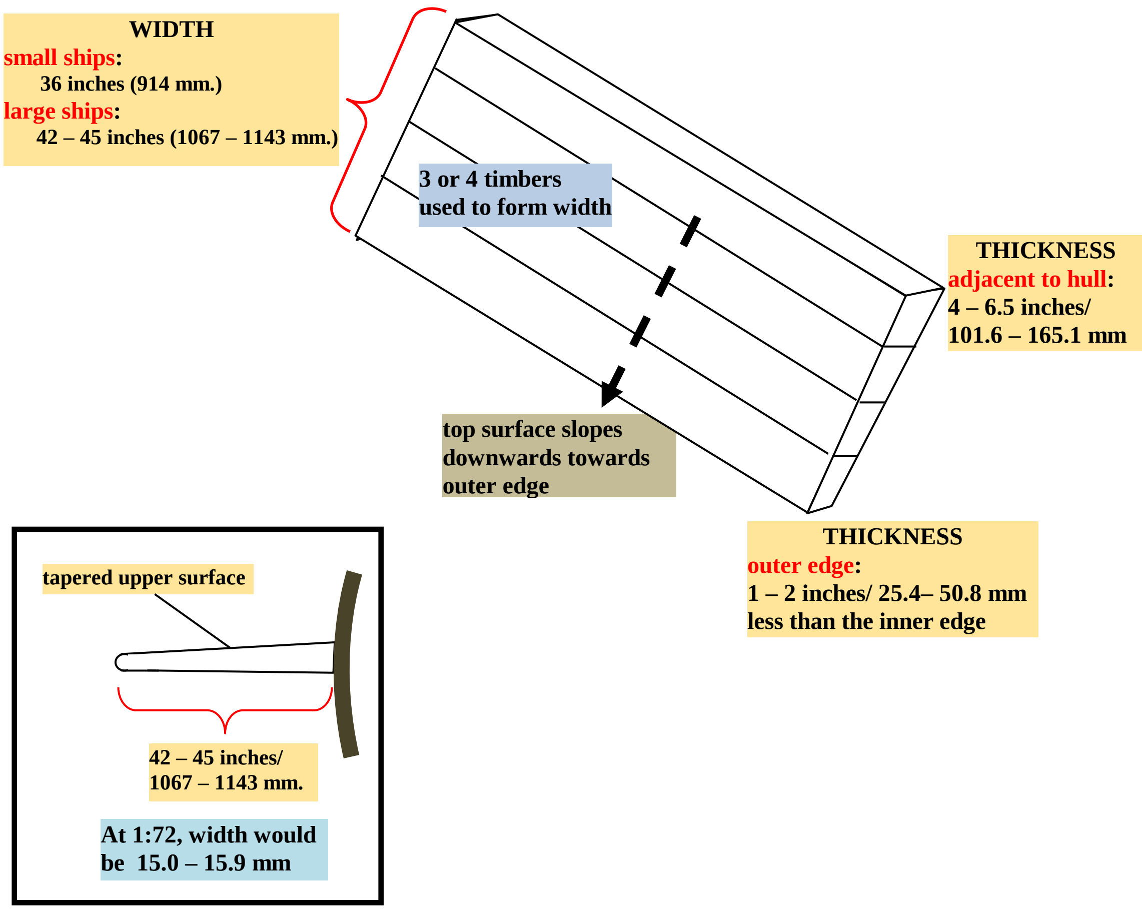


Figure 29:Channel Dimensions

Figure 30: Example of Shroud Chain Plates

" *In 1771, an improvememnt was made to facilitate removal of the deadeyes, for replacement or maintenance. This modification required slots to be cut into the outer edge of the channel, in place of the original holes through which the chain plates p[assed. Over these slots, along the edge, a thin capping was nailed, to prevent the deadeyes and chainplates from being unshipped. This batten was made to 2/3 of the thickness of the outer edge of the channel, and was generally hashioned with a plain moulding*" [Peter Goodwin,1987,187]

In Fig. 53, the slots are clearly evident. "*There are two swivelling ringbolts in each channel - they fit through a small plate on the underside which I made from thin brass shim material and blackened." [Dan Vadas, MSW]*

Figure 31: Post 1771 Channels

Also seen in Fig. 50 are the more ornate ends of the channels. The ends were typically finished with a scroll or flourish or simply left squared. A place for a little individuality.

Installation:

Figs. 51 & 52 illustrate a method used by Dan Vadas [MSW] to hold the channels in their correct alignment.

Figure 32: Holding Channels in Correct Alignment

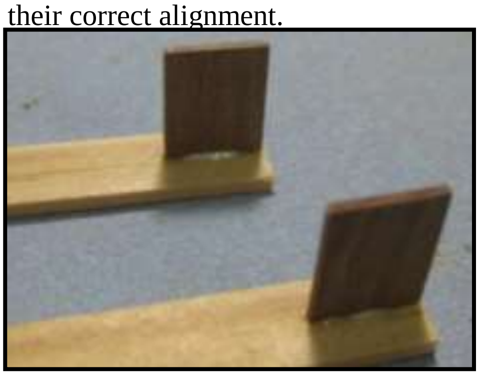


Figure 33: Channel Jig

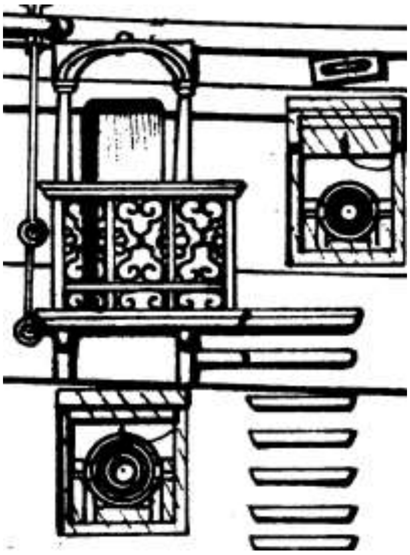
Various suggestion of fixing have been made that include …

- passing a couple of long pins through the channel thickness starting from the slot (if 1701 onwards)
- adding some short pins from the side adjacent to the hull
- adding support knees
- cutting into the second planking a slot for the channel inner edge to fit into

Figure 34: Channel Cutting-In

Whatever method is used, the builder should ensure that there is considerable strength in the channels to withstand the tension in the shrouds and backstays.

Entry Port (Side Entrance)



Entry ports were only fitted to vessels with three decks and were generally of the same width as the gunports but the diagram opposite shows a much narrower width. They were between 4ft. 6in. – 4ft. 9in. (1400 – 1500 mm.) high and provided access to the ship without scaling the full height from the waterline. After 1690, ships were authorised to have entry ports fitted on both sides. In the immediate period following this, there were constructed shallow-arched canopies supported by caryatids, both of which bore detailed carvings of dogs, fish or lions. 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.

Figure 35: Entrance Port

Figure 36: Caryatids

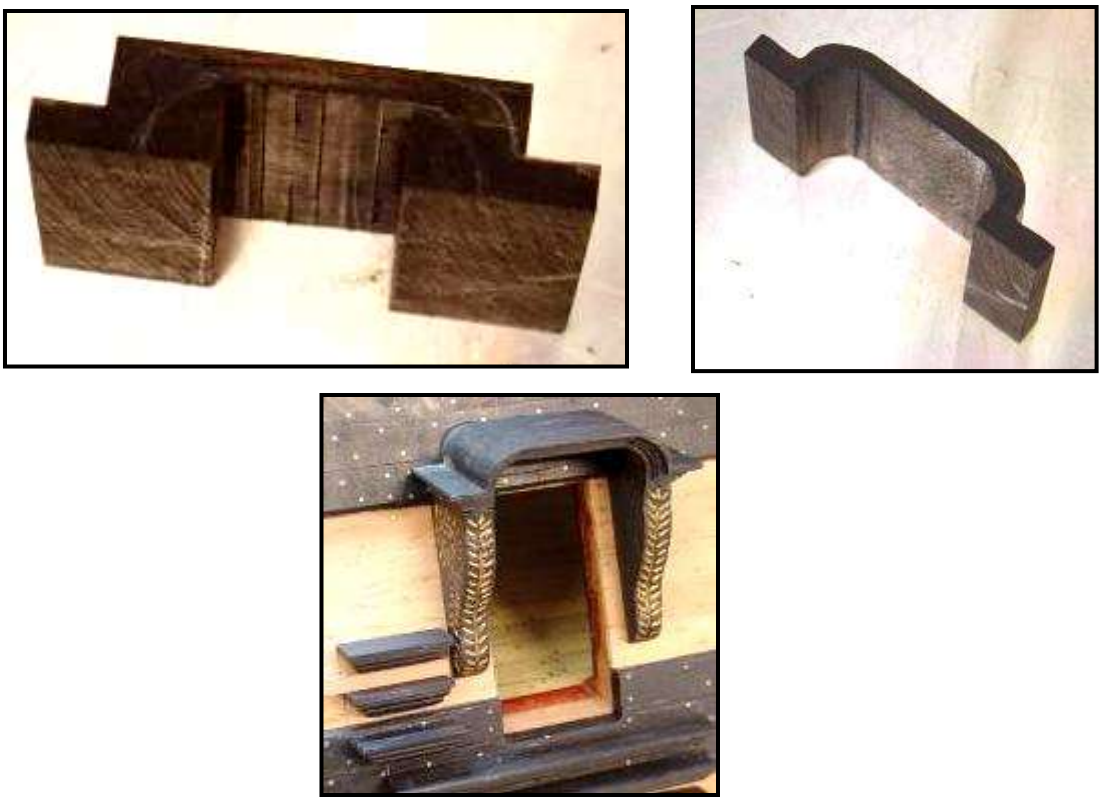


Figure 37: Canopy

By 1703, the Navy Board imposed restrictions on the surrounding architrave carvings – canopies became larger, supporting pillars less ornate and mouldings were used instead of carvings. Around this time, the main channel was raised causing the sponson to be constructed separately and there was also the introduction of a second entry port on the upper gundeck. During the eighteenth century, some balustrading was included on the sponson. Following this change, it was realized that more integral strength of the hull would be retained if the entrance port occupied the position of one of the gunports, rather than being between two gunports. The downside to this was that the broadside fire-power was reduced !

Gunports

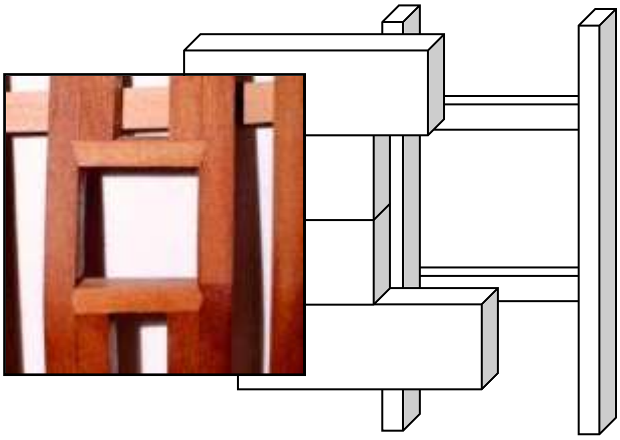


Figure 38: Gunport (diagrammatic)

Opening

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

Figure 39: Gunport Flush with Hull

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 set their strips back and some 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.

Shape

A point of confusion comes with the shape of the gunport – is it square/ rectangular or some other geometric shape such as a parallelogram? The vertical sides, following the frames, will always be perpendicular to the keel BUT there is plenty of evidence to support the upper and lower sills following the planksheer curvature. On a large ship with largely flat decks, this will 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. 59 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.

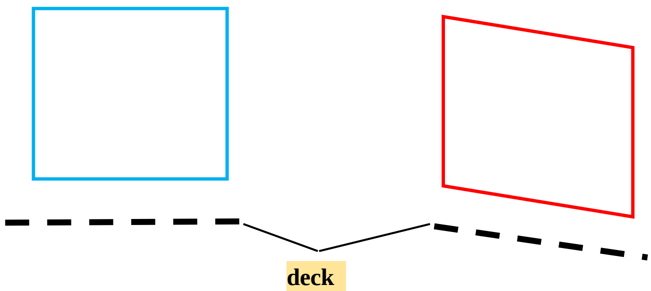


Figure 40: Planksheer and the Timber Sills

Lids

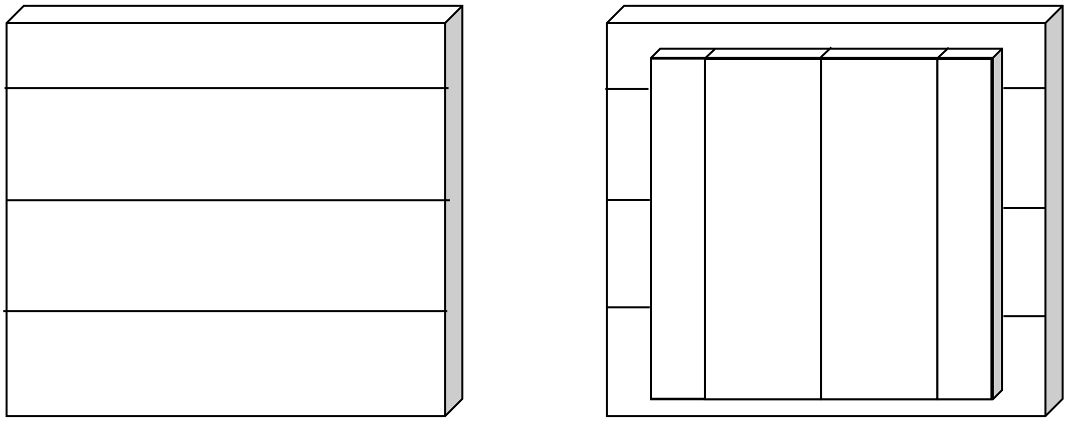


Figure 41: Port Lids (diagrammatic)

Guns

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. 48). 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. 50 & 51)

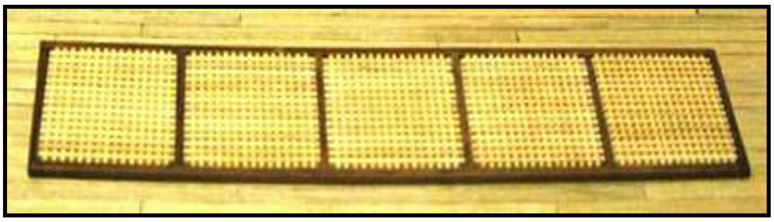


Figure 42: Main Hatchway (simplified approach)

Figure 43: Outer Frame Constructed

In both Figs. 50 & 51, 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.

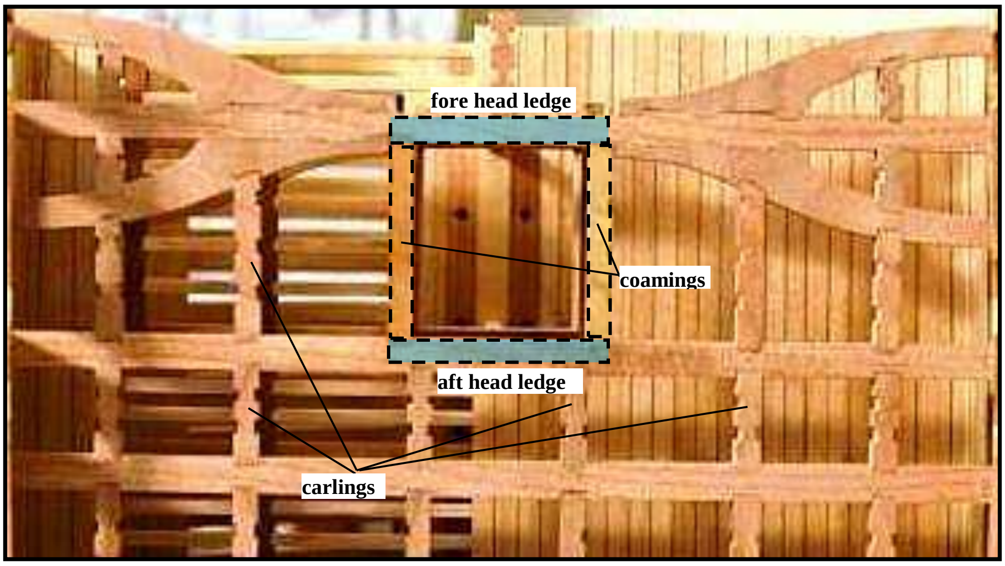


Figure 44: Supporting the Hatchway Frame

Frame Construction

Fig. 54 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.

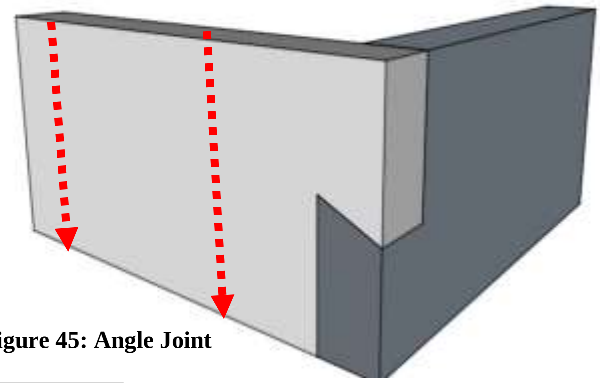


Figure 45: Angle Joint

Figure 46: Simplified Joint

Hearths & Stoves


Figure 47: 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 48: VOC Batavia (1628)

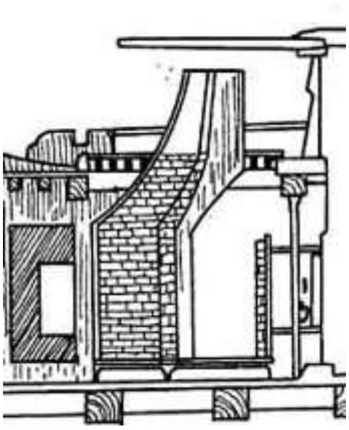


Figure 49: Hearth Under Foc'sle Deck on the La Renommee

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. 68) 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.

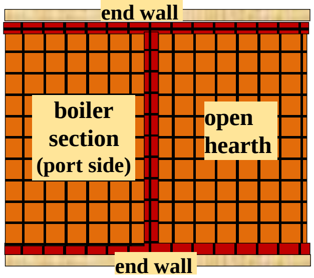


Figure 50: Plan View of Kitchen

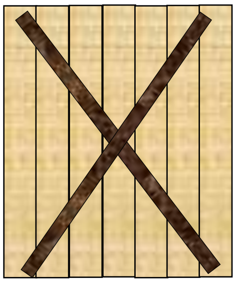


Figure 51: End Wall

- **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. 71).

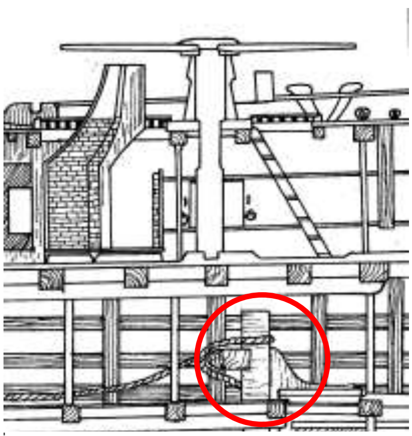


Figure 52: Kitchen Above Main Bitt

English Self-Contained All-Metal Stoves

Figure 53: 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 54: 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 ...

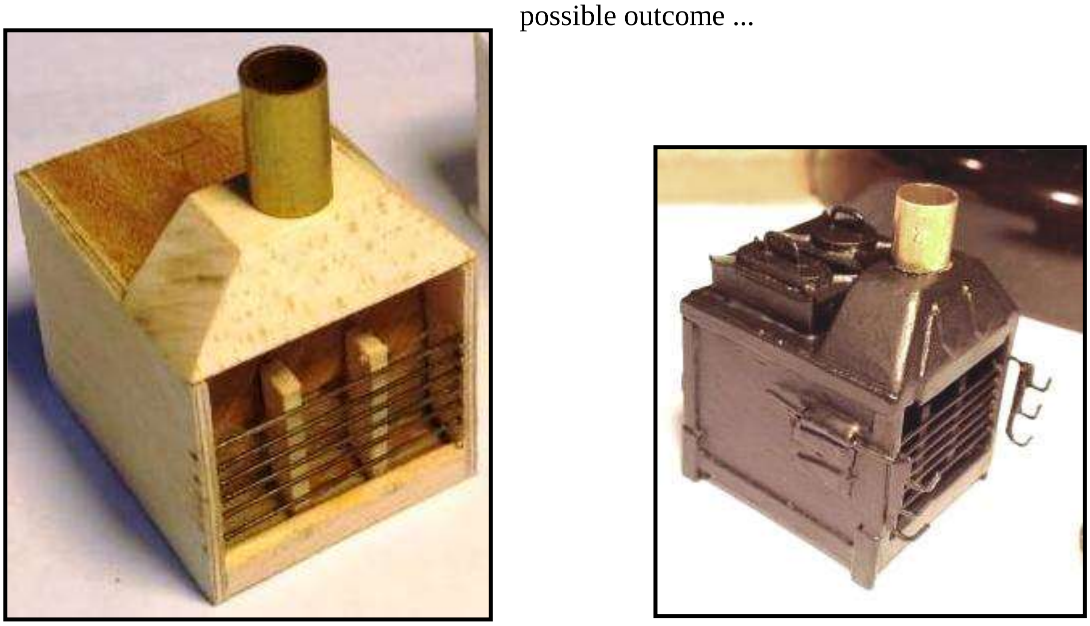


Figure 55: Brodie-Style Model Oven

Sanitation

There is an excellent detailed discussion on this topic ... http://nautarch.tamu...mons-MA1985.pdf (the file is safe !)

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

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. 75 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.

Figure 56: Portside Roundhouse

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.

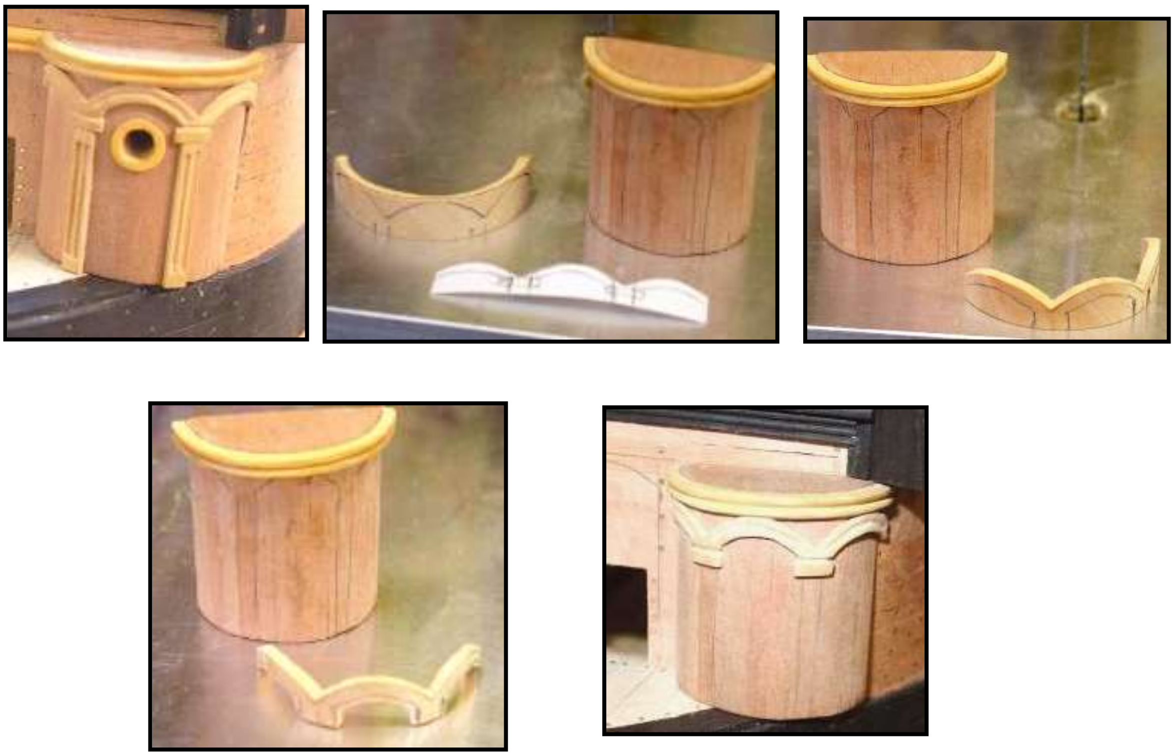


Figure 57: Round House Construction

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.***

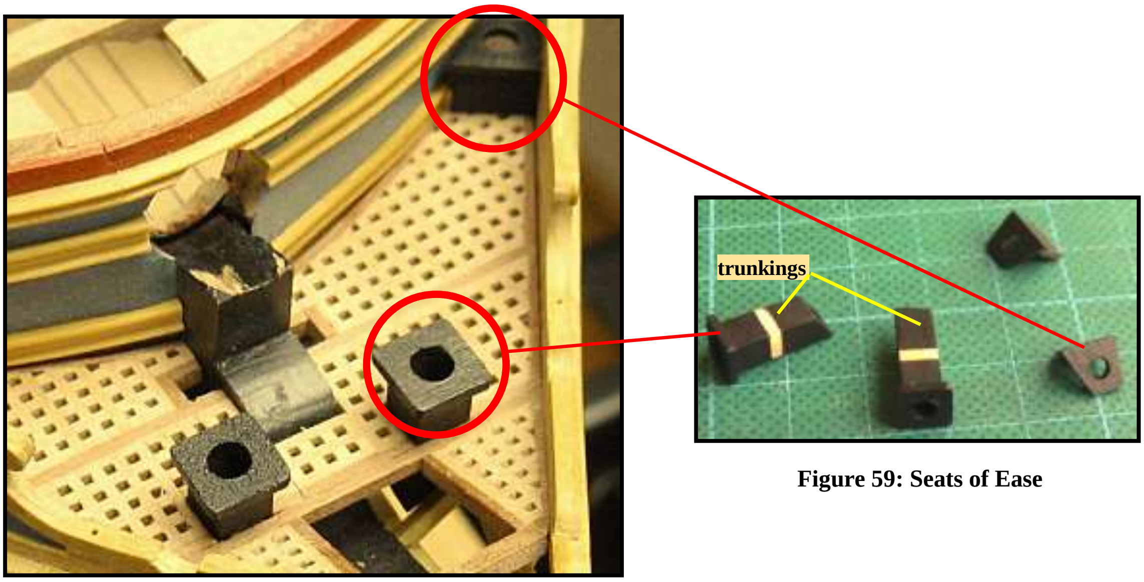


Figure 59: Seats of Ease

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. 80 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. 79 illustrates the more common multiple seats of ease.

Figure 60: *Jylland* Seats of Ease

Figure 61: *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 62: 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.

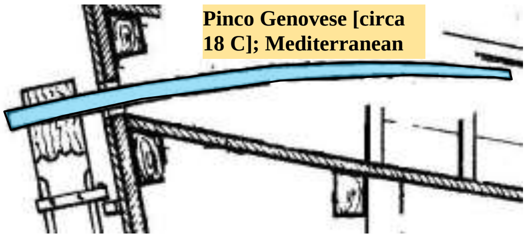


Figure 63: Tiller

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. 83) 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 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.

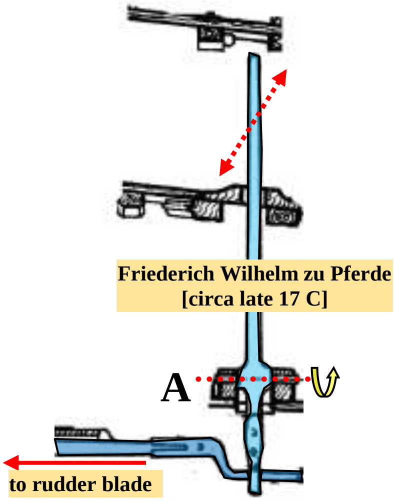


Figure 64: Whipstaff

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. 85 below).

Figure 65: Tiller and Whipstaff

Figure 66: 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 60º 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 90º, 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 67: Wheel from HMAS Protector

Figure 68: Double Ship's Wheel; VOC Amsterdam

Figure 69: 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. 88).

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.

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 70: Covered Tiller Head; replica 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. 89.

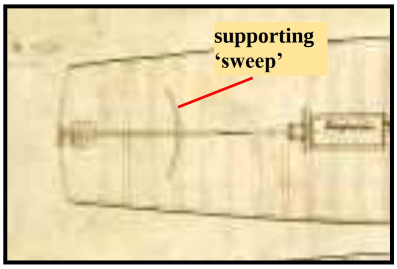


Figure 71: Portion of an Old Plan for the HMB Endeavour

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

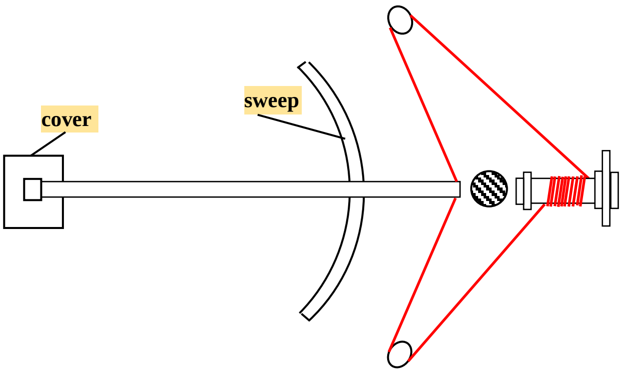


Figure 72: Steering System for a Small Ship

Rudders

Tillers & Rudder Pendants

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.

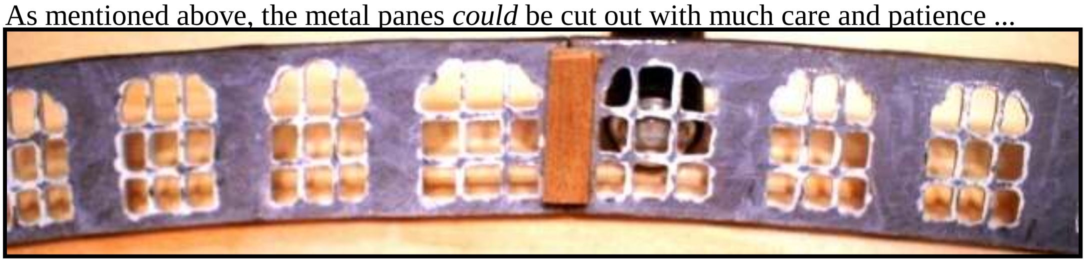
Figure 73: Spun Glass Panes

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 74: 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)

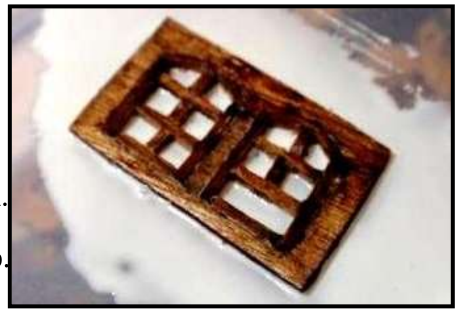
Requirements:

- 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,



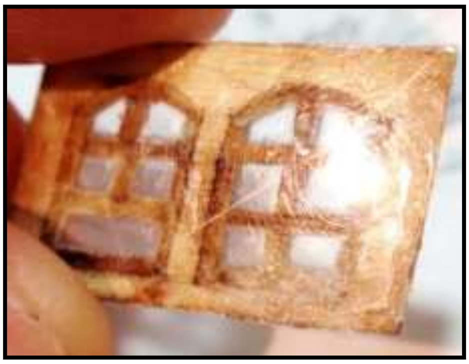
a.

b.

c. c. the 'panel' is ready now or if making glass applied directly to a window, then the back

d. of the window is gently pushed into the glue (don't oil the frame beforehand),

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 75: 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.