

THE DEVELOPMENT OF EXTERNAL SANITARY FACILITIES
ABOARD SHIPS OF THE FIFTEENTH TO NINETEENTH CENTURIES

A Thesis

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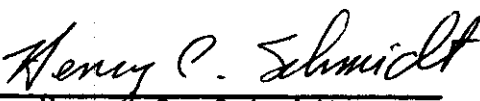
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ABSTRACT

The Development of External Sanitary Facilities
Aboard Ships of the Fifteenth
to Nineteenth Centuries. (December 1985)

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This thesis examines the appearance and development of seats-of-ease, roundhouses, pissdales, quarter galleries, and other shipboard structures which served as hygienic accommodations designed to facilitate the disposal of human waste from European ships of the 15th through the 19th centuries A.D. Almost without exception, the subject has been ignored, overlooked, or simply not mentioned or depicted due to modesty and/or societal and cultural mores, but it was certainly dealt with whenever and wherever men took to the sea.

Prominent external waste-disposal features made possible by specific changes in European hull design and construction prior to and during the period in question have been examined in contemporary depictions, models, and descriptions and the historical literature. By the last quarter of the 17th century, these features were fully developed and were retained with little or no modification until the end of the 19th century.

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I INTRODUCTION

The question of the disposal of human wastes generated aboard ships has been an important consideration throughout the roughly 10,000-year history of waterborne navigation and remains so to this day. It has certainly been of no less importance in terms of health maintenance than the proper disposal of human excreta from terrestrial habitation sites. Therefore, it is rather surprising that, almost without exception, the subject has been ignored, overlooked, or simply not mentioned or depicted.

Societal and cultural mores and strictures, a modest hesitance to describe or depict the execution of such common, basic bodily functions, and the possibility of censorship of edited contemporary accounts offer the best explanations for the lack of contemporary evidence. These same reasons may also explain the reluctance of modern historians to deal directly with the methods of human waste removal, the conditions that their improper disposal precipitated, and the structural adaptations employed on vessels to facilitate removal. It remains certain, however, that despite the apparent aversion to discuss the

This thesis employs the International Journal of Nautical Archaeology and Underwater Exploration (IJNA) as a pattern for format and style.

subject both in the past and present, it was one that was dealt with whenever and wherever men took to the sea.

In light of the increasing interest among nautical archaeologists and maritime historians in a better understanding of what life aboard ships must have been like at various periods in the history of marine navigation, it is time to open up the subject of human waste disposal from these vessels for a more complete analysis.

In order to demonstrate what the conditions on board sailing ships were like at their worst, the unhealthy conditions which improper removal of excreta helped to bring about will be discussed in a subsequent introductory section.

Attempts to improve the relative cleanliness of the vessels included the development of external sanitary accommodations incorporated into the design and structure of vessels beginning in at least the 15th century and possibly much earlier. The objective of this thesis is to examine the development of the "heads," "roundhouses," "quarter galleries," and other structural sanitary features designed to facilitate the removal of human waste aboard European ships from the 15th to the 19th centuries AD. Possible structural conveniences, evident or hypothesized, for vessels prior to this period will be briefly addressed in the following section.

It is important to note that non-structural appliances (e.g. wooden waste buckets and ceramic or metal chamber

pots) were utilized on board sailing vessels throughout the age of sail. Chamber pots were probably used more often by officers than by members of the crew, the cruder forms of collection containers being reserved for the use of the latter. Chamber pots are often found in the remains of "old wooden shipwrecks," such as the Hollandia, wrecked in 1743 off the Isles of Scilly (Marsden, 1975: 125), and a wreck in the Bay of Cadiz, Spain, thought to have sunk in 1805 after the Battle of Trafalgar. The overworked ships' boys were usually assigned the task of cleaning the officers' chamber pots.

Corresponding to the technologies of the particular period, collection containers of wood, ceramic, or metal were quite common aboard all vessels, as they are today if plastic containers are included. These were used in addition to the external accommodations of any given vessel and they were relied upon heavily during weather rough enough to make the external facilities, if any, unusable or when large numbers of the complement were incapacitated by sickness.

As recently as 1875 in British steam-gunboats, the formal sanitary removal scheme consisted of "bucket and screen" for the ships' company (Ballard, 1944: 67).

Early evidence of human waste removal

Due to their very nature, waterborne craft have usually been "able to accommodate the human need" (Pudney, 1954:

80). By simply eliminating excreta directly into the sea or by throwing collected materials overboard, shipboard occupants established an efficient, common-sense disposal scheme. Such rudimentary techniques of waste removal were undoubtedly in use in most vessels prior to the 15th century and, as situations warranted, they certainly were continued in vessels from the 15th century to the end of the age of sail.

In what were usually relatively small, undecked or partially-decked vessels limited to coastal, lacustrine, and riverine areas and which made no voyages longer than one or two days without landing, there was no need for anything more elaborate than waste buckets or a small platform on which to answer the call of nature. Such a platform could have been the gunwale (uppermost portion of the hull) or it might have been a device applied externally to the hull.

The hypothesized uses of a unique attachment on the sterns of several ships painstakingly depicted in a fresco which dates to c. 1450 BC (Fig. 1) unearthed on the island of Santorini (ancient Thera) included that of a lavatory for crew or officers (Marinatos, 1973: 292 and 1974: 50). Whether this was the case is, of course, next to impossible to determine since no one is shown using the attachment. As the devices seem to have been mounted either at or very close to the waterline, their use in anything but ideal sea conditions would have been hazardous, to say the very

least, and access would seem to have been difficult. Indeed, the idea would not be worthy of consideration were it not for a perplexing depiction on an ivory plaque from Sparta which dates about 850 years later (Fig. 2).

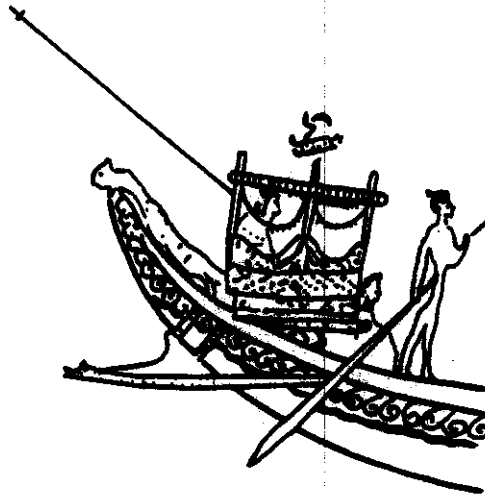


Figure 1. Best preserved Thera ship with stern appendage; c. 1450 BC. After Marinatos (1974: 48, fig. 5).

The realistic representation of a Greek warship of c. 600 BC (Bass, 1972: 42, fig. 5) depicts what is obviously a man crouched on the forward-projecting ram of the vessel engaged in either a particularly degrading form of contrition or eliminating his bowels. The latter seems far more plausible; one shipmate even seems to have taken advantage of the situation by angling in the "baited" water. However, the use of the ram for this function would have the same disadvantages as the stern appendages on the Thera ships. Though access may have been somewhat easier, it was still a fair-weather accommodation.

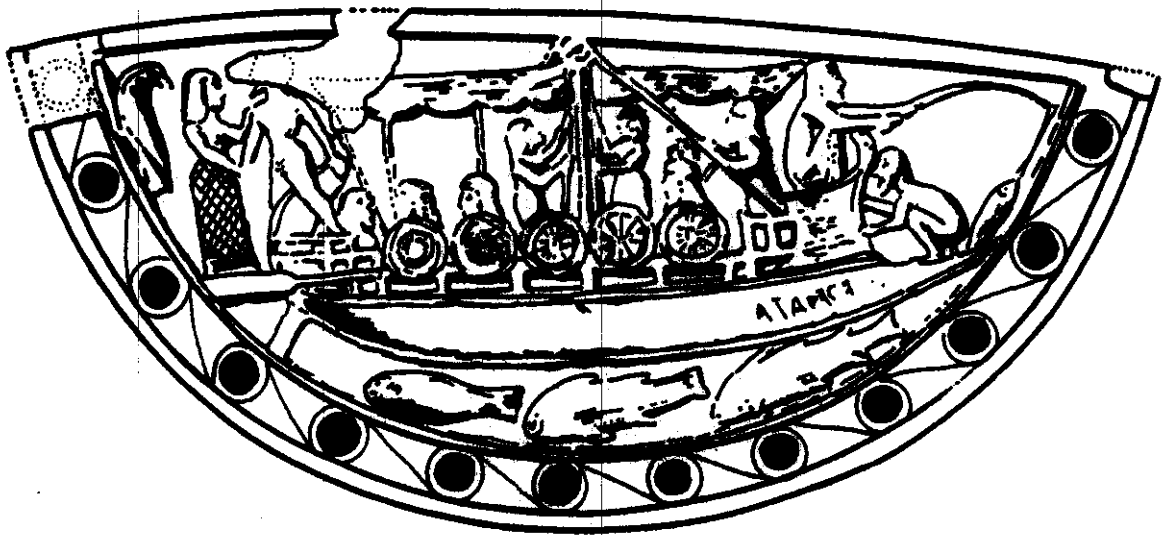


Figure 2. Ivory plaque from the Sanctuary of Artemis Orthia, Sparta; c. 600 BC, National Museum, Athens. After Bass (1972: 42, fig. 5).

The first probable literary reference found to any specific item relating to the collection and removal of human wastes aboard ships is a purchase order for 1000 "waste buckets" (ptuarion = literally, little spitters) for a fleet of 20 Byzantine dromons in c. AD 949. Each dromon had a crew of approximately 200 men; therefore each waste bucket was shared by four men--apparently a standard size crew sub-unit (Porphyrogenitus, 1830: 671A; and Van Doorninck 1982: pers. comm.).

Conditions aboard ships

In the 13th and 14th centuries AD, as compasses and nautical charts were developed and watercraft were evolving

which could withstand the rigors of sustained and repeated deep-water navigation, a unique set of sanitary and hygienic problems began to surface. Foremost among these were the efficient removal of human wastes, living healthfully in what were characteristically filthy, damp, and usually crowded conditions, the care of the sick and injured on board ship, and provisioning. The latter two considerations are beyond the scope of the present study.

Constructional features of the vessels themselves were responsible, at least in part, for a great deal of the discomfort and death. As vessels began to be decked over to improve their seaworthiness and to offer more protection from the elements, several factors combined to compromise the positive effects of the lessened exposure. These factors included decreased air flow to spaces between and below decks, decreased light to the lower deck levels, and, correspondingly, higher humidity below decks.

Of overriding concern to this study is the fact that the "stacking-up" of living surfaces, one over another, allowed for the gravitation of every imagineable bit of debris, filth, and human effluvia from the decks above to the bilges below. By the 15th century, multiple decks were quite common in the largest types of vessels. However, even smaller vessels of the period, such as caravels with only one or two deck levels aft, experienced unhealthy conditions within.

Multi-decked ships generally had constructional

features such as waterways and scuppers to aid in drainage to the outside of the vessel. But faulty or poorly fitted scuppers and loose caulking between deck beams and waterways allowed for a downward drainage through the decks of the vessel to the hold, the ballast, and the bilges. In addition, passengers and crew unable to relieve themselves at external sanitary facilities or to empty the collection buckets' contents overboard during inclement weather or because they were too sick to move were often forced to eliminate bodily wastes within the confines of the hull. The resulting accumulation amounted to an organic compost below decks in the lowest reaches of the ships.

When the conditions below decks became unbearable and started emitting "pestilential funkes," it was necessary to "rummage" the ship. In the 16th century, this consisted of "heaving her down on some convenient beach, throwing all ballast overboard so that the tide would cleanse it, scraping the horrible gunk off the inside of the hold, spraying it with vinegar, and replacing the ballast with clean stones, sand or shingle" (Morison, 1971: 135). In later years, carbolic acid, iron sulfate, bichloride of mercury, and other chemical cleansing and disinfecting agents were used (cf. Holt, 1892).

The size of ballast used was also a determining factor in the relative nastiness of the bilges. The smaller the size of ballast utilized, the greater the surface area available for the growth of algae, fungus, and bacteria. A

gradual increase in the preferred size of ballast can be seen in an examination of practices of the British navy. Until c. 1600, sand had been used extensively, as had pebble-sized gravel or "shingle," cobblestones, and, in some cases, lead ingots. During the 17th century, ballast size was progressively increased to afford better aeration, to decrease the surface area available for fungal and bacterial growth, and to ease handling. Lead ingots continued in use and broken pieces of iron cannon, anchors, and outsized shot, etc., were frequently used as ballast in combination with stone (Martin, 1978: 34). Permanent pig-iron ballast, cast in stackable shapes, apparently made its appearance in the first half of the 18th century (Peterson, 1955: 2).

Presumably, similar attempts to improve the dreadful conditions in the bilges were undertaken by other European navies and merchant fleets. However, a peculiar practice of at least two European navies probably negated any improvements that an increase in ballast size or any other hygienic measures would have afforded. The Catholic concept of consecrated burial ground and the dictates of canonical law prescribed against French and Iberian mariners disposing of their dead at sea. Apparently, it was not a hard and fast prescription; the numerous dead on Vasco da Gama's first voyage to India (1497) were thrown overboard with alarming frequency (Allison, 1942: 15). However, as late as 1780, French ships captured during

Rodney's campaign in the West Indies were observed to contain mangled limbs and decomposing corpses in the ballast (Lloyd & Coulter, 1961: 12; Roddis, 1941: 116). Could the human skull found in the floor timbers of the wreck of the St. Joseph, a member of the ill-fated 1733 Spanish fleet, be the remains of someone buried in the ballast of this vessel rather than a victim of the wreck or a drowned salvage diver as supposed? (Bass, 1972: 264).

Pumps were of some help in mediating the conditions of the bilges. They were usually set down low inside the hull next to the keelson in a recess or well where the water in the bilges could run to collection points. This run of water was unhindered by the framing of the hull due to the use of limberholes or watercourses cut into the underside of each frame. From time to time, however, these became clogged with the finer bits of debris and denser organic materials which worked their way through the ballast into the lowest portion of the hull. When this occurred it was necessary to break up the obstructions and for this purpose limber-ropes, or to coin a term, "limber floss," which had lain stretched out through the limberholes along the keelson until needed, were pulled back and forth (Falconer, 1780: 177).

In 1689, the sickness and foul conditions on board the Dartmouth, a British 5th-rate, was so bad that the ballast and bilge, "stinking and all of a quagmire," prevented the water from flowing into the pump wells. Seemingly, there

was no limber floss in her bilge or they would have used it to clear the watercourses. Does this point to the development of limber floss sometime between 1689 and 1790? Probably not; for such a simplistic, self-evident device it seems far more likely that no evidence has so far been found which demonstrates its use, or knowledge of its use, prior to c. 1790. "Had we that ballast out, and [clean] shingle in," continued the Dartmouth's lieutenant, "I doubt not but our ship would be healthy and in good condition" (Martin, 1978: 34).

Archaeological evidence of the nature of bilges during the 17th century has been obtained from two wrecks. The Sea Venture, lost in 1607 off Bermuda, was found to contain a rich organic layer just above the bottommost portion of hull remains. Although it is not known if this deposit was ever thoroughly analyzed, it was tentatively identified as being composed partially of fecal materials (Adams, 1983: pers. comm.). The Kennemerland, a Dutch East Indiaman wrecked in the British Isles in 1664, had a layer of matted organic remains consisting of wood splinters, patches of wood tar, resin, coal, seeds, peppercorns, pieces of leather, fragments of oakum and rope, and other artifacts in at least two areas of the site. It was assumed to be an undisturbed 17th-century horizon that probably originated in the bilges of the Kennemerland (Price & Muckelroy, 1977: 193, 195, and 198; Muckelroy, 1978: 177). In fact, when recovered from the site, a sample was said to have "smelt

strongly like the contents of any wooden boat's bilges" (Price & Muckelroy, 1977: 195).

When ships leaked, as ships from all periods have been prone to do, or when they had accumulated rain water, wave-splash, barrel-leakages, and sundry contributions from passengers and crew, the pumps brought the mixture of thriving organic residue to one of the upper deck levels. Here it was discharged onto the deck to run through the scuppers cut into the side of the ship or into a trough-like dale which channeled the discharge closer to the scuppers.

By all accounts, the resulting smell was devastating. A Franciscan friar traveling from Spain to Mexico in 1544 with Bishop Bartolome de las Casas was greatly offended by the pumps on his ship:

The air is foul, especially below decks, and intolerable throughout the ship when the pumps are going, and these work more or less frequently, depending on whether it is a good or a bad ship. The least they pump is four or five times a day, in order to drain out the water that leaks into the ship, and this bilge water stinks (de la Torre, 1973: 471).

Eugenio Salazar, traveling to the New World in 1573 on a moderate sized 120-ton vessel, was equally unimpressed with the cleanliness of his habitation of some five weeks. In a letter home he stated that the ship had "one or two fountains, called pumps, the water from which [was] unfit for tongue and palate to taste, or nostrils to smell, or even eyes to see, for it comes out bubbling like Hell and stinking like the Devil" (Parry, 1968: 351). He added that

the pump-dales were "running rivers, not of sweet, clear, flowing water, but of turbid filth: full not of grains of gold like the Cibao or the Tagus, but of grains of very singular pearl--enormous lice, so big, that sometimes they are seasick and vomit bits of apprentice." In addition, Salazar noted that inside the vessel it was "closed-in, dark, and evil-smelling," and it reminded him of "burial vaults or charnel houses" (Parry, *ibid.*). This cynical testimony fell far short of constituting an endorsement of transatlantic travel of the period.

Conditions aboard vessels did not improve much, if any, in the 17th century, even though, by external appearances, the prolific ornamentation and decoration of vessels from this century bespoke a certain enlightenment. The ships remained

cramped, uncomfortable, and filthy places for human beings to live. Sanitary facilities were entirely inadequate. With hundreds of men living in close proximity, the ships were breeding places for all sorts of infectious diseases...and mortality rates of 15% per year were not looked upon as especially bad (Fox, 1980: 21).

Nor was there any improvement in the 18th century. In fact, during this century the practice of purposeful overmanning reached a peak and greatly aggravated the existing poor conditions. In this practice, more men were signed on than was necessary to sail and fight the ships so that when sickness and injury incapacitated crewmen there would be someone to take their places. This is an excellent example of a deadly "catch-22" cycle which, once

established, frequently spelled the difference between the successful completion of a voyage or campaign and utter disaster for crew and vessel.

As recently as the 1950s, in Arab vessels which have remained substantially unchanged for hundreds of years, poor sanitary conditions which probably contributed to deaths on board have been documented (Bowen, 1951: 190).

Understandably, rough weather only made the situation worse. First-time voyagers or those susceptible to seasickness were particularly disadvantaged by storms at sea. The unfortunate Franciscan of 1544 was a first-timer when his ship encountered a tempest in the tropics:

"Shortly, the sea made us understand that it was no place for human habitation, and all of us collapsed as dead with seasickness....Only the Father Vicar helped us, and placed basins and buckets for us to vomit in, which were of no use if they were not close at hand" (de la Torre, 1973: 469).

A prolonged storm, exposure in the North Sea during January, and the resulting sickness are thought to have combined to render the crew of the Amsterdam incapable of preventing her going aground near Hastings in 1749 (Marsden, 1975: 51).

As a direct consequence of the fetid conditions between and below decks, and in the ballast and bilges especially, great numbers of vermin were able to breed and multiply virtually unchecked. Rats, lice, weevils, fleas, and cockroaches, to name a few, abounded. Rats were often

found in such numbers that they became a supplement to the routine diet. During the first Pacific Ocean crossing in 1521, rats aboard vessels of Magellan's expedition were sold for a half year's wages (Allison, 1942: 19; and Cameron, 1973: 155). The landfall on the west coast of America during Cook's last voyage was celebrated by the "gentlemen of the gun room dining on a fricasse of rats" (Lloyd & Coulter, 1961: 71-72).

The importance of proper or, as was more commonly the case, improper waste-disposal schemes on board naval and merchant sailing vessels which were, in effect, closed communities cannot be overemphasized. Conscious attempts at improving the unhealthy interior conditions resulted in the development of external waste disposal accommodations. The understandable rationalization seems to have been that any amount of bodily eliminations directed immediately into the sea rather than the interior of the hull was an improvement. However, at present, these external waste disposal facilities cannot be shown to have had any meaningful impact on the situation. Nonetheless, their development can be shown to have been expedited by specific changes in northern European hull construction techniques which occurred in the 15th, 16th, and 17th centuries. By the last quarter of the 17th century, these features were fully developed and most of them were retained with little or no modification until the early 19th century.

II SOURCE REVIEW

The sources of information utilized in this study include contemporary depictions and descriptive accounts of voyages, secondary historic treatments of voyages; general works on seafaring, ships and their construction, and life at sea; histories of medicine and sanitation, nautical medicine, and naval hygiene; and archaeological reports. Regarding the subjects of privies, latrines, etc., from terrestrial contexts and, more specifically, human waste removal from sailing vessels or any accommodations on them which facilitated this action, there is a severe dearth of literary information.

By far the most important sources of data have been a number of contemporary depictions in a variety of publications. Strangely, there seem to exist far more depictions of external sanitary accommodations than descriptions. Perhaps this fact may relate to the veracity of the depictions, in that the artists were not sacrificing realism to societal mores or modesty.

Several prints by the famous, unnamed Flemish marine artist, who signed his works "WA," were the best sources for mid to late 15th-century vessels, especially for carracks. Other artists of a similar school provided depictions of Italian, Spanish, French, and English ships of the 14th, 15th, and 16th centuries. Without doubt, the most comprehensive repositories of these illustrative

materials are in early volumes of Mariner's Mirror, the journal of the Society for Nautical Research. Certain authors tended to argumentative, serial-like articles, in which there was a good deal of ego involved. Yet, the figures included in these highly informative volleys were often excellently rendered and, with few exceptions, dependably accurate. Perhaps the most prolific contributor during this period was R. Morton Nance. For over 45 years, he wrote knowledgeably about a variety of subjects. I have either cited or consulted some 23 of his articles on 15th- and 16th-century ships alone.

Certain maritime-oriented Dutch Masters (e.g. Bruegel, Van de Velde the Elder and Younger, and Vroom) have been the best sources for 17th-century illustrations. Publications which contain these sketches and paintings include Sailing ships (de Groot & Vorstman, 1980), The ship of the line (Lavery, 1984), and Great ships. The battlefleet of King Charles II (Fox, 1980).

Illustrative evidence for the mid 17th to the 19th centuries consisted largely of drawings of contemporary ship models in the collection of the National Maritime Museum, Greenwich, in the single best literary source consulted, J. Munday's "Heads and tails: The necessary seating" (1978).

Additional sources for this period included various paintings, etchings, woodcuts, tapestries, and ship models which I have examined in the major maritime museums of

Europe. The National Maritime Museum, Greenwich, the Scheepvaart Museum and Rijksmuseum in Amsterdam, and the Musee de la Marine in Paris, have all been combed for evidence of external sanitary accommodations. Iberian institutions in which I have conducted hygienic research include the Museo Naval, Madrid, the Archivo General de Indies in Sevilla, the Museo Maritimo, Barcelona, and the Museu da Marinha in Lisbon.

Perhaps the relative absence of contemporary descriptions of hygienic conditions generally, and sanitary facilities specifically, has been due, in part, to social strictures, an aversion to discuss basic bodily functions, and acceptance of the relatively unhealthy environments common throughout the period. J. H. Parry (1968: 348) offers an additional, simpler explanation for the lack of "details of life at sea," particularly during the 15th and 16th centuries.

Sailors were practical men, little given to writing. Explorers kept journals, but rarely troubled to include information about a daily round which to them was familiar, and which they took for granted. The best accounts of ships' routine and conditions on board ship were written by landlubbers who, for one reason or another, made sea voyages as passengers.

Subsequent editions and translations of these landlubbers' accounts (e.g. Carletti, 1965; de la Torre, 1973; Gage, 1958; and Roberts, 1947) have been examined. Though enlightening because of the pictures they paint of life at sea, they have yielded few, if any, specific references to waste disposal practices and conditions below

decks. In one outstanding description of a voyage from Spain to the New World in 1573, written by Eugenio de Salazar and republished, after translation, in a collection entitled The European reconnaissance: Selected documents (Parry, 1968), the trials and tribulations involved in the usually simple act of defecation are cynically addressed:

If you want to relieve yourself...you have to hang out over the sea like a cat-burglar clinging to a wall. You have to placate the sun and its twelve signs, the moon and the other planets, commend yourself to all of them, and take a firm grip of the wooden horse's mane; for if you let go, he will throw you and you will never ride him again. The perilous perch and the splashing of the sea are both discouraging to your purpose, and your only hope is to dose yourself with purgatives (Parry, 1968: 357).

From this and other tidbits contained in this narrative one can glean a few helpful scraps of information about accommodating the human need in this instance; among them, the facts that it was necessary to "hang out over the sea" in order to accomplish the task, that one was often "splashed" by the seas, and that there was some reliance on laxatives. However, no distinct clues are decipherable as to exactly where on the vessel these daring deeds took place, nor what structural features the ship possessed, if any, to facilitate their accomplishment. Possibly, Salazar was referring to "hanging out" from the lee fore or main chains: This seems to always have been a viable alternative in all but the worst weather (Munday, 1978: 131). In terms of aiding in the reconstruction of the material culture of shipboard life and of the vessels from

the period themselves, particularly of their sanitary accommodations, this lack of precision has been a characteristic failing of the available literature.

General works on seafaring, ships, and their construction (e.g. Anderson, 1921; Artiñano, 1920; Bass, 1972; Casson, 1964; Fernandez Duro, 1880; Howard, 1979; Laughton, 1974; Lloyd, 1968; and Stevens, 1949) have offered extremely useful contemporary depictions and illustrations and mentioned the subject of sanitary facilities generally.

Historical treatments of nautical medicine, and naval hygiene and sanitation (Fonssagrives, 1886; Gatewood, 1909; Holt, 1892; Keevil, 1957 and 1958; Lloyd and Coulter, 1961; Roddis, 1941; and Shaw, 1929) have been revealing. However, they have been disappointingly general in their approach to the particular problem in question.

Although a number of publications which deal with waste disposal and sanitary facilities in terrestrial contexts have been located (e.g. Holt, 1879; and Pudney, 1954), only one historical article (Munday, 1978) has been found to date which forthrightly addressed the nautical side of the issue. Even though it has been an excellent source, it is somewhat limited because sanitary facilities aboard only English ships from the late 17th to mid 19th centuries are discussed.

Another source of information utilized has been evidence from underwater archaeological contexts. Scant

but enlightening clues from preserved organic remains and artifacts encountered among the ballast and within the bilges of shipwrecks from the period are coming to light (Adams, 1983; Martin, 1978; Muckelroy, 1978: 177; and Price and Muckelroy, 1977: 193, 195, and 198) and have been discussed above. So far as is known, only one part of a probable external sanitary accommodation has been discovered in an archaeological context--a lead plumbing pipe which was presumably from the bow latrines of the Dartmouth (Martin, 1978: 52-53).

III FIFTEENTH CENTURY

In order to understand the changes in construction by which 15th-century vessels established the development of external sanitary accommodations, it is first necessary to briefly cover the trends in hull construction during the preceeding two centuries. Basically, the development of external hygienic facilities was made possible by the construction of platforms at bow and stern which consisted of overhangs and projections on which facilities that emptied directly into the sea were erected. The discussion primarily concerns the larger types of ships of the period, known as carracks, naos, hulks, and coqs. Where no distinction is made, general application to ships of the period is intended.

Pre-15th century bow and stern evolution

From largely double-ended ships (i.e. those with similar overall shapes fore and aft) which had lightweight, small scale additions of platforms or decking at either or both ends, the average sailing ships of the 13th and 14th centuries evolved by the 15th century into vessels with distinct, characteristic built-up features in the bow and stern.

In the 12th and 13th centuries, stages, or "castles," which were essentially temporary fighting platforms, were located at either end of the simple, double-ended hull.

Named castles for a good reason, these platforms incorporated features of contemporary terrestrial military architecture, e.g. battlements, because of the similarity between tactics used on land and at sea at the time. A fight at sea was simply a land engagement fought on floating platforms, using similar styles of attack and defense. "Warships had high sides--the equivalent of castle walls--and the high stages at bow and stern provided command and enfilading fire as a castle's towers did" (Howard, 1979: 14). Castles on vessels of this period were still very lightly built in comparison to the much stouter and, therefore, more castle-like structures developed in the 15th century.

As early as 1150, stages, or bellatorium, were depicted erected on stanchions in the stern of northern European ships. Late in the 12th century, raised platforms appeared at the bow (Arenhold, 1911: 299). City seals of the 13th century evidenced square or polygonal platforms erected independently of the stem and sternposts on wooden stanchions (Fig. 3). These were apparently fixed to the upper deck and planking. During the century a movement of the stages forward and aft, respectively, brought the stem and sternposts into use as supports. Subsequently, the stages were projected beyond the ends of the ships, leaving the stem and sternpost heads rising uselessly through the middle of the platforms (Nance, 1913b: 35).

The planar patterns of the bow stages are difficult to

determine with any accuracy, but they tended to square, rectangular, and pentagonal configurations. By the late 14th century, the forward end of the forecastle had developed a distinct point, and as the structure grew aft to occupy the entire space available at the bow, it assumed a triangular shape in plan. The triangular forecastle continued in use throughout the greater part of the 15th century (Nance, 1912a: 176; 1913a: 35; 1955a: 187).



Figure 3. Double-ended vessels with platforms erected at bow and stern; late 13th century. Left, after Bass (1972: 199, fig. 20); right, after Bass (1972: 196, fig. 13).

With the replacement of quarter steering oars by the stern rudder, the sternpost head was necessarily cut off so that the tiller attached to the rudder head could be efficiently utilized. As a result, by the mid 14th century, "the sterncastle now unsupported by the sternpost, was modified in shape, becoming lower and longer than the forecastle which, before, it had strongly resembled" (Nance, 1913b: 35). Incorporating the support of these

structures into the forward and after portions of the hull and its framing made subsequent enlargements and elaborations possible.

The emergence and incorporation of bow and stern superstructures in Mediterranean ships of the 14th century apparently developed at a greater pace than those of northern Europe (Nance, 1911b: 336). The former were already sporting two decks aft above the hull proper (quarter deck and poop deck); the quarter deck was still a novelty in England in the 14th century. Above the rounded sterns, the aft ends of the overhanging decks were terminated in a "square vertical bulwark." The projecting ends of these decks were supported by curved "counters," the framing of which was inside the fabric of the hull (Laughton, 1974: 104). The whole presented a rather box-like appearance; Nance (1914c: 277) noted that "the idea of a rectangular 'castle,' added after the ship proper was built, evidently died hard."

It has been suggested that the relatively elaborate stern structures of some southern, or "Latin," ship depictions of the 14th century, with their multiple, vertically rising stages and rudimentary side galleries, were directly influenced by the "higher, fuller stern[s] of Roman or earlier vessels" (Nance, 1911b: 336; and 1955a: 180).

By the beginning of the 15th century then, prominent forward projecting forecastles and box-like aftercastles

with a concave counter and resulting overhang at the stern were the norm. Both of these superstructures were relatively lightly-built and, though primarily erected on the external planking of the hull and the underlying decks at bow and stern, were beginning to be founded more on the structural framing of the vessels.

The bow

As stated, the predominant shape of the forecastle in the larger ships of the 15th century, carracks especially, was triangular in plan view, the apex of the triangle pointing forward. Contemporary artists have left precious little evidence of the exact nature of the construction of the forecastles of vessels like carracks. Figure 4a, dated c. 1450, is one of the most illustrative depictions known. The bow-on view clearly shows the underside of the triangular platform of the forestage with its single longitudinal support, four transverse frames, and laterally-laid floor planking (cf. Fig. 4b). The space between the underside of the forestage and the carvel-built hull of this Mediterranean carrack is covered with diagonal clinker planking. Carracks of northern Europe had clinker planking which followed the line of the sheer in this space (Howard, 1979: 22). It was in this area that the increasing incorporation of the forecastle into the hull took place.

This bow configuration changed very little during the

15th century. In general, the changes that occurred were the addition of one or two levels to the height of the forestage, which by this time had acquired dimensions

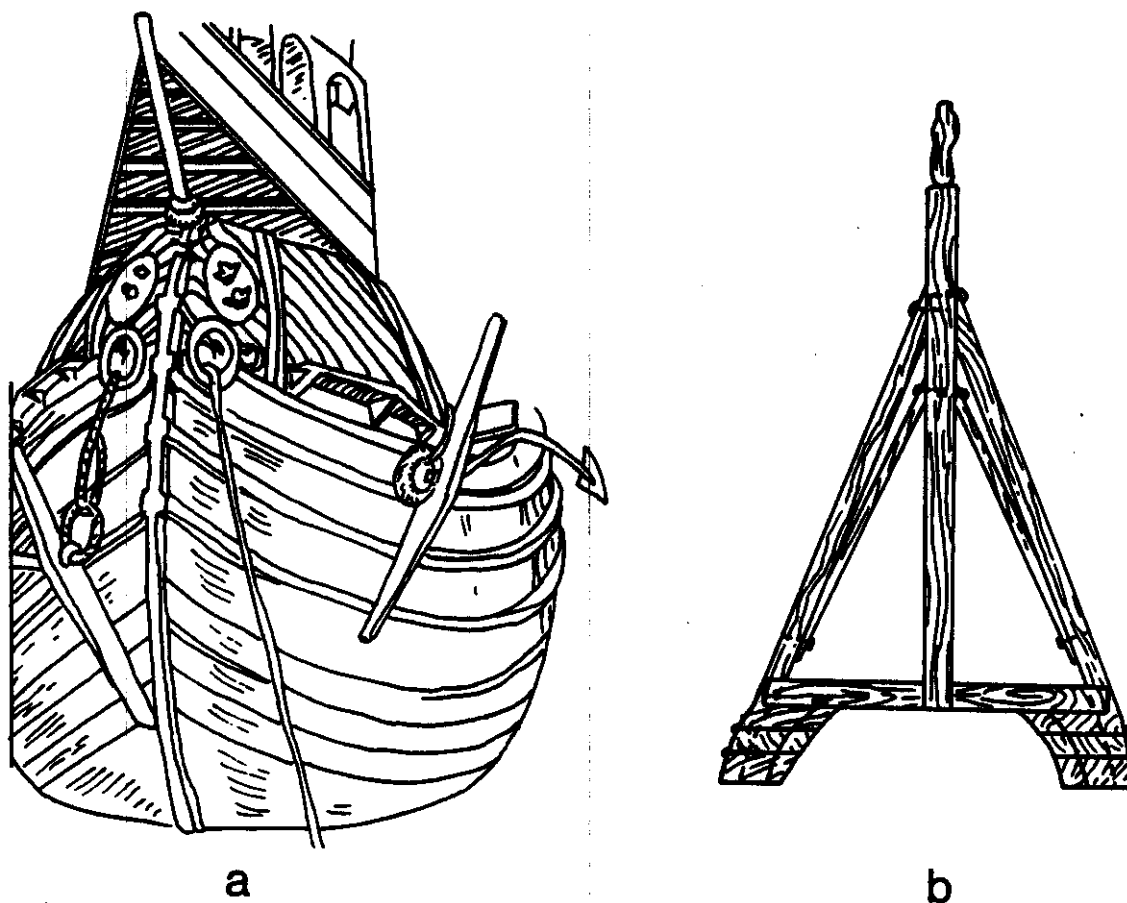


Figure 4. a. Bow of carrack from Carpaccio's Legend of St. Ursula; c. 1450. After Nance (1955a: 191, fig. 9). b. Framework of a 15th-century carrack's forestage. After Howard (1979: 22, fig. 19).

sufficient enough to be termed a true fore-"castle," and no longer a forestage, or more lightly-built platform. Other changes were the hyper-extension of the forecastle forward (Laughton, 1974: 31) and, during the last quarter of the

century, the upper stories of the forecastle were supported on curved, rather than straight, stanchions (Howard, *ibid.*). By the end of the 15th century, further consolidation had occurred in both the bow and stern, "leaving traces of the stanchions on which they were formerly reared, in the tiers of arched openings which [served] to give light and to act as emplacements for swivel guns" (Nance, 1955b: 288). Thus, vessels with the "towering poops and forecastles to which our eyes are accustomed in ships of the 16th century" had developed (Nance, 1955b: 284).

However, neither these nor any other depictions, models, or contemporary accounts have yielded any firm evidence of what type of sanitary accommodations, if any, existed in the forecastles of vessels from this period. Logically, it would have been an easy matter to simply not have lain floor planking over portions of the forecastle platform. Sections of planks could have been left out and/or replaced with wooden gratings. Gratings were used as sanitary accommodations in the forward projecting "beakheads" of vessels throughout most of the 16th century. Probably, slot-like defensive openings, or machicolations in medieval architecture parlance, were left in the projecting flooring to allow defenders to drop hot liquids, stones, and other objects down on attackers at the bow. These openings could have easily served a hygienic function, as they certainly did in the land-based analogs.

The striking similarities between defensive and sanitary features of castles and ships are further addressed in the following section on the sterns of vessels of the 15th century.

The stern

Little change in the general stern configuration took place in the 15th century. The multiple, lightly-built stages and tilt-frames, or awning supports, were gradually strengthened and further incorporated into the hull fabric and framing. Above the concave counter, most ships of the period ended in a flat and squared-off fashion; the line from the counter to the upper rail of the sterncastle was vertical. By c. 1450, the sternpost had become vertical, or nearly so, as well. The addition of the lower wing-transom below the tiller hole produced "what became the normal stern of the typical 15th-century carrack" (Nance, 1955a: 189-190). The introduction of the "square-tuck," or flat, as opposed to round, hull shape in the stern area occurred at the end of the century. In addition to making the placement of stern chaseguns possible, the square-tuck reduced the sheer in the stern while increasing the width of the extreme aft end of the hull. This provided a more substantial base upon which to erect the stern superstructure and improved the ability of the counter to support upper works which were trending toward accentuated rake aft and multiple counters

(Laughton, 1961: 102; and Nance, 1955b: 288-289).

In various depictions from the period, a number of features with obvious hygienic functions are evident at the sterns of these vessels. Without doubt, the single best representation of the aft end of a vessel (in this case, a carrack) with such features is the "Kraeck" of W.A., c. 1470 (Fig. 5). Apparent in this depiction and others to be

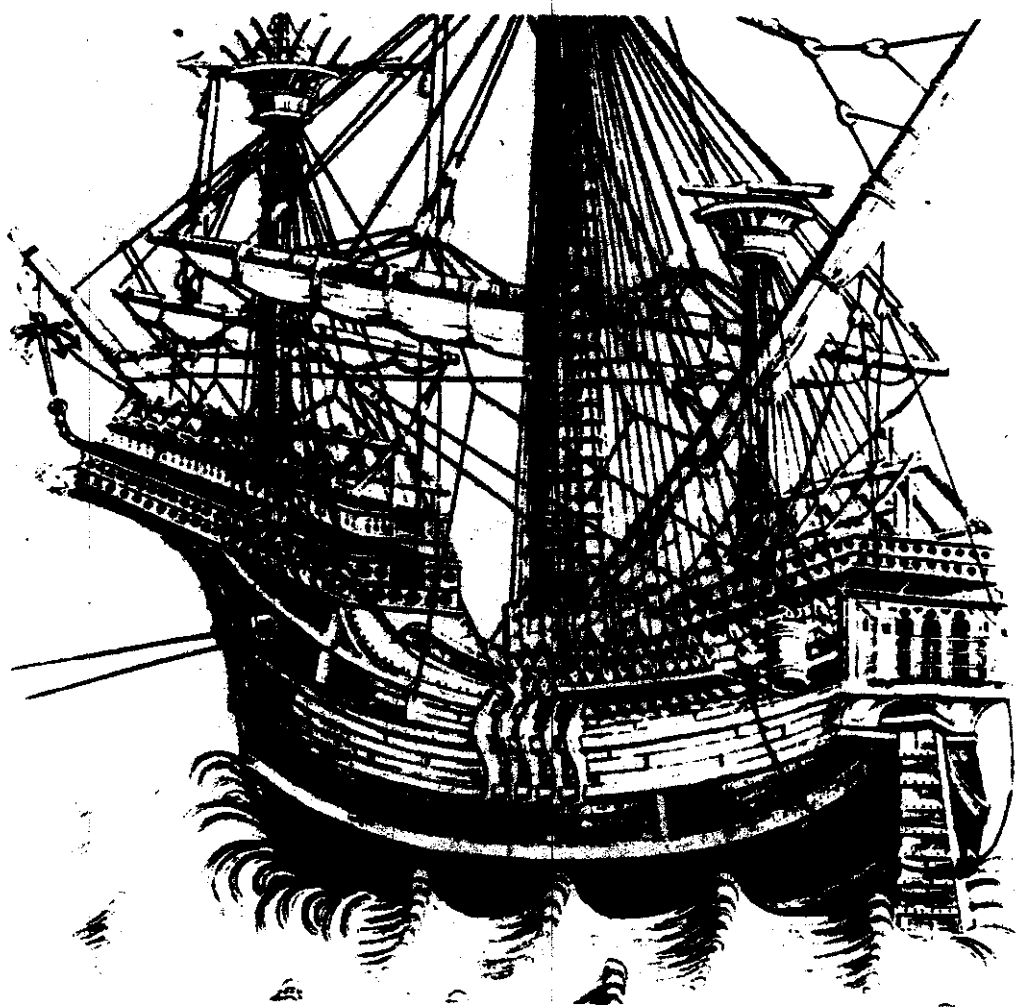


Figure 5. WA's "Kraeck"; c. 1470. Courtesy of The Ashmolean Museum, Oxford.

presented are the following: barrel-like attachments on

the stern quarter and over the transom and counter, often called "steep-tubs" after their other function; closet-like additions over the counters which projected out from the sterncastle, similar to "garderobes" in contemporary castle architecture; structures which closely resembled castle turrets and which probably performed much the same functions; and small projections through the counters which may have been "soil-pipes," or plumbing from facilities within the sterncastle. Each of these features will be addressed individually, below.

Steep-tubs

"Steep-tubs" were wooden barrels, or half-barrels, generally thought to have been used for the humidification and partial desalinization of salted meats--a staple for crews of sailing ships from at least as early as the 14th century to well into the 19th century (Jones, 1979: 93; Howard, 1979: 22; Nance, 1911c: 349; and Smith, 1652: 37). An alternative use has been suggested, as well: They were utilized as external sanitary accommodations (de Groot & Vorstman, 1980: pl. 3, caption). Hopefully, this dual purpose would not have been served in the same steep-tubs, but the contemporary and modern evidence, at least for the 15th century, is confusing, possibly due to the same or similar terms having been used for both. Nevertheless, they were depicted in contemporary illustrations from the 15th to the 18th centuries lashed upright to the stern

quarters, right aft over the counter, or in the mizzen or main chains. Horizontally mounted barrels in illustrations by WA and others, are thought to have been associated with the fishing industry.

During the 15th century, steep-tubs were most commonly shown on the quarters and sterns of northern and southern vessels--there being some distinction between features represented on ships representative of north or south. WA's "Kraeck" (Fig. 5), supposedly a Flemish carrack, had a steep-tub lashed to the port stern quarter just aft of the main chains and presumably had one on the starboard side at the same location. The stern of another carrack drawn by WA is shown in Figure 6. Two steep-tubs were depicted, one on either quarter, as were two objects on the starboard quarter which cannot be identified. In addition, a partitioned, stall-like stern gallery with one large and two small enclosures was drawn right aft, over the counter.

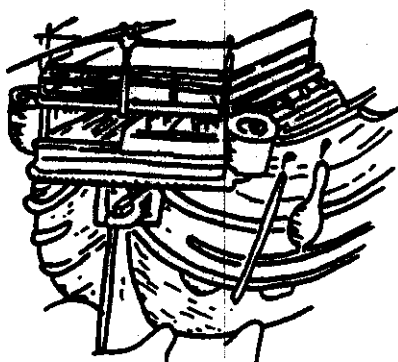


Figure 6. Stern of a vessel drawn by the Master WA; c. 1470. After Nance (1955b: 282, fig. 12b).

Depictions of southern ships of this century (Fig. 7) often show a slightly different type of container lashed to the stern or fitted into a projecting ledge over the counter. They seem to resemble large oil, water, or wine storage jars more than barrels, but the distinction is a difficult one to see plainly. Nance (1955b: 284) noted that the jars "can hardly be 'steep-tubs,' such as WA would give his [northern] vessels, for in some instances we seem to have upon the quarter these same tubs for de-salting preserved meat as well as the objects astern." Indeed, they were probably examples of some of the earliest external sanitary accommodations. Between the jar-like containers on these vessels (Fig. 7), some interesting

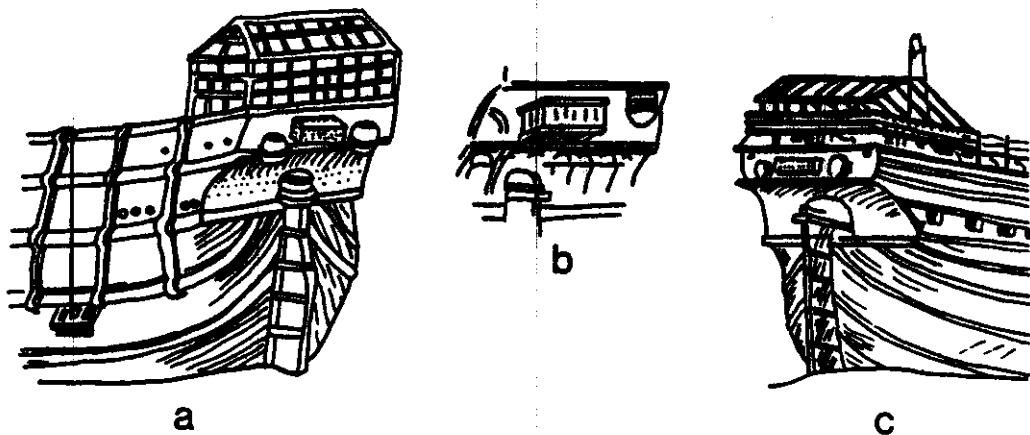


Figure 7. Sterns of southern ships; late 15th century. a. and b. After Howard (1979: 22, fig. 21). c. After Howard (1979: 22, fig. 20).

structures were depicted which appear to be large "hencoops" or small crate-like galleries, roughly similar to the small stalls on the stern of the ship in Figure 6. Nance (ibid.) added that these "crates...and the jars may

be peculiarly southern equipage."

An ethnological analogy can be drawn between these jars, barrels, hencoops, crates, and small box-like galleries on 15th-century ships and the "sanitary boxes" of modern Arab dhows, booms, abubuzes, and other vessels (Fig. 8 and 9) which have remained virtually unchanged for

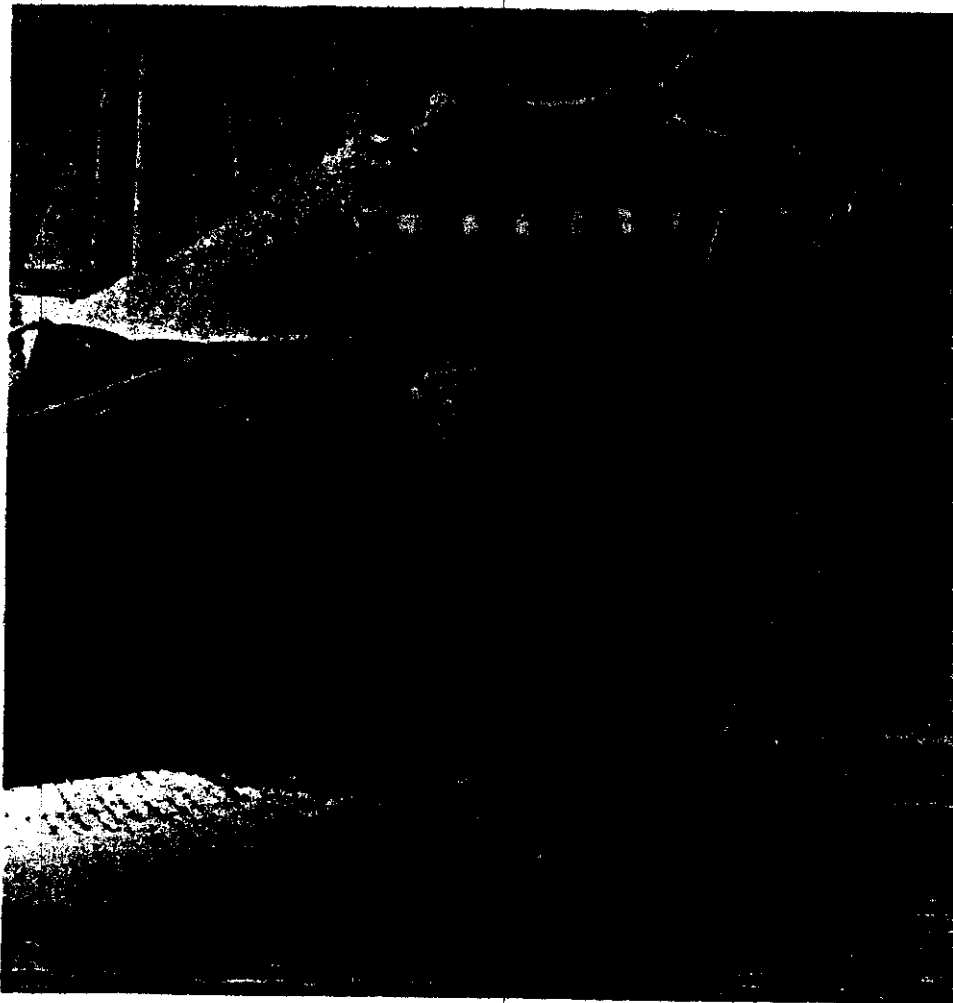


Figure 8. Stern of a boom with two decorated "sanitary boxes," one on either side of the sternpost. Courtesy of East African Publishing House, Nairobi, Kenya.

hundreds of years. Generally, sanitary boxes were "one-holed privies hung overboard off the poop, usually on the port side, but sometimes seen on starboard....[They] usually lack the privacy of a privy, and are almost completely open" (Bowen, 1951: 190).

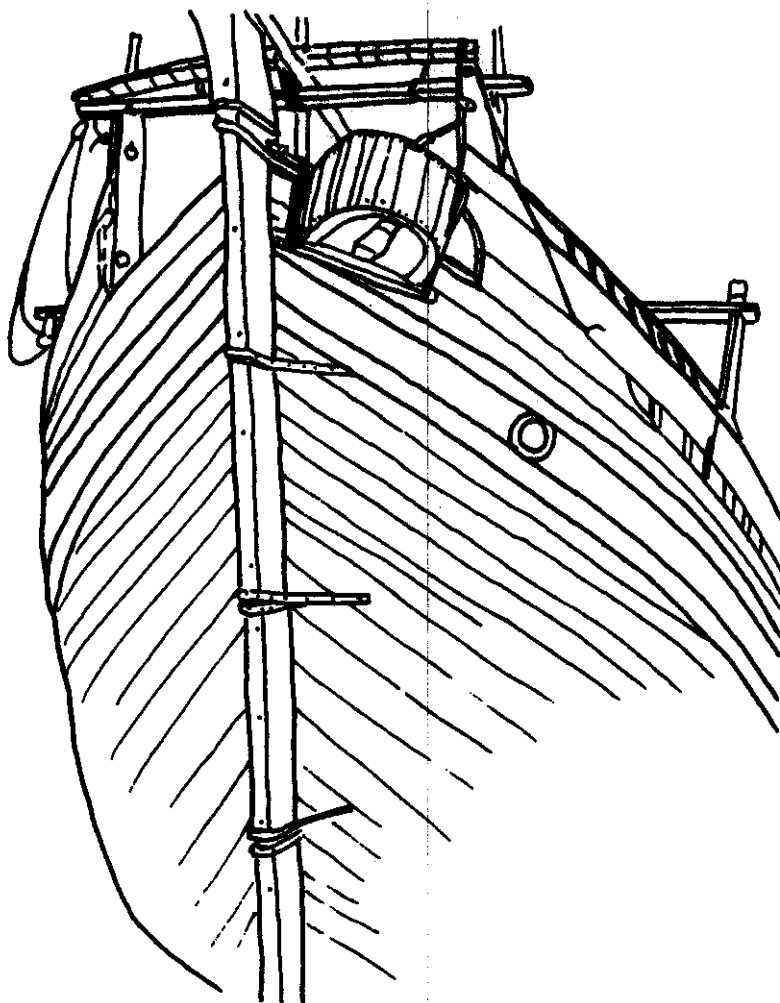


Figure 9. Stern of an "80-year-old" boom. Note "sanitary box" to starboard of sternpost. After Howarth (1977: 29).

It is widely accepted that Arab influences on southern, and, in turn, northern European ships, their style, construction, and rigging, were substantial ones.

Certainly, the adoption of one more feature is not infeasible, especially if the feature in question offered distinct, readily apparent advantages.

These sanitary boxes are predominately semi-circular or square, in plan view, and are usually constructed in the plain, utilitarian fashion of a crate (Fig. 9). Some examples, however, are decorated (Fig. 8) or made with more obvious artistry. Figure 10, a detailed view of the interior of a sanitary box, offers a representative of the latter. The most apparent feature, apart from the rough

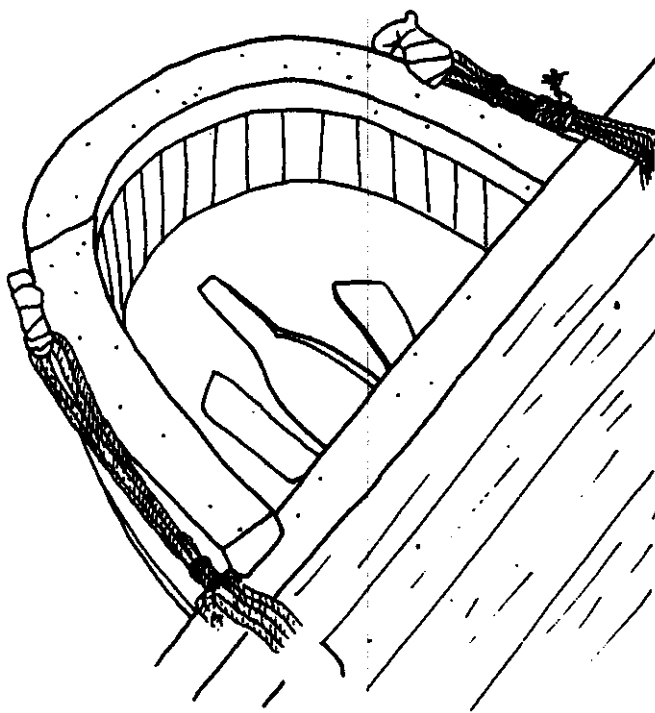


Figure 10. Interior view of semi-circular "sanitary box."
After Howarth (1977: 55).

but well made semi-circular box itself, is the elongated keyhole-shaped slot in the floor and the foot-pads on

either side. Their alignment indicates that the user would face outboard while squatting, feet placed on the pads. Being simply lashed on the gunwale, it would be easy to move from side to side, as necessary, when changing tack.

The overwhelming simplicity and indisputable usefulness of such a device favor an extreme conservatism in its use. It seems probable that contemporary artists of the 15th century were attempting, in at least some of their works, to depict external sanitary accommodations very similar to modern Arab "sanitary boxes." Interestingly, one source has stated that Vasco da Gama's caravels of 1497, relatively small, but important ships of the period, were probably equipped with a very similar device. "For jakes there were the 'gardens,' stools hung over the leeside, where, as like as not, the sweep of the water as the ship heeled would wash your arse" (Jones, 1978: 46).

Garderobes

On several interesting depictions from the 15th century, most notably WA's kraeck, peculiar closet-like additions were represented projecting aft from the stern, over the counter. In this work by WA (Fig. 5) two of these devices are seen, one on each side of a small, ballustraded gallery. The three external sides of each were pierced with what were apparently windows to admit light and to afford some ventilation. On the underside of each device, the flooring had been left partially open between the

curved supports. Below this, on the curved counter, small "shields" are evident. Between the additions are what have been interpreted as three doorways with round windows above them, or the artist's attempt at depicting a trio of humans, possibly saints (Howard, 1979: 27).

These stern additions were so similar to the garderobes used in medieval castle architecture that there can be little doubt as to their intended uses. Harris & Lever (1966: 31), have defined a "garderobe" as: a "euphemism for a privy in a medieval castle...[that] was built either within the thickness of the castle wall, or else projecting beyond the wall...[and draining] into the moat or into a special pit." Obviously, access to the garderobes was from the interior of the castle. Thompson, in Military architecture in medieval England (1975: 156), has further characterized these terrestrial hygienic facilities: "...the outer wall, in which the seat was contained, was slightly thickened and corbelled out at this level, and a vent made below the seat." Garderobes were usually equipped with a loop, or slot in the masonry, to allow the entrance of air and light (Harris & Lever, 1966: 38). Figure 11 illustrates the classic style of garderobes as constructed in medieval European castles. They served as excellent models for their maritime analogs.

Therefore, the ship-borne garderobes are best interpreted as external sanitary accommodations, entered from within, which were borrowed from castle architecture,

made of wood, not stone, and projected out from suitable "walls" of the vessels, in this case (Fig. 5), the aft face of the sterncastle. The overhang afforded direct deposition of excreta into the sea, much as the terrestrial garderobes were able to deposit their discharge into moats and pits. The shields on the counter of WA's kraeck may

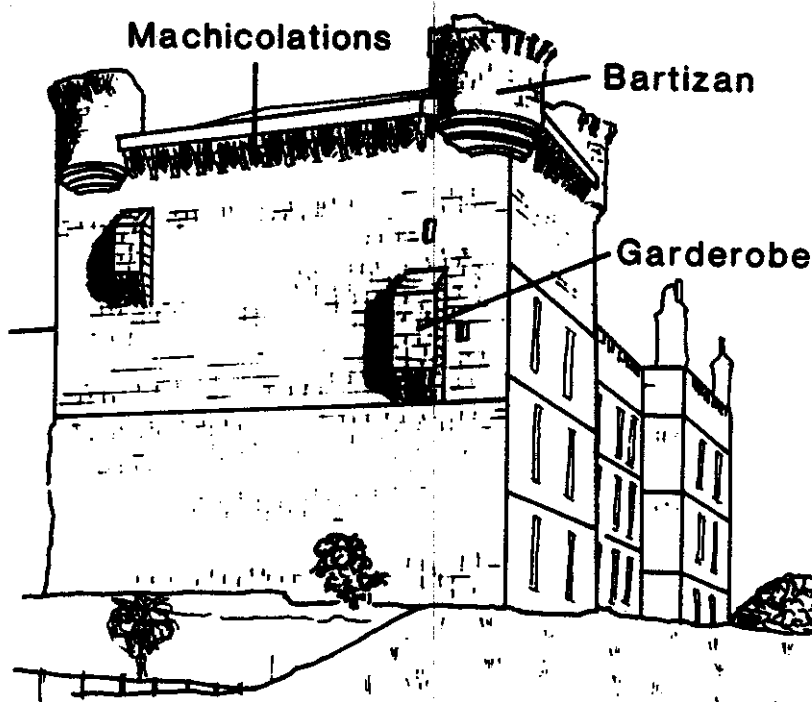


Figure 11. Prominent garderobes on the 13th-century Chipchase Castle, Northumberland. After Thompson (1975: pl. 114).

well have been protective splash-guards of lead that would have inhibited rot from attacking the counter (Nance, 1912b: 229). The latter were not needed on castle walls since they were much less susceptible to excreta-generated molds, fungi, etc. The dark stains below the vents of most castle garderobes attest to the rich organic nature of any

possible residues, although this possibility would have been lessened on ships by wave action at their sterns. Incidentally, taking a following sea while using these garderobes would have been quite an experience, especially if there were not a one-way flapper valve or something similar at the mouth or in the throat of the vent.'

It has been suggested that ships' garderobes could have served a defensive purpose, in addition to its primary function as "sanitary office": "...as a means of annoying boarders at the stern by pouring hot water or molten lead upon them..." (Nance, *ibid.*). Garderobes continued in use throughout the 15th and into the 16th century when they can be seen to have undergone important changes.

Turrets/Bartizans

Another interesting feature apparent in depictions of the last quarter of the 15th century is the stern "turret," square in plan, usually seen in pairs, and attached right aft on either side of the stern structure. Figures 12a and 12b are two vessels, probably Flemish, drawn by WA. Seemingly, they were fishing craft, as is evidenced by the barrels strung horizontally outboard along the starboard gunwale (Fig. 12b) and at the port quarter (Fig. 12a). An additional illustration of a detail from the roughly contemporaneous painting entitled The Rape of Helen, by Gozzoli (Fig. 13), evidenced turrets in the same locations which have crenelations, or battlements, on their upper

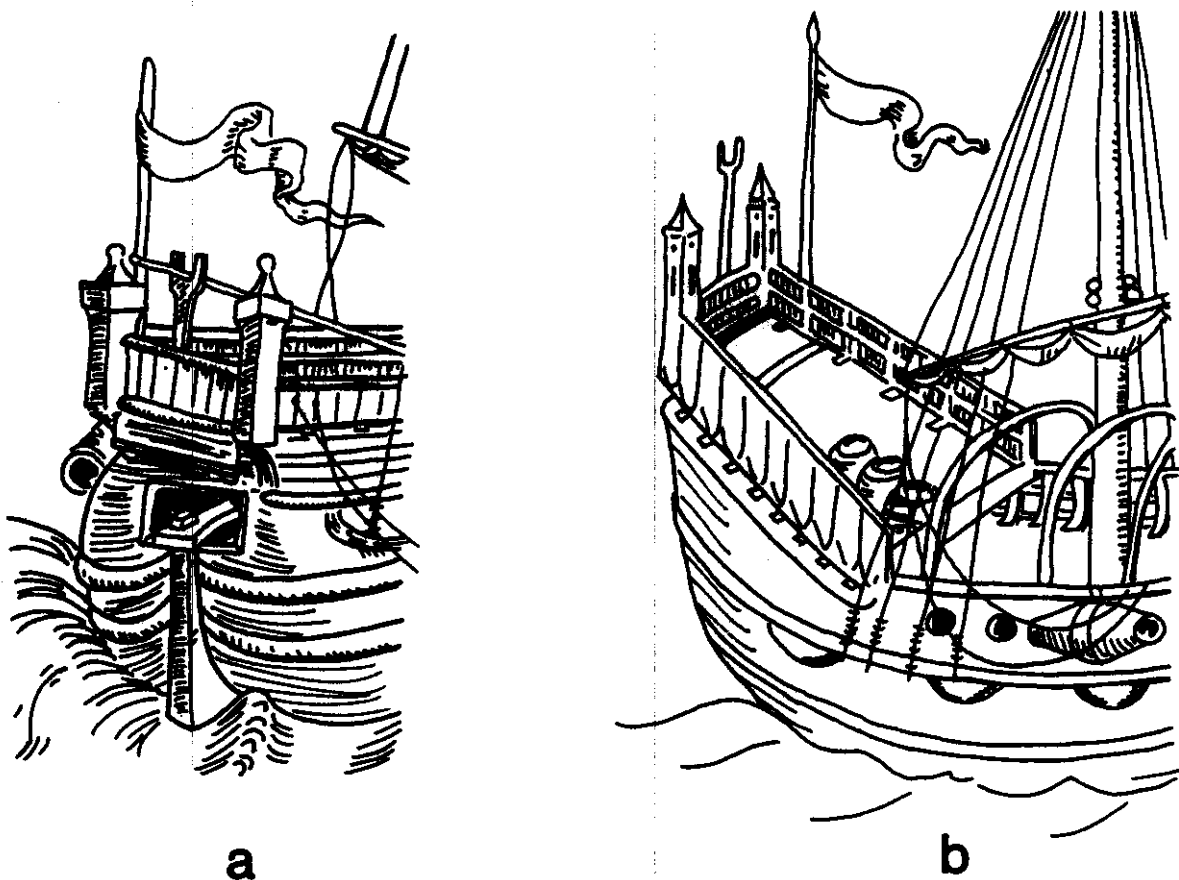


Figure 12. Stern turrets on two vessels drawn by the Master WA; late 15th century. a. After Nance (1913b: 67, fig. 1). b. After Nance (1911a: 66).

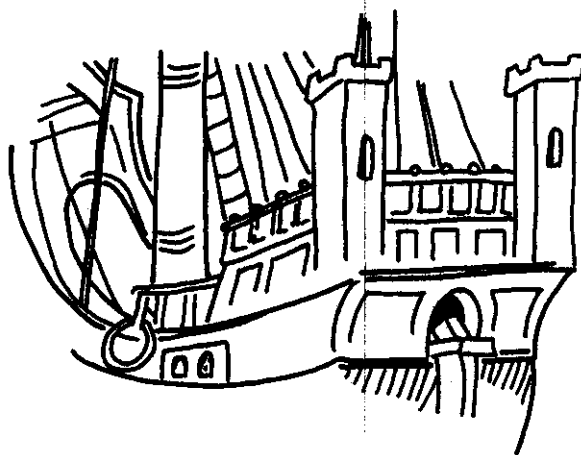


Figure 13. Battlemented stern turrets on ship from Gozzoli's The Rape of Helen; late 15th century. After Nance (1913b: 67, fig. 4).

level. Although all three pairs are very similar, minor discernible differences in the turrets of these three ships are knobbed versus pointed and crenelated tops and the absence of loops, or windows, in the turrets of the vessel depicted in Figure 12a. In the one turret which could have yielded evidence of the entrance to these devices (Fig. 12b), no trace of any entryway is seen. Moreover, the undetailed depiction of the undersides of the turrets of the Italian ship (Fig. 13) leaves a good deal to be desired. Regardless of the lack of such small but tangible clues, it is postulated that the stern turrets of this period represented yet another feature of medieval castle architecture directly adapted for shipboard use.

In medieval military architecture, turrets corbelled out at strategic points near entranceway arches, or from the walls of towers, churches, and habitations were known as bartizans (Harris & Lever, 1966: 7; and Thompson, 1975: 235). Originally used in defensive and lookout roles, they came to be used additionally as sanitary accommodations. Occasionally, bartizan machicolations, defensive slots left between supports in their floors, were used as vents through which to remove excreta (Thompson, 1975: 156). Figure 11 illustrates a type of round, corbelled, though unmachicolated bartizan.

According to Thompson (1975: 235), bartizans were "common in French military architecture of the 13th and 14th centuries." However, they were not as common in

England during this or subsequent periods. Interestingly, turrets, or bartizans, were rare in English vessels and may have been utilized in French, or French-influenced, craft (e.g. Dutch-built French vessels) almost exclusively (Laughton, 1974: 219).

Bartizans depicted on ships of the 15th century, with their ample overhang at the stern, served as external hygienic accommodations in a fashion similar to the garderobes which they closely resembled. In addition, they may have served another purpose. Nance (1913b: 69) offered the following illumination: "...of all WA's ships these two fisherboats alone have such turrets, which fact, taken with the necessity of lights to a fishing fleet, strongly tempts one to look upon them as lanterns," above, and garderobes, below.

Soil-pipes

A relatively small number of 15th century depictions evidence what appears to have been some type of plumbing, or venting, for sanitary accommodations (i.e. soil-pipes) in the sterns of larger vessels, such as carracks. In Figure 14, a carrack with features similar to these is illustrated. The construction of this vessel is reminiscent of WA's kraeck, with its "curved bare stanchions...and gallery right aft" (Nance, 1913c: 245). There were, apparently, no garderobes like those on WA's kraeck, but the hencoop-like structure in the middle of the

aft projecting ledge and the somewhat obscure circular objects on either side of it seem to resemble the equipage on the sterns of southern carracks of the period (Fig. 7).

Of importance here, are the two small objects protruding from the underside of the projecting ledge. Their stark shadows give a hint of their having been cylindrical and, therefore, are probably best explained as soil-pipes from the presumed circular hygienic devices with which they are plainly associated.

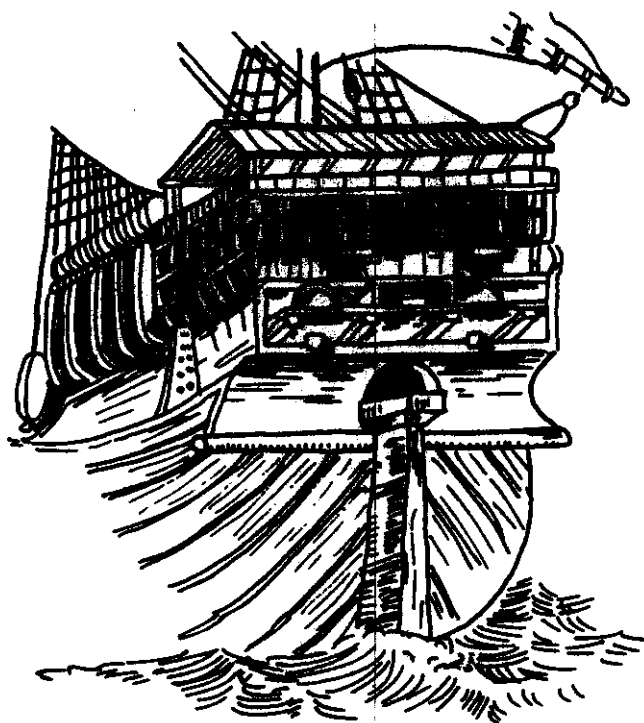


Figure 14. Stern of a 15th century carrack by Reuwich (1483), in Breydenbach's Journey to Jerusalem. After Howard (1979: 22, fig. 21).

IV SIXTEENTH CENTURY

During the greater part of the 16th century, moderate and large size ships were still considered as "sea castles" which relied heavily upon offensive and defensive tactics and weaponry borrowed from land armies. Correspondingly, the garderobes and bartizans taken from castle architecture and utilized aboard ships during the previous century continued in use, in slightly altered forms, during most of this one. Steep-tubs, or necessary tubs, were also utilized throughout the century, as were the simple disposal systems which made use of the scupper-like soil-pipes.

The bow

Changes in the configuration of the bows of 16th-century ships had considerable impact in regard to the establishment of more efficient external sanitary accommodations in their forward areas. Further incorporation of the forecastle into the hull structure and framing occurred, while its height was reduced. Of greatest concern to this study was the appearance and development of the "head," or "beakhead."

The beakhead came into existence during the reign of Henry VIII (1509-1547). The exact changes which lead from the typical carrack forecastle of the 15th century to the beakhead of the 16th are not well understood. Generally,

the "galley spur," actually a type of ram, appeared low down on the bow of carracks and other vessels early in the century and the projecting apex of the triangular forecastle was reduced. The galley spur moved upward somewhat and elaborated while, by c. 1550, the forecastle had retracted to within the confines of the forward portion of the hull, and, as such, was fully incorporated into its fabric and framing.

The installation of the galley spur was an attempt to equip sailing ships with the oared galleys' primary weapon, the ram, so that they might meet on more even terms. It seems to have been readily accepted because in the few years following its appearance it is seen in English, French, Spanish, and Portuguese depictions. The Spanish Santa Ana of 1525 clearly had the "very elaborate projection of the carrack forecastle" and the distinctive galley spur just a few feet above the waterline (Laughton, 1974: 31; and Nance, 1924: 212-213). Figure 15, an English ship from the Anthony Roll (1546), displays these characteristic features.

The galley spur, when it first appeared, seems to have been a relatively open framework, occasionally topped with a figurehead of some kind. Then, in the 1540s, the spur was decked in, probably by the Spanish, so that it could have been used to handle the "headgear" more effectively and to mount small guns in the bow to give the broadside ships the "end-on" firepower of galleys (Laughton, 1974:

33). Within a short time, rails were added to the galley spur's decking. Subsequently, a bulwark was "carried along each side of the structure, and the resulting [beak]head was in section a rectangular trough" (Fig. 16) (Laughton, 1974: 34).

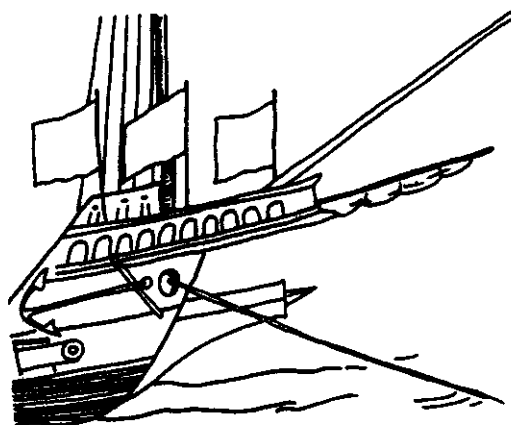
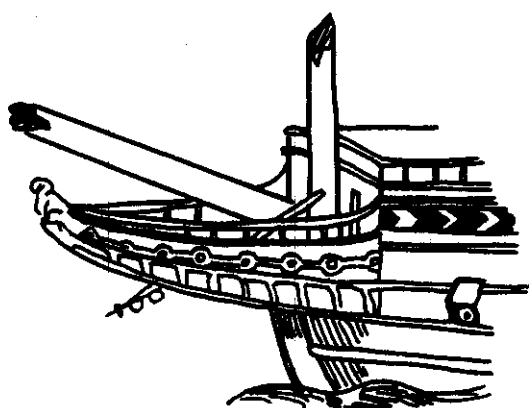
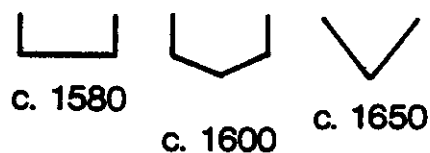


Figure 15. Galley spur and projecting forecastle on English ship Swallow from Anthony Roll of 1546. After Vaughn (1914: 38, fig. 4).



a



b

Figure 16. a. Late 16th-century beakhead. After Howard (1979: 106, fig. 146a). b. Cross-sectional views of characteristic beakheads. After Howard (1979: 106, fig. 146b).

By the last third of the century, there were some apparent distinctions between the beakhead arrangement of Spanish, and probably Portuguese, ships and those which routinely plied more northern waters: The bows of Spanish vessels were cut down square to a level with their relatively low-mounted beakheads. This made as many as three tiers of forward chaseguns possible. In contrast, the beakheads of northern European ships were not placed as low, probably owing to the rougher waters of the North Atlantic Ocean and North Sea which they frequented. Their beakhead was at the same level as the upper deck under the forecastle (Laughton, 1974: 33-34).

As the Spanish apparently developed the beakhead, so were they the first to alter its form. By the last decade of the 16th century, they were "steeping up" the knee of the head, or increasing the angle of the beakhead so as to shorten its forward projection and, consequently, decrease its area. The angle settled on by the Spanish seems to have been about 30 degrees between the head and the waterline. Once started, this trend toward shortening the projection of the head continued until well into the 17th century. However, northern ships lagged behind in this fashion; by c. 1650, they had not yet surpassed the 30 degree angle established by the Spanish more than 50 years earlier (Laughton, 1974: 41-42).

The relationship between the development of the beakhead and the present study is an important one. In

terms of hygienic considerations, the beakhead was an improvement over the projecting forecastles of carracks. The heads were open to sun, wind, rain, and sea, whereas the forecastle projections had been more enclosed. Constructed as they were of relatively light framing, light planking, and gratings, beakheads were ideal as platforms for the establishment of external sanitary accommodations. These probably consisted of rails or simple, holed planks erected as much out of the way of the other activities performed there as possible and which offered an unhindered drop to the sea. Gratings were certainly used, as well. The whole would have been relatively easy to keep as clean as the common practices of the day allowed. The poor standards of cleanliness commonly practiced then have been previously addressed in the introduction to this study.

It is important to note that while the increased openness of the heads were an important hygienic improvement over the closed forecastles of earlier vessels, the opposite is true of developments in the stern. There, the upperworks were undergoing an increased closing-in as protection from the elements and were an important improvement for the hygienic conditions as well. The reason for these seemingly contradictory developments each contributing to the improvement of hygienic conditions on board can be easily explained by considering the uses to which each area was put.

There was indeed a great gulf fixed between the lower deck and the wardroom, a great disparity in victuals, in accommodation and in living conditions generally. Nowhere is this more marked than in the question, which must be considered fundamental, but which is much neglected by writers on the Service, of the ship's necessary arrangements (Munday, 1978: 125).

The forward area was the domain of the common seaman and hence was much more crowded and given the least consideration for health and comfort. Therefore, construction that facilitated waste removal with little effort, maintenance, or expense of construction was the norm. On the other hand, the stern was the officers' area. At the apex of the hierarchy, these men expected and received better facilities than the common seaman. Of prime importance is the fact that there were relatively fewer officers utilizing stern hygienic facilities which they did not have to clean. Hence, the enclosed nature of the quarter galleries and their more difficult maintenance were of substantially less importance.

One interesting description of the use of a 16th-century galley's sanitary accommodations has come to light. The galley's configuration would have been comparable to those of un-oared sailing ships from the period and, therefore, this passage (which I have translated from the Spanish) can serve an insightful purpose.

It is a privilege of the galley that all passengers that want to evacuate the bowel and to produce something from their person [have] the necessity of going to the latrines of the bow and

leaning against a head rail; and [in] what cannot be said, much less done, publicly without embarrassment, all of them are to be seen seated on the necessary as they have seen each other eating at the table (Fernández Duro, 1880: 47).

This account yields several clues about the use of the forward sanitary accommodations on Spanish galleys. Since the users of this particular facility perched on a "head rail," the head timbers of this galley's beakhead must have been fairly open and canted out slightly, not vertical. In this manner, the user could have sat over a middle head rail and leaned back against the upper head rail. Apparently, these beakhead latrines could have accommodated a number of people simultaneously, in spite of the "embarrassment" of the situation.

To date, no archaeological evidence of beakhead structures or associated external sanitary accommodations has been recovered from 16th-century shipwrecks. Unfortunately, this is to be expected in the great majority of cases. Upper works of neither the bow nor the stern are likely to be preserved due to the fact that they are usually the last remains to be covered by protective sediments. As a result, they are left exposed to the ravages of shipworms, tides, storms, and other destructive agents and all that remain are images on contemporary depictions and the sparse literary evidence.

The stern

As forecastles had been consolidated into the forward

portion of hulls, the sterncastles of 16th-century ships also experienced further incorporation into the aft hull structure. The tendency to place multiple counters at the stern and the extreme rake which resulted continued during the first half of the century. However, during the Elizabethan era, the number of overhangs and, thus, the rake seem to have been somewhat reduced, at least in English vessels. The continental fashion tended to retain the multiple counters (Howard, 1979: 51 and 98).

A very important development occurring in this century and relating to the removal of human wastes was the appearance of stern and quarter galleries. Quarter galleries are of greater import to the present study, for it was in these features of the stern that external sanitary accommodations were to become firmly established until the end of the 19th century.

Steep-tubs

Steep-tubs continued in use throughout the 16th century, serving their function of meat desalinization or as "necessary tubs" externally and within the hull. In their simplest forms, they were similar to the steep-tubs used during the preceeding century and to modern Arab sanitary boxes. As such, they were slung over the upper bulwark or attached to the hull so that they had a relatively unhindered drop to the sea and, at the same time, were reasonably accessible. Morison (1974: 171) stated that

among Spanish seafarers "there was a good deal of joking" regarding the devices "hung over the rail forward and aft, for the seamen...to ease themselves." He added that "they were called jardines [gardens], perhaps in memory of the usual location of the family privy."

The external necessary tubs, when depicted in this period, seem to have been moved from the sterns and quarters to the main chains of either or both sides sometime around mid century. It is assumed that this was the case in vessels of most European nations. Here they were rested on the chain wale and lashed to the hull or deadeyes. An excellent depiction of this arrangement in what was probably a Portuguese ship of c. 1562 is given in Figure 17. This move may have taken place due to the increased height of sterncastles and other factors which made necessary tubs on the quarters relatively inaccessible. For the same reasons, steep-tubs used as meat softeners may well have retained their positions at the quarters, so that their remote locations inhibited pilfering by the crew.

There is an interesting account of steep-tubs used as interior necessary tubs on English vessels during the last half of the century. As in preceeding years, necessary tubs, into which the crew urinated, were located at strategic points on the lower decks. There seem to have been standing orders in the British navy during this period to the effect that the necessary tubs were to be

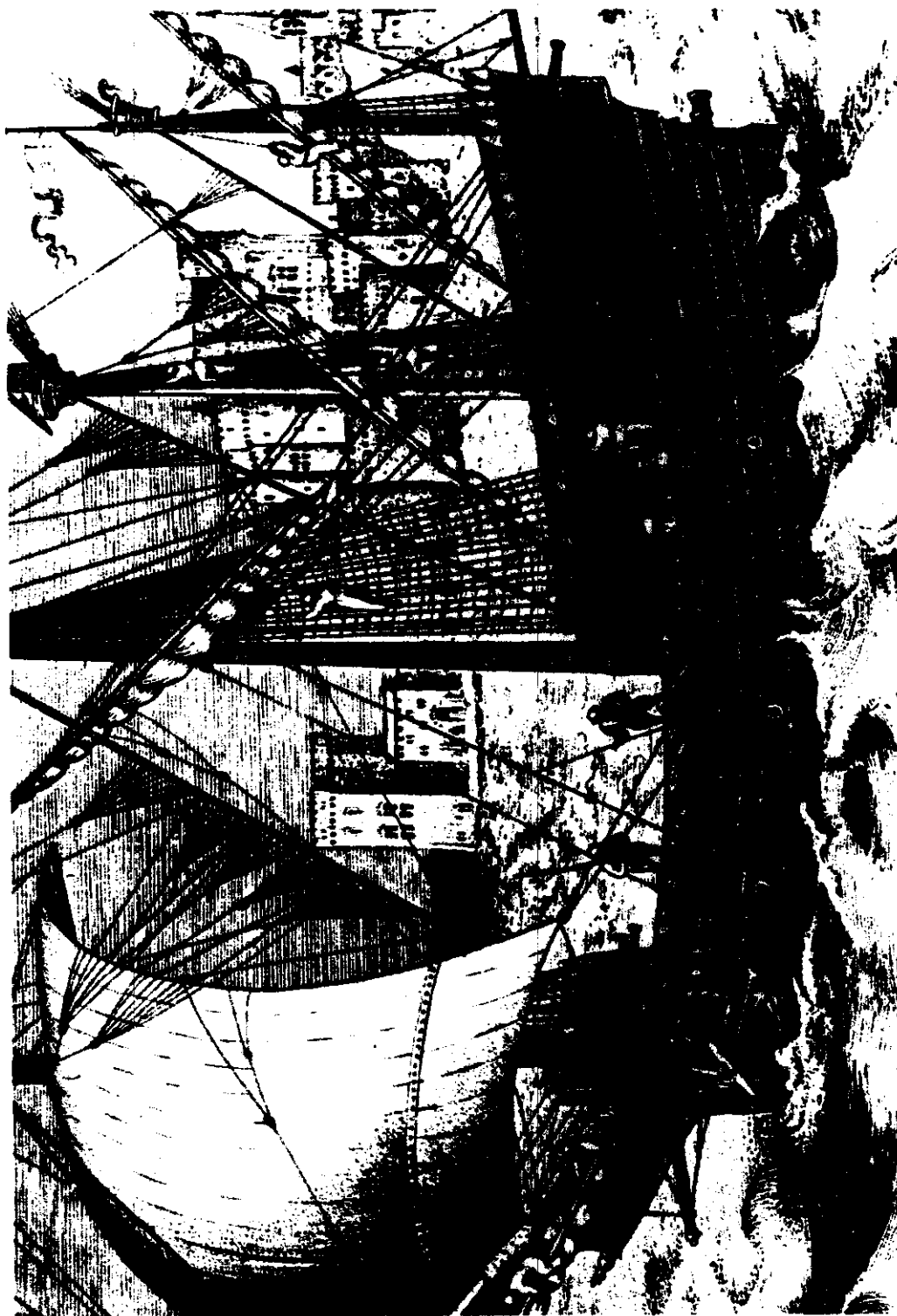


Figure 17. Necessary tubs in port main chains. Detail of Armed Four-Master Putting to Sea by Frans Huys after Pieter Bruegel; c. 1562. Courtesy of Rijksmuseum, Amsterdam.

continuously "filled with urine and ready for use in the event of fire" (Keevil, 1957: 116). It has been suggested that these orders implied a belief that urine had special fire fighting qualities. However, this suggestion ignores the fact "that it was more reasonable to retain this liquid where it might put out a fire than to carry it to the upper deck, lower the bucket over the side, refill it with sea-water, and take it to a place where it could now no longer serve its primary purpose" because it was full (Keevil, *ibid.*).

While no archaeological evidence for steep-tubs used as waste receptacles yet exists, there is some limited archaeological evidence of steep-tubs having been used in a meat-softening role. On the exterior of the preserved starboard section of the sterncastle of the Mary Rose (sunk 1545), a series of barrels were found just above the chain wale. Within them, a number of animal bones were found (Rule, 1983: 148).

Garderobes

The role of garderobes as external hygienic facilities during the 16th century is much less apparent than it was during the previous one. In fact, there is a veritable dearth of information regarding them, both in contemporary depictions and descriptions. To date, only one illustration of garderobes from this period is known (Fig. 18), and it is from the first quarter of the century. This

painting, by an anonymous artist, is The Embarkation of Henry VIII, c. 1520, and includes some of Henry's largest vessels, among them what are popularly understood to have been the Henry Grace a Dieu, the Great Bark, and, possibly, the Mary Rose. On the extreme aft end of the starboard stern quarter of the Great Bark, what was plainly a garderobe can be seen. It was supported at a rakish angle by a pair of brackets underneath, a vent having been left

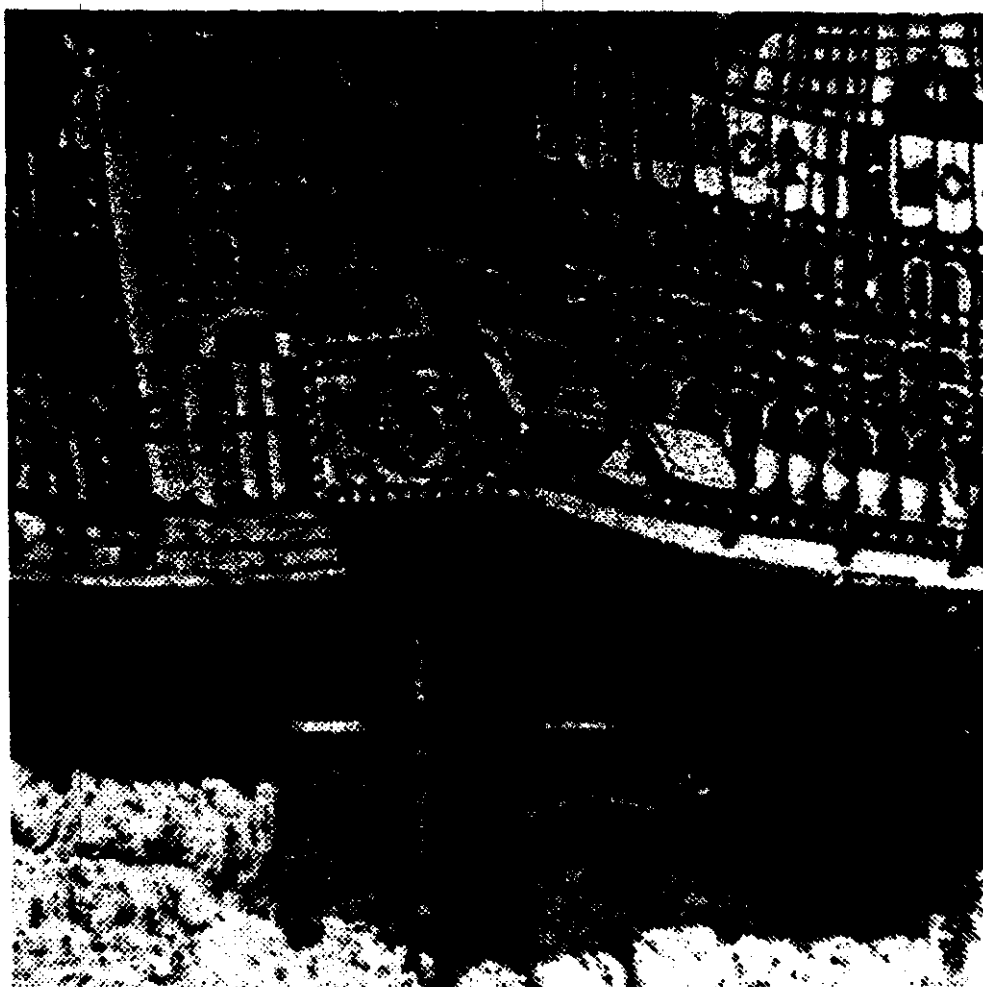


Figure 18. Detail of ship's quarter with garderobe attached, from The Embarkation of Henry VIII by an unknown artist; c. 1520. Hampton Court. Reproduced by Gracious Permission of Her Majesty the Queen. Crown Copyright Reserved.

in the floor between them. Presumably, the stark, undecorated device projected out far enough to allow a reasonably clean drop past the tumblehome.

Even though depictions of garderobes are anything but abundant for the previous century, there are a sufficient number to allow reasonable interpretation. Contrastingly, the sparseness of these representations during the 16th century, is no less significant. What happened to garderobes during this hundred-year period?

Possibly, they lost out to the general tendency of most European nations during the greater part of the period to build multiple counters at the stern. The number of overhangs and the rake of the sterncastle's aft face might have made it prohibitively difficult to fit them on to the area they had characteristically occupied in vessels of the previous century. However, the sides of the sterncastles, above the tumblehome, were still roughly vertical, flat surfaces upon which the garderobes were easily installed, as was the garderobe on the Great Bark. By assuming this configuration, garderobes may have become the true predecessors of enclosed quarter galleries which made their first appearance in the early 17th century.

Another possible explanation is that garderobes were made somewhat redundant by the emerging development of the "open balcony" style of stern and quarter galleries. These emerging features were utilized as external sanitary accommodations (Casson, 1964: 98; and 1971: 180).

For the same reasons that the remains of beakheads, forecastles, and other superstructures are rarely preserved for archaeological examination, physical evidence for hygienic facilities in the sterns of 16th-century vessels is nonexistent. Perhaps as shipwrecks are being found in deeper and more protective waters, the possibility of finding preserved portions of upper works at both bow and stern and, consequently, associated external sanitary accommodations will increase.

Quarter galleries

First introduced in the 1530s, quarter galleries appeared as an extension of the unroofed stern galleries around the quarters (Fig. 19) (Laughton, 1974: 161). The first English depiction of a vessel with a quarter and stern gallery is the Greyhound from the Anthony Roll of 1546 (Howard, 1979: 51, 79, fig. 114, and 163, fig. 246). Their acceptance and diffusion seems to have been rather slow for they were not common as late as c. 1555 (Nance, 1955b: 296). When utilized, quarter galleries appear to have continued this "open balcony" configuration until the end of the century. Because the counters above stern galleries afforded some amount of protection above, there was no need to cover them. The quarter galleries, on the other hand, were not protected by any overhang above and, in order to give some measure of protection, supports for awnings were erected over them (Laughton, 1974: 161). The awnings gave

way to wood coverings and to increasing enclosure of the quarter galleries during the first third of the 17th century.

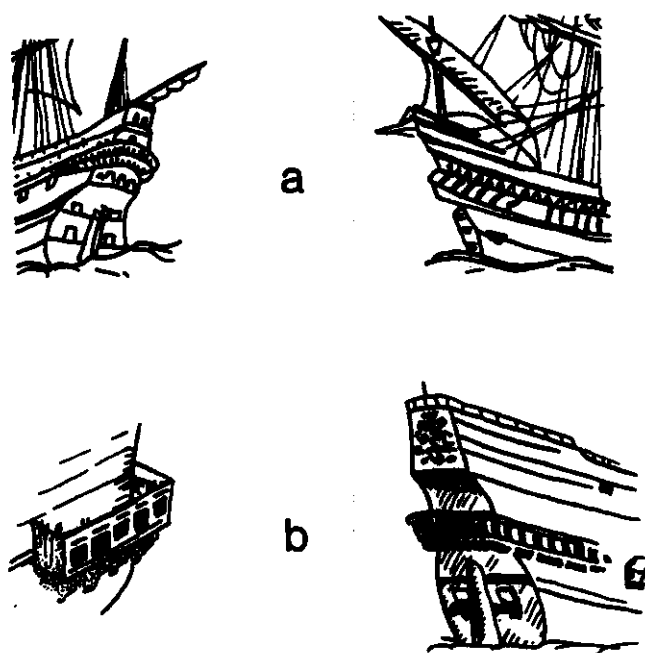


Figure 19. Early styles of open quarter galleries; mid to late 16th century. a. Two ships by Le Testu. After Howard (1979: 60, fig. 78). b. By Dutch artists. After Laughton (1974: 162, fig. e and i).

These facilities originated as and remained the sole domain of the officers and important passengers throughout their long history. "...Officers being officers, [quarter galleries] were handsomely built and decorated" (Casson, 1964: 98).

Quarter galleries afforded an easily accessible, projecting platform on which to establish sanitary accommodations. However, during this century they were

left largely open, though most were equipped with awnings or other types of relatively insufficient coverings. It has been suggested, above, that the appearance of enclosed quarter galleries at the beginning of the 17th century may be due, in part, to garderobes having been placed on the quarters during the early 16th century. It seems logical that after experiencing the relatively uncomfortable accommodations of open quarter and stern galleries the need for more enclosure was loudly voiced. Partial coverings could not have offered the same amount of comfort as the "old style" garderobes. Shipwrights were conservative people: If something worked, they did not change it without a great deal of pressure. Why not re-introduce a device, albeit in an elaborated form, which had a proven record as an efficient and comparatively comfortable sanitary accommodation?

Turrets/bartizans

Apparently, turrets were not common in either British or continental navies or merchant fleets during most of the 16th century, or else they were not commonly depicted, or both. The only such depiction that I know of is of a British naval vessel from the latter part of the century: the Ark Royal, flagship of the anti-Armada campaign of 1588. Although she suffered several refits, when originally built she had the characteristic beakhead, a single deck in the forecastle, and open stern and quarter

galleries (Howard, 1979: 51). The surviving depictions, whether demonstrating results of her numerous refits or results of artists' fancies, offer problems in interpretation.

Figure 20 is a group of three examples of depictions, all thought to represent the Ark Royal. Between them,

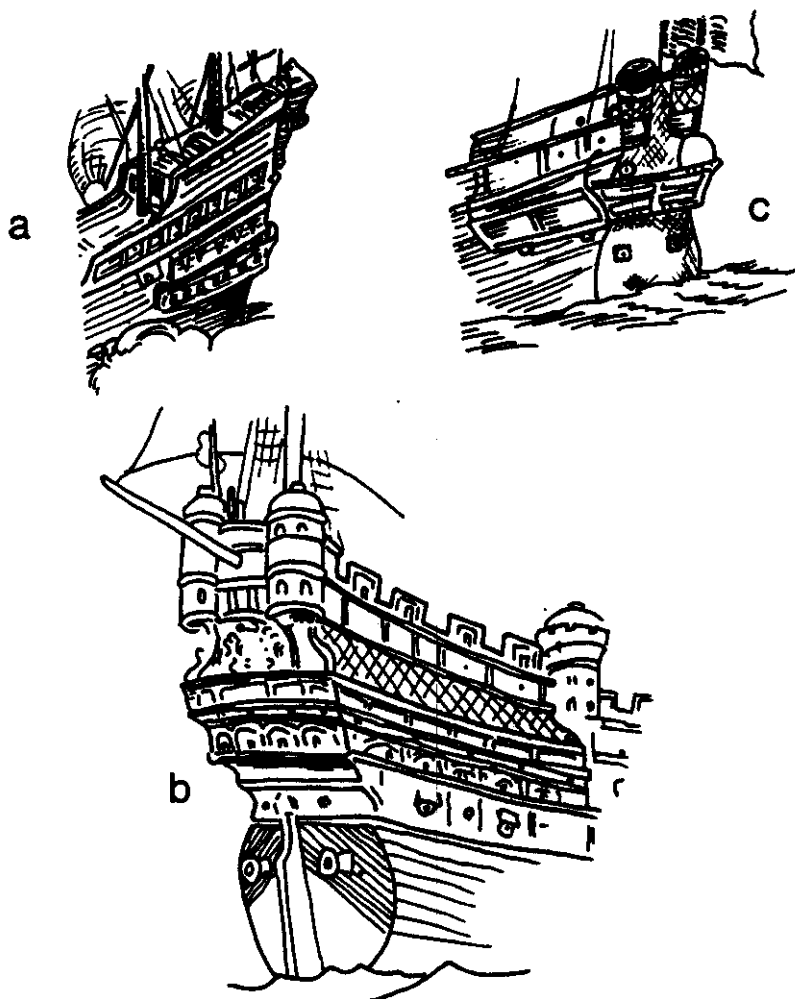


Figure 20. Three depictions of the Ark Royal's stern. a, b, and c. After Nance (1914b: 154-155, fig. 1, 3, and 2, respectively).

almost every possible configuration of turrets and stern galleries is covered. One (Fig. 20a) shows high-mounted

stern turrets with an apparently open stern gallery. Another (Fig. 20b) has high turrets and lacks a stern gallery, or has an enclosed gallery, while the third (Fig. 20c) evidences low-mounted stern turrets and open stern and quarter galleries. Of them all, the middle is the most rational in terms of use of turrets as latrines. In the latter, the effluent would not have a clear drop to the sea; in the former the clear drop to the sea would be in clear view of anyone on the open stern gallery and any effluvia probably would have been blown their way.

That she had stern turrets is certain, though. "...What distinguished Ark Royal from her companion ships was the unusual construction of her after part. There were two turrets...at her stern and her poop bulwarks were battlemented. There may have been another pair of turrets at the forward end of the poop, used for latrines" (Howard, *ibid.*). It makes better sense, however, that whether there were two pairs or only one pair of turrets on the Ark Royal, they all conceivably could have been used as latrines, depending on the configuration of the stern gallery.

Turrets at the forward end of the poop were extremely rare throughout the age of sail, although depictions of some do exist, and they may have served a hygienic function in this location. Stern-mounted turrets, on the other hand, were more common and predecessors from the previous century are known. However, problems arise when

interpreting these structures as having a hygienic function when mounted over open stern galleries. If, indeed, the Ark Royal had open stern galleries in combination with stern turrets, then the latter must have been mounted high up on the stern to take advantage of the greater overhang. In this situation, the effluent from the turrets may have fallen fairly clear of the stern galleries, but there was the problem with the open gallery below. On the other hand, if the turrets were not mounted far enough aft, or, possibly when open galleries were mounted below, then an alternative, such as soil-pipes to carry the discharge down past the level of the stern galleries, must have existed for them to have been utilized as sanitary facilities. However, if the turrets were mounted over a closed stern gallery or no stern gallery, then the waste disposal problem would not exist. Otherwise their appearance can best be explained as their having been poop lanterns. In fact, even when mounted far enough aft, they could have served the dual purpose of lantern/latrine, as hypothesized for 15th-century turrets.

Although we have no other 16th-century turret depictions, there is one obscure reference to a bill for the painting of the Elizabeth of 1598 that offers further evidence. In it, the "barbican" on the side of the sterncastle is mentioned as having been painted (Howard, 1979: 61). Barbican was a general term for round defensive

structures on medieval castles and, in this case, probably meant a turret mounted on or near the quarter.

The use and/or depiction of turrets apparently experienced a resurgence during the very end of the 16th century and throughout the 17th century, especially in Danish, Dutch, and French vessels.

Soil-pipes

During the 16th century, few depictions were made which showed soil-pipes or any type of plumbing features on ships. One example is the large soil-pipe, or disposal chute, represented at the stern of a carrack (Fig. 21) from



Figure 21. Detail of stern of the Ship of St. Stonybroke; c. 1520. After de Groot & Vorstman (1980: 6, ill. 1).

a Dutch woodcut of a wharf scene, dated c. 1520. The chute was presumably made of wood and it can be seen to have angled out of the stern just under the counter on the port side. Since the stern of this vessel was drawn with very little perceivable overhang, perhaps the deflecting chute was necessary for the effluvia to be better directed away from the stern. If there was a seat for this device, it was probably in a cabin on the halfdeck level and reserved for the use of the master or captain. "In Dutch vessels, and foreign [non-English] ships in general, latrines were inconspicuous, being arranged right aft, over the lower counter, and entered from the great cabin..." (Nance, 1914b: 55).

On the other hand, the chute may have been for the removal of other types of refuse; a fact that could explain its rather large size in comparison to the rest of the stern.

V SEVENTEENTH CENTURY

In terms of external hygienic facilities, the 17th century was a period of dramatic change and innovation: The beakhead was reduced in length and area, as its forward edge was angled further up (steeved up) from the waterline. Beakhead accommodations, for which the allotted area had consequently been reduced, became more individualized seats-of-ease toward the end of the century. The semi-cylindrical "roundhouse" was introduced at the juncture of the beakhead bulkhead and the main rail of the head. Latrine facilities appeared in the main chains, resting on the chain wale or on specially built shelves. During the early part of the period, quarter galleries were enclosed, subsequently elaborated, and assumed prominent positions at the stern.

The 17th century is also characterized by the tendency to embellish practically every external surface on ships with some type of florid design. From figurehead to stern gallery, no place remained undecorated, except the planking of the decks and the hull itself. Smooth, curving lines were embraced, while linear or angular features were scorned.

The bow

The characteristic beakhead of the 16th-century galleon (Fig. 16), projecting its exaggerated length roughly

horizontal with the waterline, slowly faded from favor during the first third of the 17th century. In its place, a sequence of transitional forms (Fig. 22) can be seen on moderate and large naval and merchant vessels, which, as has been stated above, followed in the wake of the trend-setting Spanish by some 50 years.



Figure 22. Cross sections of characteristic beakheads of 17th- to 19th-century ships. After Laughton (1974: 34, fig. b).

From c. 1610-1640, a gradual series of modifications occurred: The fore part of the beakhead was raised further from the water by a slight upward curve and tended to taper forward. During the 1640s, changes were more rapid. The steeking up of the knee of the head continued, while the head rails curved upward, taper increased, and solid sides were replaced with an open framework. The resulting structure was somewhat smaller and lighter, but the area assigned to activities there, including waste removal, was reduced. The figurehead became more and more vertical as

the angle of entry was raised to about 30 degrees (Lavery, 1984: 47-48).

By c. 1650, the basic form of the head, being in cross section a shallow "V" and appearing less "beaky" than before, was achieved and the pace of change slowed (Laughton, 1974: 34-35). From c. 1650-1670, the shortening of the projection of the head was continued, thus further decreasing its area and probably reducing the number of sites which served a hygienic function. Greater upward curvature of the head rails continued, as did the increasing verticality of the figurehead, until the angle of the bow was some 45 degrees (Laughton, 1974: 35; and Lavery, 1984: 58). Figure 23, a drawing of the head of the Prince of 1670, illustrates the form achieved by this time.

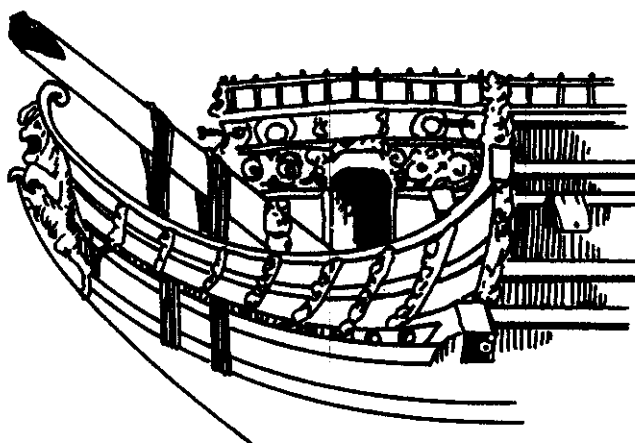


Figure 23. Head of the Prince of 1670. After Howard (1979: 106, fig. 146c).

After c. 1670, there were no fundamental changes in the configuration of the head, only details were altered: The upper head rails were raised, which made the head

deeper and afforded the installment of seats-of-ease at several levels. The head timbers became convex rather than straight, thus giving a cross section which resembled something between a "V" and a "U" (Fig. 22) (Laughton, *ibid.*). Sometime shortly after c. 1673, the roundhouse, a distinctive sanitary accommodation discussed below, made its appearance on either side of the beakhead bulkhead.

Just prior to the end of the century, the head timbers straightened out again and then reversed curvature, becoming concave and fanning out above to meet the "main, or upper rails which in plan ran straight from the figures to the corners of the forecastle" (Laughton, *ibid.*). By 1700, a general arrangement was developed which continued until the end of the 19th century.

A meager amount of archaeological evidence of beakhead conveniences exists in the form of one piece of lead plumbing which is purported to be a "pissdale" pipe. Pissdales were simple trough-like urinals placed at various locations forward and amidships, usually on the upper decks of ships. The pipe which probably belonged to one of these devices was located on the wreck of the Dartmouth, sunk in 1690 (Martin, 1978: 37). Because of the pissdale pipe's association with assorted hardware representative of bow sections of vessels, it was assumed that the flanged lead pipe was part of the bow accommodations (Muckelroy, 1978: 188). Serving this function at the bow, the pipe would have been situated almost vertically from the base of the

urinal trough through the gratings and head beams; not horizontally, as were scuppers (lead pipes which pierced the ships' sides and drained the deck surfaces).

Seats-of-ease

Sometime during the period 1670-1680, distinct individual sanitary accommodations, or seats-of-ease, placed within the structure of the head and equipped with "trunking," or drainage sluices, made their first appearance in models (Fig. 24) (Munday, 1978: 127; and Stevens, 1949: 65). It is assumed that they were introduced into full scale ships

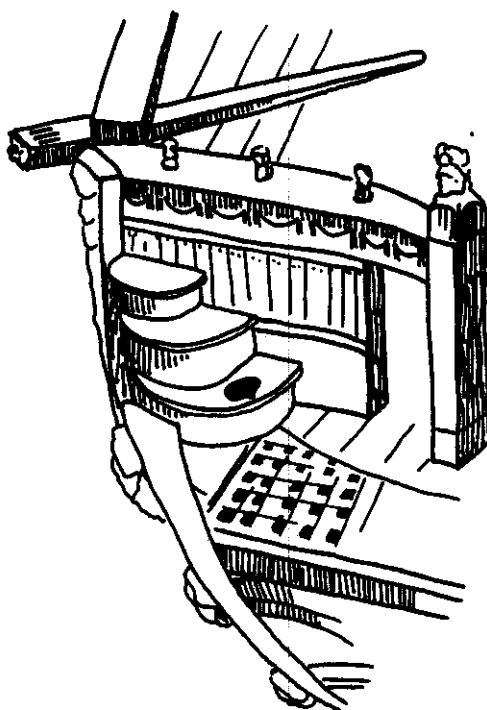


Figure 24. Model of English 46-gun Mordaunt (1681). Three-level construction, only one hole; upper levels were probably steps to deck over forecabin. Another hole and gratings on port side. After Munday (1978: 135, fig. 1).

at this same time, although they may very well have been utilized prior to this. Depictions made in the earlier years of the 17th century seem, without exceptions, to have been drawn at precisely the wrong angles to discern any possible details of the construction or placement of accommodations in the head.

When they appeared, seats-of-ease were placed "over the bow on the gratings of the beakhead," originally situated "in the angle between the top [head] rail and the beakhead bulkhead, on each side" (Fig. 24) (Munday, *ibid.*). Having an unhindered drop to the sea, these areas were also the most protected, relatively speaking, in the open works of the beakheads,

but [they] would hardly encourage loiterers in anything but calm weather, besides which there must have been constant pressure from men awaiting their turn. The advantage of having spray, not to say seas breaking over the head when the vessel was under sail, or in a rough anchorage, and so cleansing the area, must at the same time have rendered it uncomfortable and even dangerous from the seaman's point of view (Munday, *ibid.*)

Another task which may have proved uncomfortable for the seamen is the cleaning of the beakhead. Apparently, the drop to the sea was not always a completely clear one. John Smith (1652: 36) stated that punishment for lying was having to "keep clean the beakhead, and chains."

A wide variety of configurations were utilized: seats placed on one, two, and three levels; on either side of the bowsprit; or placed at lower levels athwart the head. The

arrangement of bow accommodations on the model of an English ship of 46 guns (Fig. 24) consists of a set of three tiers on either side of the beakhead bulkhead in which only the bottom tier was pierced. "This is not provided with a round hole, but with an aperture of a far more tailored shape..." (Munday, *ibid.*). This "tailored shape" is in the form of a keyhole and is known to have existed in Roman latrines of stone and wood (Munday, *ibid.*; and Redknap, 1976: 288). Gratings would have been utilized, as they had been and as they would continue to be.

Figure 25 illustrates another configuration from a model of a larger 80-gun ship from 1692. In this example,

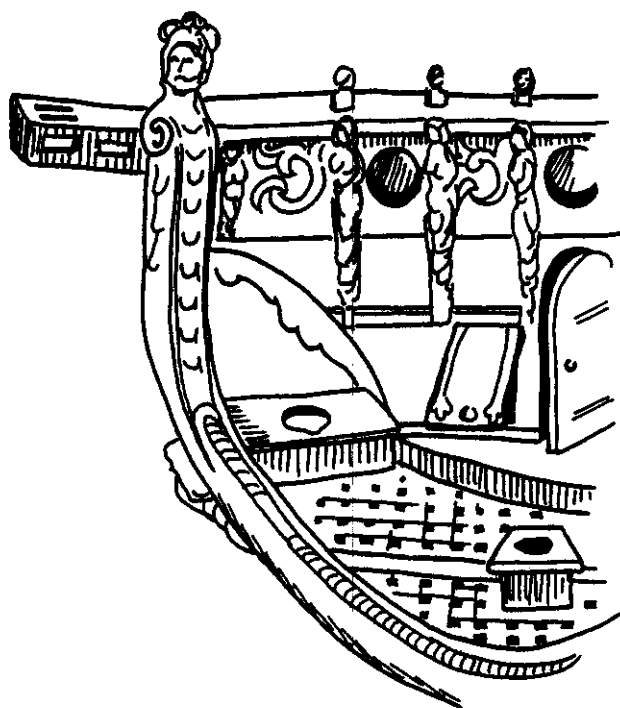


Figure 25. Model of English 80-gun Boyne (1692). Starboard side seating only. After Munday (1978: 135, fig. 4).

a single keyholed-seat is seen at the juncture of the top rail and the beakhead bulkhead. Gratings occupy most of the area of the head platform and an isolated seat pierces the gratings on the starboard side of the bowsprit. On these isolated seats-of-ease, the keyhole slot, when evident, indicates which direction the user would have faced; in this instance, the user faced outboard. This model had facilities only on the starboard side of the head--a mere two accommodating appliances for a large portion of the crew of an 80-gun ship!

Trunking, a form of drainage sluice, was fitted to the isolated seats-of-ease to direct the discharge downward. Usually square in section, these wooden shutes projected

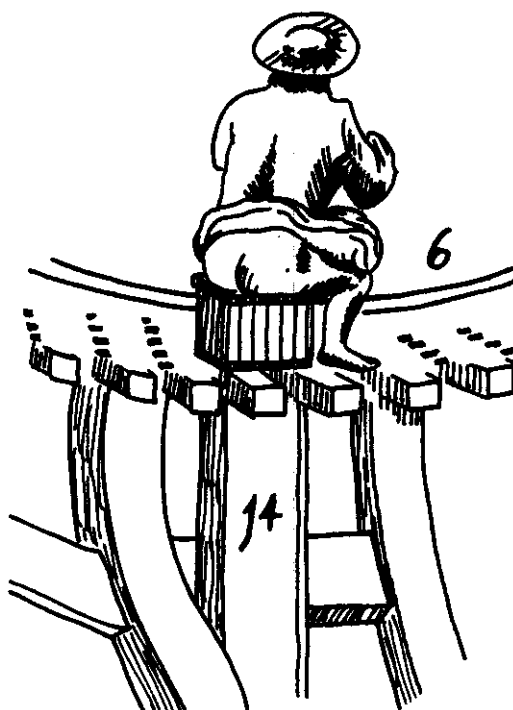


Figure 26. A free-standing seat-of-ease with square trunking (14). User facing outboard. After Munday (1978: 133, tailpiece).

down through the head timbers and terminated just below the knee of the head. Figure 26 shows one of these seats in use, sailor facing outboard, and the trunking, labelled "14," can be seen to run past the head timbers.

Fore turrets and roundhouses

A peculiar feature seen in a handful of depictions of 17th-century French vessels is the fore turret. It first appears in an etching of the Navire Royal of 1626 (Fig. 27) and another Dutch-built French ship (Anderson, 1913: 376) located on port, and starboard presumably, just abaft the beakhead. The only other depiction of fore turrets that I know of is that of the La Couronne built in 1638 (Howard, 1979: 90-91, fig. 127). Her fore turrets were located in the same position as the other two French ships. In this position, projecting out from the side of the ship's side and placed at a level that might have allowed interior access from within the forecastle, fore turrets offered a possible location for sanitary facilities. However, what seems to have been a rather short period of use hints at inherent problems. Apparently, they were very light structures attached to an area of the hull which was buffeted by waves in anything but following seas. As a result, fore turrets would have been vulnerable and liable to loss.

Laughton (1974: 219) said he knew of no other ships which were depicted as having fore turrets. He added that



Figure 27. French Navire Royal of 1626. Courtesy of Rijksmuseum, Amsterdam.

they seem "to have been peculiar to the French, and there is little doubt that [they were] the ancestor[s] of the later round house[s] in the head, which [are] found in French ships about 1690."

Roundhouses, or semi-cylindrical hygienic accommodations placed at either side of the beakhead bulkhead, are generally thought to have been introduced by the English at the beginning of the 18th century (Laughton, 1974: 53; and Anderson, 1921: 314). At least, the first representations of them are in models of English ships dated 1703. In one vessel (Fig. 28), a single roundhouse

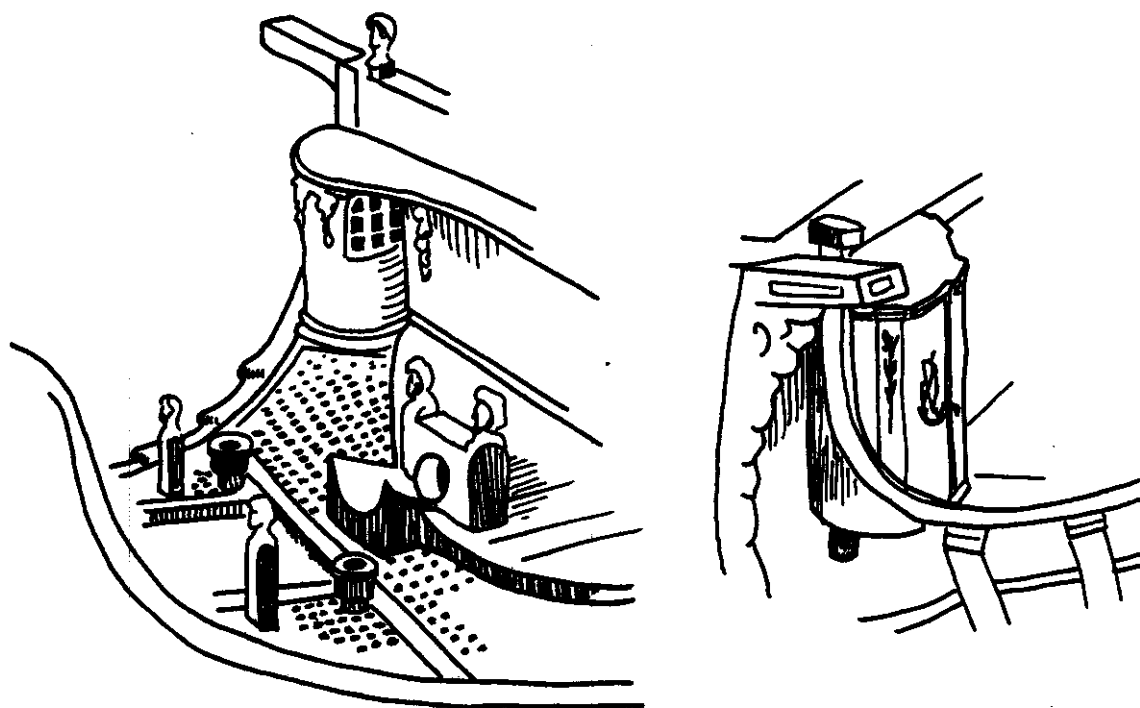


Figure 28. Left, model of English 96-gun ship of 1703. Roundhouse on starboard side only. Round seats on port and starboard. Right, detail of roundhouse showing soil-pipe from model of another first rate of 1703. After Munday (1978: 136, fig. 7 and 6, respectively).

is shown on the starboard side of the head; it has been suggested that this may represent a transitional form to the pair of roundhouses which became the standard configuration (Laughton, *ibid.*). Another model from this year has a pair of roundhouses; this seems to imply that the transition was very brief, which, based on the average rate of change of other features of ships, would appear to be unlikely, or the single roundhouse example was simply a variation.

If the single roundhouse in the model of 1703 does not represent the transition period, then there must be earlier examples. Could the French fore turrets and the reported appearance of roundhouses in French ships of c. 1690 be the forerunners of roundhouses in English vessels? It is certainly possible, but it may only be a part of the answer. The other part may have been the result of a slow development begun by the English as early as 1668.

In that year, the year following the disastrous defeat of the English at the Battle of the Medway, the 96-gun Charles (later the Royal Charles and St. George) was built. "She was the first of the 'great ships' to appear after the [second Anglo-Dutch] war" (Fox, 1980: 95 and fig. 104) and was extremely popular. Of interest to this study is the fact that in the middle of her deep two-level beakhead bulkhead she was given a set of three semi-circular, ballustraded galleries projecting forward from the upper deck level (Fig. 29). At first glance, roundhouses do seem

to be there; a second look reveals the lifted lid of a port underneath the starboard gallery. Obviously, the space below was left open (Laughton, *ibid.*).

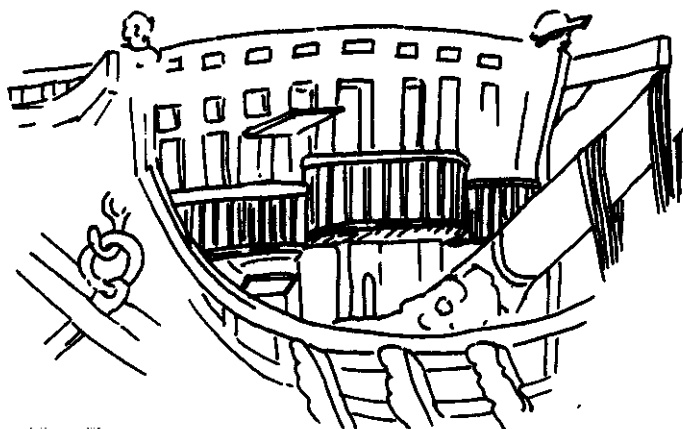


Figure 29. Detail of bow of 96-gun Charles (1668). Note three semi-circular galleries on beakhead bulkhead. After Fox (1980: 95, fig. 104).

If the space underneath the outer two galleries were simply closed in with light planking and either incorporated the seats at each aft corner of the head (W., 1914: 158) or pierced a hole through the head platform in the resulting compartment, then a serviceable sanitary accommodation would have been created. Moreover, the area on either side of the beakhead bulkhead had become relatively unused since chaseguns had been moved out of the forecastle by the increased height of the head. This location was a "natural" spot on which to erect latrines: The overhang was sufficient to allow a clear drop to the sea. There would have been easy access to these facilities through the forecastle and, as enclosed and much more comfortable hygienic facilities, they would have been

sought after and used as perquisites for petty officers, midshipmen, mates, and others whose status was elevated above the common seamen.

In light of the popularity of the Charles, the tendency of shipwrights to imitate the styles of trend-setting designs on popular vessels, and the fact that there are references in the Admiralty surveys of 1674-1680 that suggest the presence of roundhouses (Laughton, *ibid.* and 1925: 27; and Munday, 1978: 127), it would seem that the development of roundhouses may have been the fusion of French fore turrets and a structure which serendipitously resulted from the imitation of a particular style of embellishment--the semi-circular head galleries of the Charles.

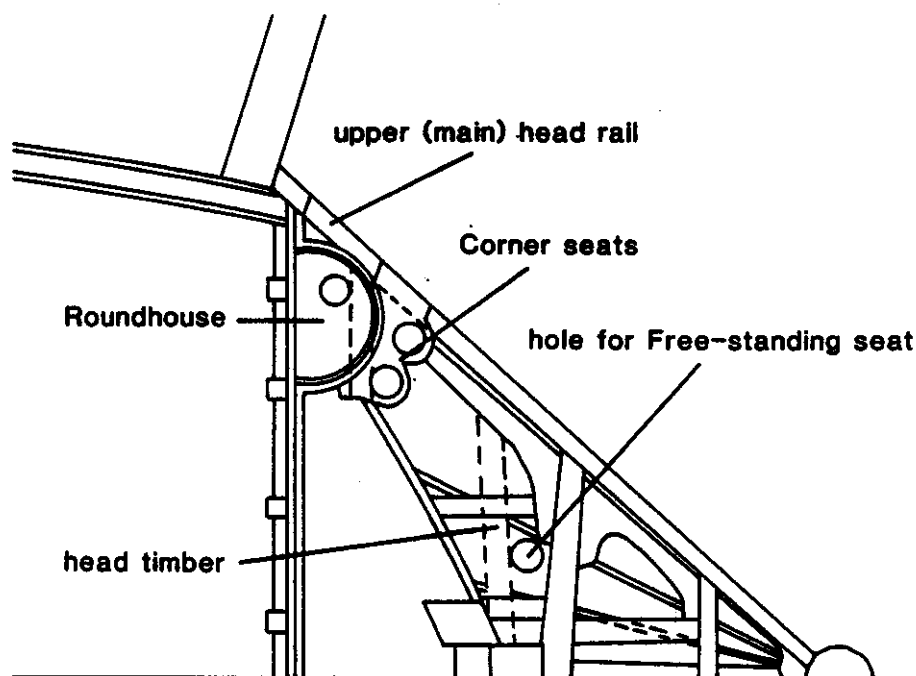


Figure 30. Plan of the head of the English Suffolk of 1765. After Lavery (1984: 141, Fig. 2).

Figure 30 is a generalized diagram of the layout of roundhouses and seats-of-ease from the following century, but it serves to illustrate the configuration of roundhouses which became more or less standard by the end of the 17th century (cf. Fig. 28).

Amidships

In larger ships, auxiliary hygienic conveniences were added at locations amidships. Pissdales, mentioned above, were not only placed in the head, but were installed against the bulwarks on upper, and presumably, middle decks, as well. A pissdale located forward on the upper deck just abaft the forecastle bulkhead is seen in a cross-sectional plan of a first rate of c. 1680 (Lavery, 1980: 142, fig. 1). Another example from a model of the first years of the 18th century, located in roughly the same position, is depicted in Figure 31.

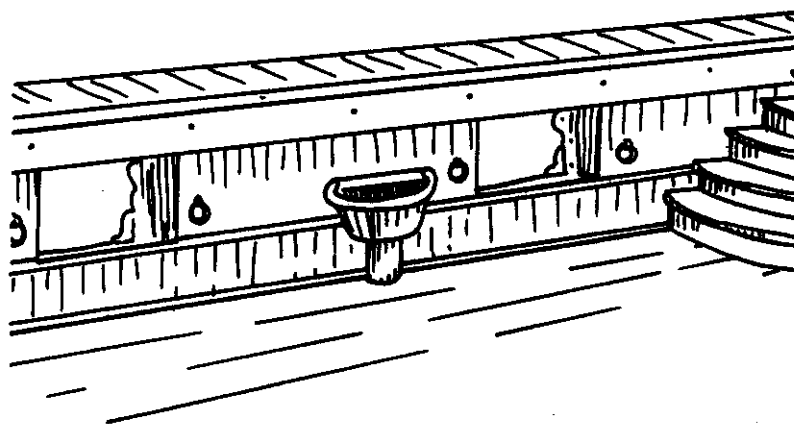


Figure 31. Pissdale on port side, forward. From model of an unidentified English ship of 90 guns (1703). After Munday (1978: 136, fig. 8).

Side-shelves

During the early 17th century, a type of sanitary accommodation carried roughly amidships in or near the main chains first appeared in depictions of predominately English vessels (Fig. 32). In this painting by A. Willaert (c. 1613), an English ship is depicted which had a side-shelf, as they are called, placed on a supporting bracket below the starboard main chains.

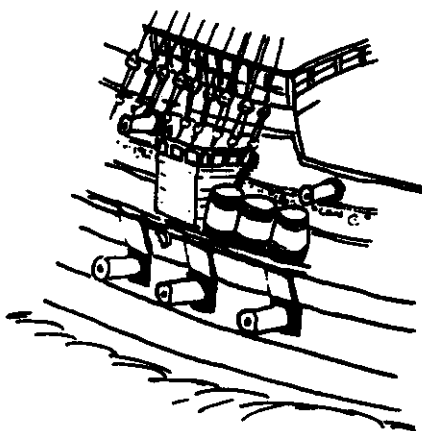


Figure 32. Early starboard side-shelf carried on separate ledge with three steep-tubs. From a painting by A. Willaert of c. 1613. Scheepvaart Museum, Amsterdam.

The side-shelf, in this instance, was a "solid square structure, roofed in and railed about at its top" (Nance, 1914a: 55). Nance added that since there was no external entrance apparent, the side-shelf must have been "a built-out latrine entered from within." Just forward of the side-shelf on the same support were three steep-tubs. These would certainly have been used in their food

preparation role, for with the appearance of the side-shelf, they were made redundant as sanitary facilities.

It should be remembered that during the 16th century, steep-tubs which were thought to have served a waste disposal role were located in the main chains (Fig. 17) and, during roughly the same period, garderobes had been moved from the stern to a position on the quarter. In the late 16th and very early 17th centuries, garderobes can be seen to have moved to the fore end of the quarter galleries (Laughton, 1974: 219). With another small move forward into the main chains, the early, angular side-shelf would have been born. In addition, the Willaert representation seems to be evidence that "there was a period during which, rather than cumber the chains with steep-tubs and latrines together, English seamen carried both latrines and steep-tubs on a specially-built separate shelf below" (Nance, *ibid.*)

An additional aspect of side-shelves is the fact that, if fitted on a vessel, they seem to have been located on the starboard side, opposite the larboard side entry port, when there was one. In fact, "it seems to have been an invariable rule..." and may have been an explanation for the use of "port" as an alternative for larboard (Anderson, 1914: 153-154; and Nance, *ibid.*). Of note is the fact that there seem to be a disproportionate number of depictions in which the port sides of vessels were illustrated.

During the last half of the 17th century, side-shelves, when fitted, seem to have assumed a semi-cylindrical shape, possibly as a result of the rather anti-angular pressures of baroque style. The introduction of the second entry ports on the starboard sides of most two- and three-deckers, beginning in c. 1670 (Anderson, 1914: 153; and Howard, 1979: 111), may have displaced the side-shelves or helped to retire them from common use by c. 1700; being used thereafter primarily as temporary accommodations, erected only when needed.

The stern

The baroque fashions popular during this century were most readily apparent on the sterns of contemporary ships. Generally, the larger or more important the vessels, the more elaborate the decorations became. Also during this period, the heights of the sterncastles were reduced, stern and quarter galleries at two, and occasionally three, levels appeared, and quarter galleries were largely enclosed. The extreme elaboration of the quarter galleries made them the single most prominent features at the stern. The Sovereign of the Seas (1637) is considered by many to have been the finest English example of baroque-style embellishment and grace.

Another change in appearance of ships' sterns during this century was the adoption, actually re-introduction, of the round-shaped hull, or "round-tuck." The English seem to

have initiated this move in the first half of the period in order to improve sailing capabilities; most continental navies and merchant fleets followed suit during the second half (Anderson, 1921: 312; and Howard, 1979: 96). The Spanish and Dutch resisted the change to the round-tuck until shortly after c. 1725 (Anderson, 1921: 312).

However, in regard to the hygienic functionality of quarter galleries over round-tucked sterns, the shape of the hull below the sterncastle was of little importance.

Garderobes

Garderobes were only depicted at the forward end of ships' quarter galleries in the first two decades of the 17th century. They are to be seen isolated on quarter galleries which were open (Fig. 33) or had been partially enclosed:

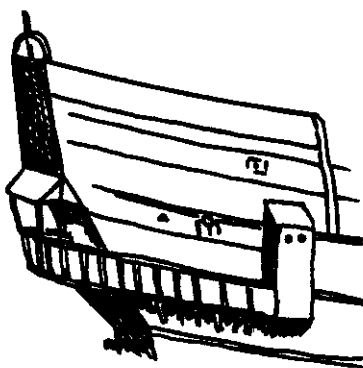


Figure 33. Garderobe isolated at forward end of quarter gallery; early 17th century. After Laughton (1974: 162, fig. b).

I know of no depictions of garderobes associated with completely enclosed quarter galleries. In what seems to

have been a transitional stage in either the development of enclosed quarter galleries, or side-shelves, or both, garderobes were able to play a final role before they virtually disappeared from all subsequent depictions.

Quarter galleries and turrets

The first third of the century witnessed the increasing enclosure of the quarter galleries, an action which may

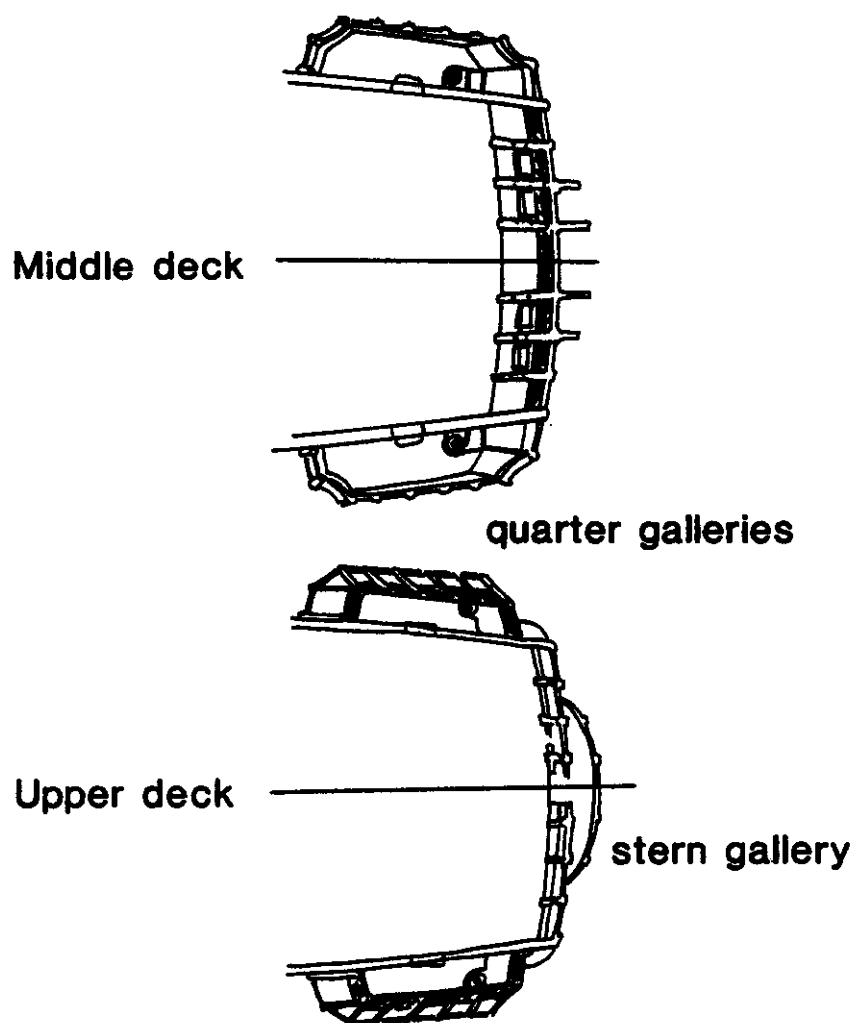


Figure 34. Diagram of two-level quarter galleries in a typical first rate of c. 1670. After Fox (1980: 202, plans H and I).

have received some impetus from the placement of the garderobe on the quarter. Quarter galleries were arranged in two levels on larger ships and sanitary accommodations were often installed at both levels (Figure 34). In this case, removal schemes consisting of soil-pipes leading from the upper facility to external vents at the lower ends of the structures would have been necessary; single quarter galleries, or those on the lowest level, customarily had a short length of soil-pipe leading directly down from the latrine, through the lower finishing of the structure, and into the sea.

Functionally, quarter galleries did not change; stylistically, they can be seen to have changed a great deal throughout the 17th century. These changes are beyond the scope of the present study except for the fact that the stern turrets evident in the last part of the preceding century and those which made an appearance on English, Danish, and French vessels (Fig. 27) in this century were incorporated into the design and structure of the quarter galleries. As such, the hygienic function that turrets served was combined with the same function of quarter galleries.

VI EIGHTEENTH AND NINETEENTH CENTURIES

The grand-scale elaboration of the 17th century yielded to a relatively stark, utilitarian appearance overall. Regardless, throughout the 18th and 19th centuries, hygienic accommodations remained virtually unchanged. Only minor alterations were made in the number and configuration of facilities in the heads of large vessels; a pair of roundhouses and from two to six free-standing seats-of-ease continued in use throughout the period. Quarter galleries with one, two, and, occasionally, three levels remained the principal conveniences for senior officers and pissdales were relied upon heavily amidships as auxiliary features for the crew.

Side-shelves, however, were not depicted in these centuries. It should be remembered that during the last third of the 17th century, side-shelves on large vessels were probably displaced by second entry ports having been installed on the starboard side, in or near the area previously assigned to side-shelves. Additional changes made in the 18th century in the location of fore and main channels may have detrimentally affected the side-shelves, as well (Anderson, 1921: 312; and Laughton, 1925: 9).

The bow

Seats-of-ease

The 18th and 19th centuries witnessed a tendency to

increase the flair of the head, as seen in cross-section (Fig. 22). This allowed for an increased surface area on which to install more gratings (Stevens, 1949: 70 and 115), increase the number of free-standing necessary seats, and, permit the arrangement of grouped, multi-hole conveniences placed against the forwardmost part of the bows.

In all of the detailed construction plans which exist for this 200-year period, there is a severe lack of diagrams for the hygienic facilities in the head. Their design and placement were apparently left to the "imagination or whim of the shipbuilder" (Munday, 1978: 130). The best sources of information on bow accommodations for this period are the large number of extant contemporary models; they evidence a great variety of configurations.

Free-standing seats-of-ease were installed, singly or in pairs, on the gratings at either side of the bowsprit, next to the gammonings (Munday, 1978: 127; and Stevens, 1949: 70). They were usually square and were mounted on square trunking (Fig. 35) (Munday, 1978: 128); a small number of round seats with either round or square trunking are known. One disgruntled passenger of the mid 18th century described the trunking in less than respectful terms: "Those more vulgar tubes that downward peep, near where the Lion awes the raging deep..." (Munday, *ibid.*). If the trunking did not continue down to the waterline in some manner, then it was

"poised over the sea [such that] it would have been incautious for a party of ladies and gentlemen to hire a boat for amusement and pull around among the anchored ships, say in Portsmouth Harbor or Spithead....To pause on such an aquatic excursion to admire the gilded figurehead would be an error which was doubtless well enough known to the local boatmen. By the same token, it would be imprudent to loiter under the quarter, even if the carved work was of extraordinary quality (Munday, 1978: 131).

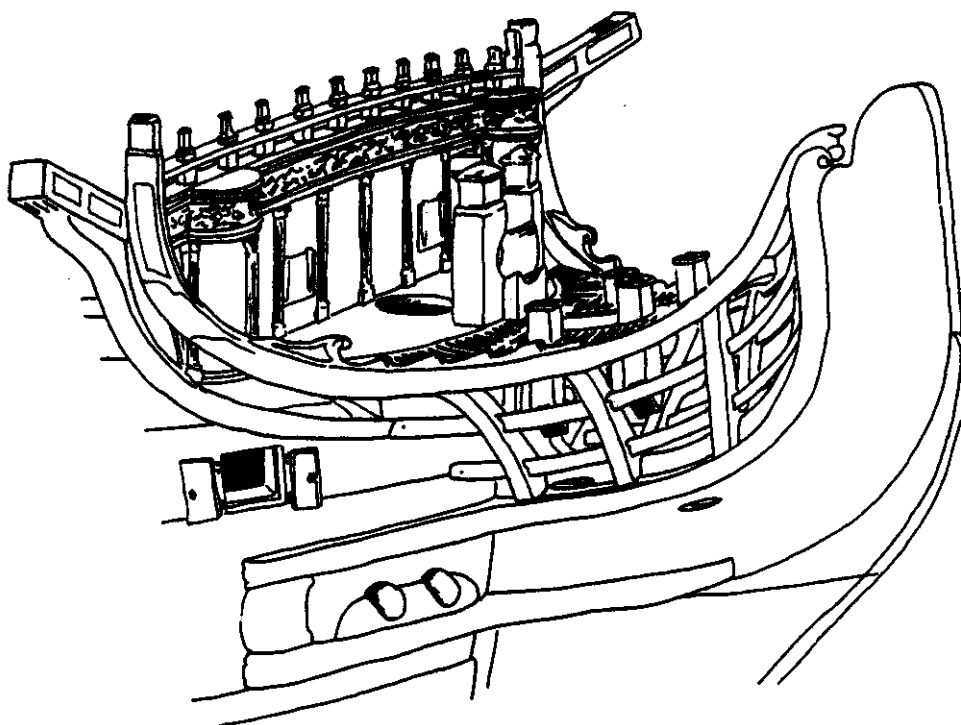


Figure 35. Bow accommodations as evidenced in a model of the English Princess Royal, a second rate of 1773. Note two roundhouses and four free-standing seats with square trunking. After Stevens (1949: 75).

Some double, triple, and quadruple seats were located at lower levels within the head, usually arranged athwartships (Munday, 1978: 128). Using these particular conveniences must have been a "wet ride rivalling a

fairground Big Dipper, as the ship pitch[ed] into a sea" (Munday, 1978: 131).

An example of typical hygienic facilities in the heads of large vessels of c. 1800 is offered by those of Nelson's Victory. She was equipped with six seats-of-ease: two pairs of free-standing units and one tucked in each corner by the roundhouses. That was a total of six formal sanitary accommodations forward for the roughly 800-man complement of this first rater (Munday, 1978: 127).

In 1811, the beakhead bulkhead was officially abolished and the "round bows" were introduced. This was deemed necessary because of the vulnerability of the bulkhead to head-on enemy fire. Unable to withstand the onslaught of attack from the carronades and other ship-smashing guns, the beakhead bulkhead had left the upper deck relatively unprotected (Laughton, 1974: 53). The appearance of the round bow did not affect the function of the head or seriously alter its shape, but it did modify the design and placement of crews accommodations. More multi-holed appliances were utilized. Settles, or drainage catchments, pissdales, and simple holed seats were incorporated into a variety of different configurations usually placed on either side of the stempost outboard of the forwardmost part of the hull (Fig. 36).

Around 1811, the trunking, or soil-pipes, became less conspicuous, especially if they were single soil-pipes from multi-hole units placed close to the bows. In that

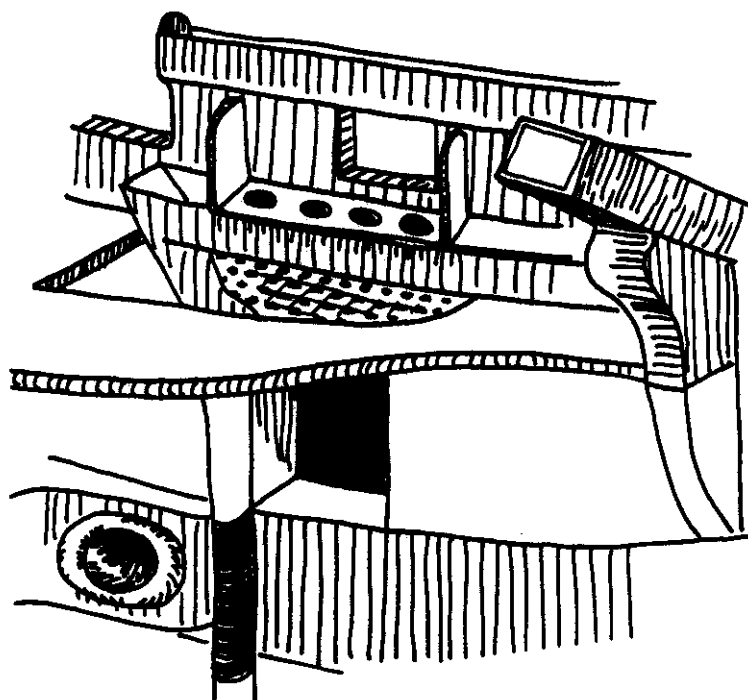


Figure 36. Four-holed settle with pisse-dale. Soil-pipe runs to the waterline. From model of 80-gun Collingwood of 1841. After Munday (1978: 140, fig. 24).

location, trunking led directly downward to the waterline against the bow or was nestled in the angle formed by the stempost and the hull planking. Soil-pipes were often disguised by having been painted over in the accepted fashions and colors of the day (Fig. 36) or were incorporated into the hawse bolsters and cheek pieces. The incorporation of roundhouse soil-pipes in the cheek pieces began in the middle of the 18th century. Two models (c. 1750) in the Museo Naval, Madrid, evidence such soil-pipes. These are the Rayo, a Spanish vessel lost in the Bay of Cadiz after the Battle of Trafalgar, and an unknown navio. The model of a Dutch first rate of c. 1800 in the

Scheepvaart Museum, Amsterdam, has a soil-pipe descending from a three-hole settle to the waterline, running through the cheek pieces.

Sometime around the middle of the 19th century, massive changes in bow designs were brought about by the introduction of iron-hulled ships. These changes so affected the sanitary accommodations at the bow that they were no longer placed there; only the term "head" remained in use as a euphemism for any ship's hygienic facilities. "The disuse of this great convenience, having the seats-of-ease poised over the sea, must have been gradual. Clearly the structure of the ship was changing, the advent of iron in shipbuilding heralded new designs and the removal of the heads amidships, so to say" (Munday, 1978: 126). These midships accommodations were still inadequate for the number of men carried aboard. An account from c. 1870 described conditions on a general depot ship, HMS Duke of Wellington, stationed at Portsmouth. She was equipped with simple six-holed platforms on either side; no partitions were provided. From "four a.m. until long after pipedown at night there were queues of waiting men on each side of the upper deck struggling to reach the heads" (Capper, 1930: 416). Apparently, only the strongest were successful. "There were numbers of men daily who were in the report for offences against decency. While every morning care had to be taken to remove the evidence of such offences in scores of places" (Capper, *ibid.*).

Roundhouses

Roundhouses continued in use throughout the 18th and 19th centuries in basically the same form as that developed during the preceeding century, as can be seen in a number of models housed in European museums. In addition to the many examples of roundhouses on models depicted by Munday (1978), the National Maritime Museum, Greenwich, has models of an unknown 60-gun English ship of c. 1720 and an unknown 50-gun vessel of c. 1725 which have a pair of roundhouses each, in conjunction with corner seats. The Museo Naval, Madrid, contains at least five models of mid to late 18th century which display this standard configuration. The model of the Real Carlos of 1766 has single corner seats, while the San Justo of 1779-1826 is fitted with two-tier corner seats-of-ease in which the upper one is fitted with a back. The mouths of the lead-lined soil-pipes from these grouped conveniences are evident on the underside of the head platform.

About 1732, slightly modified roundhouses were installed in the bows of sloops-of-war and small frigates when these types of vessels were built with round bows (Stevens, 1949: 66). After the abolishment of the beakhead bulkhead in 1811, roundhouses were simply moved into the forward part of the forecastle and retained their relative positions in the ship. Still installed in pairs at this time, the port roundhouse was for the use of mates,

midshipmen, and warrant officers, while the starboard facility was for the use of the sickbay with which it was customarily associated (Munday, 1978: 127). Sickbays had been placed on the starboard side, in or under the forecastle since c. 1800.

Amidships

The use of pissdales at various locations amidships continued unabated throughout the period. They are often seen on contemporary models installed forward and aft against the bulwarks in the waists (Fig. 31). At least six other examples of pissdales on unidentified models in the collection of the National Maritime Museum, Greenwich, are known to exist. Of these, two models (a 50-gun ship of c. 1720 and another of the same size from c. 1725) have paired pissdales, one on either side of the forward-mounted jeer capstans. The model of an unknown 100-gun first rate of c. 1725 exhibits a pissdale in the waist which is in the form of a rimmed basin set on the deck and not installed against the bulwark as was the common practice.

Contrastingly, I know of no depictions of side-shelves on ships of the 18th or 19th centuries. Were side-shelves not used after the 17th century? Possibly not, but it seems likely that they may have been resigned to more of a temporary function, to be used only when needed, or they may have resurfaced in the late 19th century in the guise of the six-holed platforms placed port and starboard

amidships, mentioned above. As relatively light structures whose foundations, the fore and main channels, were always left in place, side-shelves could have been juryrigged easily. Moreover, side-shelves, if still predominately on the starboard sides, may not show up in the pictorial record due to the disturbing practice of contemporary artists to continually depict the port sides of ships.

The stern

Quarter galleries, as well, continued serving the same functions in the same manner, throughout most of the 200-year period. Models of the first rate San Juan Nepomuceno (1766-1805) and the San Justo (1779-1826) in the Museo Naval, Madrid, evidence two-level quarter galleries. The lower levels of the latter have single benches pierced with two holes. The model of a Dutch first rate of c. 1800 also has dual-level quarter galleries which are separately plumbed. The mouths of the soil-pipes are on the aft faces of the lower finishings of the quarter, as was standard.

Of course, some slightly modified forms existed among the European navies. Instead of pierced bench seats, which were the practice with the British and most continental navies and merchant fleets, the French seem not to have had seats in the quarter galleries of their ships of the late 18th century. The accommodations consisted of simple holes over which one squatted, with earthenware "footprints" on either side of the hole (cf. Fig. 10) (Munday, 1978: 131).

A description of similar sanitary conveniences on an American vessel of 1793 was given, curiously enough, by a Frenchman: "In such a well appointed cabin, it is something of a shock to find that needs which might offend the nostrils must be satisfied through a hole in the floor, near the starboard windows. Cleanliness condemns this practice, and its practicability is so doubtful as to make one prefer a bottle" (Roberts, 1947: 4-5).

Apparently, early flushing water closets were first installed in the quarter galleries of British ships of the line in 1779 (Lavery, 1984: 141). However, they do not appear to have been extensively used until well into the 1800s. Toward the end of the 19th century, quarter galleries were eliminated when the "wide overhung stern of convention had been abandoned in favour of an oval underhung stern devoid of quarter galleries and ornamentation...This type of stern lightened the ship aft, and improved on the older kinds in every way, except that it greatly reduced the accommodation for officers" (Ballard, 1930: 217). The era of internal, plumbed sanitary conveniences had begun.

A classic anecdote about the lively nature of life at sea, in spite of the often abominable conditions, revolves around a particular activity that occurred in the quarter gallery of a certain ship:

Stories...have been handed down and one such, its ingredients undeniably basic, concerns a seaman on board a sailing passenger vessel who, during a long voyage, was one day over the side,

painting the ship's hull. His work took him to the vicinity of the quarter gallery and he became aware not only that it was occupied, but also that the occupant was female. Whatever urge it was that made him dab upwards with his brush, indeed whether he thought to claim it as an accident, cannot be known, but the result was an outraged passenger's complaint to the captain. The indiscipline was, of course, punished and the offence logged. The wording of the entry in the ship's log, was the cause of no small cogitation, but the final version was in its way a masterpiece: '...that he did paint an uncaulked seam'" (Munday, 1978: 133).

VII SUMMARY

This study is an analysis of the development of shipboard external hygienic accommodations which were made possible by the construction of platforms at bow and stern. Later known as forecastles and sterncastles, such platforms consisted of overhangs and projections on which facilities that emptied directly into the sea were erected. Projecting shelves and chain wales on the ships' sides offered other locations on which facilities were fitted.

The development of external sanitary conveniences was born out of attempts to improve the usually horrendous hygienic conditions of ships of the 15th to 19th centuries. As vessels began to be decked over to improve their seaworthiness and to offer greater protection from the elements, and relatively more comfort, a number of factors combined to lessen, or negate, the obvious positive effects of decking-over. The subsequent decrease in ventilation and light to the spaces below and between decks was a serious matter. Of overriding concern to this study is the fact that placing living surfaces (decks) one over another, created a birdcage-like environment in which every imaginable bit of debris, filth, and human effluvia gravitated from upper to lower levels.

The examination of contemporary depictions of ships and descriptions of life at sea, combined with historical analyses of ship construction, shipboard life, and naval

medicine, have yielded a history of the use of external sanitary accommodations for the period in question.

Table 1 is a flow diagram which graphically summarizes the developments, transitions, and interrelationships of external sanitary accommodations through time.

The bow

Evidence of hygienic conveniences in the projecting bow structures (beakheads, or heads) of ships of the 15th and 16th centuries is admittedly sketchy. Inferences as to their nature, based on a simplistic rationale, have been made from more detailed data available for the 17th century. Wooden gratings, slots in the flooring, rails of the beakhead, and simple, holed boards as seats, have all been suggested as having served a hygienic, waste disposal function during the 15th and 16th centuries.

The 17th century witnessed four important hygienic developments in the heads: Between 1670 and 1680, distinct individual sanitary accommodations, or seats-of-ease, placed within the structure of the head and equipped with "trunking," or drainage sluices, made their first appearance in models, and presumably appeared in ships about the same time. Fore turrets, devices seemingly peculiar to the French, made their debut and quickly disappeared. However, they may have left an enduring legacy. In combination with the imitation of a particular style of embellishment (the semi-circular head galleries of

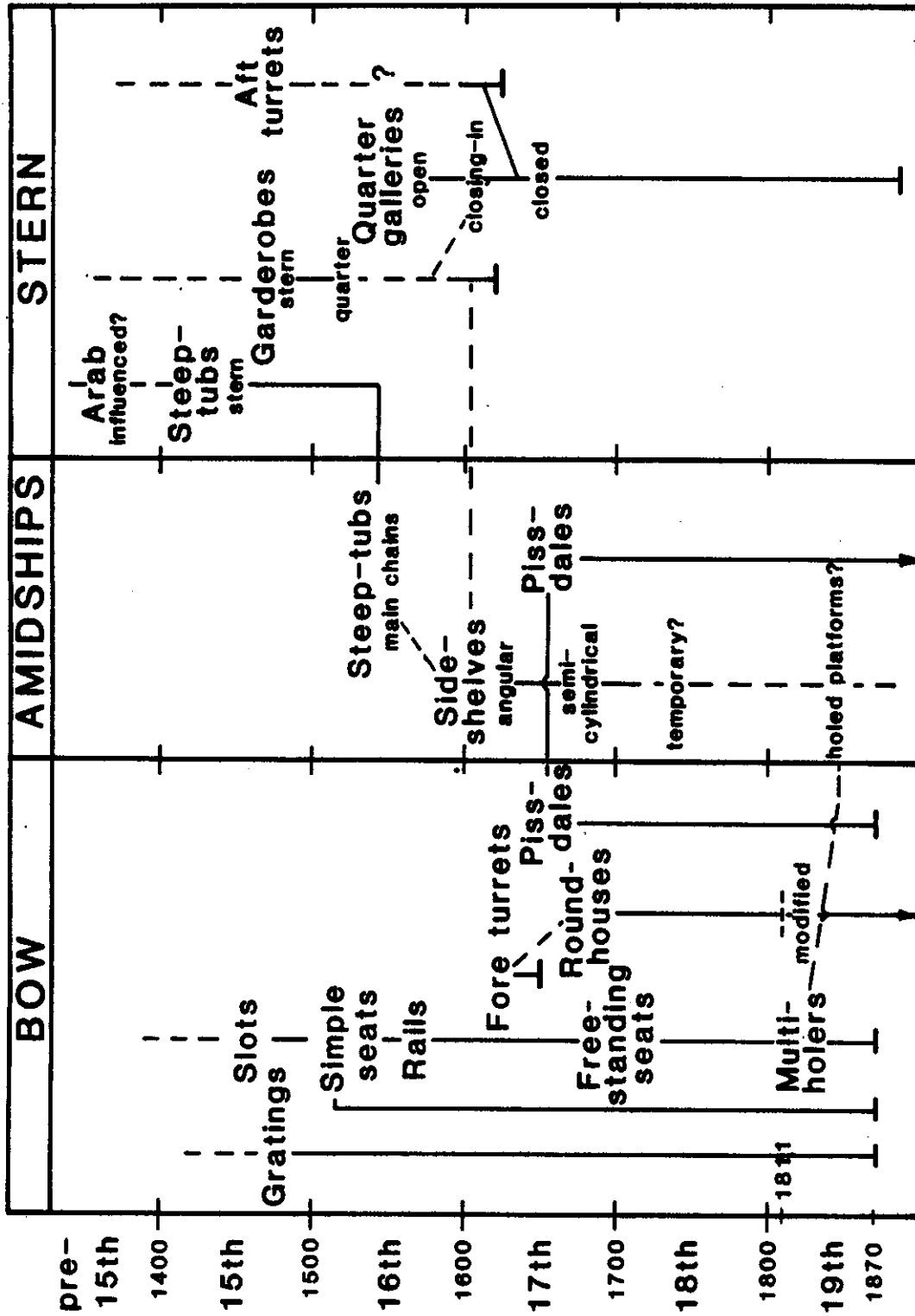


Table 1. Timeline/flow diagram of the development of external sanitary accommodations.

the Charles of 1668), fore turrets may have helped to bring about the appearance of roundhouses. These were "...perhaps the most satisfactory form of convenience found in ships. Access was through a door in the [beakhead] bulkhead, there was often a small port for ventilation and light, and presumably the occupant was left in a solitary state" (Munday, 1978: 127). This cannot be said of the other 17th-century development--the pissdale. This was a convenience utilized at the head and amidships which was a simple urinal trough plumbed with lead pipes directly through the platform of the head or the sides of the ship. It was designed for and experienced heavy traffic.

During the 18th and 19th centuries, an increase in the relative area of the head platform allowed for more gratings, a greater number of free-standing necessary seats, and permitted the arrangement of grouped, multi-hole conveniences placed against the forwardmost part of the bows. Around the middle of the 19th century, massive changes in bow designs were brought about by the introduction of iron-hulled ships. These changes so affected the sanitary accommodations at the bow that they were moved amidships.

Of all the types of hygienic conveniences developed at the bow over the course of some 500 years, only the roundhouse survived into the 20th century, and that in a modified form.

Amidships

During the 16th century, necessary tubs, when depicted, seem to have been moved from the sterns and quarters to the main chains of either or both sides about 1650. Early in the 17th century, they are seen in association with angular side-shelves, but necessary tubs are not in the pictorial record after this brief appearance. Similarly, side-shelves, which may have developed from garderobes shifting from the quarters to the main chains, were depicted throughout the 17th century and became obscure in the 1700s. After the removal of the "heads" to positions amidships in the late 19th century, multi-holed platforms, which resembled devices formerly used at the bow, can be said to have resurrected in an altered form the side-shelf of the 1600s.

The use of pissdales continued unabated from their first appearance in the last half of the 17th until the end of the 19th century. Indeed, pissdales existed until the mid 20th century in the form of crew's urinals, placed amidships and plumbed through the bulwarks directly into the sea.

The stern

The use of three major external hygienic accommodations located in the stern of 15th-century ships has been suggested: barrel-like attachments on the stern quarter and over the transom and counter, often called "steep-tubs"

after their food preparation function; closet-like additions over the counters which projected out from the sterncastle, similar to "garderobes" in contemporary castle architecture; and structures which closely resembled castle turrets and which probably performed much the same functions. Small projections through the counters which may have been "soil-pipes," or plumbing from facilities within the sterncastle have been noted, but are not considered as a major feature. In fact, they probably were used in one form or another in conjunction with the three types of stern accommodations of this period.

During the 16th century, steep-tubs were moved to the main chains and garderobes to the quarters, where the surface of the sterncastle was still relatively flat, in stark contrast to the multi-counterered, overhanging sterns which were the fashion. However, garderobes disappear from the pictorial record after c. 1525 and are not seen again until the early 17th century, when they had been moved to the fore end of the open quarter galleries, introduced in the 1530s. Quarter galleries remained largely open throughout the 1500s. The first third of the 17th century witnessed the increasing enclosure of quarter galleries, an action which may have received some impetus from the placement of the garderobe on the quarter. The remainder of the 1600s was a period of grand-scale decorative elaboration readily apparent in the quarter galleries of ships of the period.

Throughout the 18th and 19th centuries, hygienic accommodations at the stern remained virtually unchanged. Quarter galleries with one, two, and, occasionally, three levels remained the principal conveniences for senior officers. Toward the end of the 19th century, quarter galleries were eliminated when major changes in the design of the stern occurred.

Apparently, early flushing water closets were first installed in the quarter galleries of British ships of the line in 1779. However, they do not appear to have been extensively used until well into the 1800s; by that time, the conveniences were internal, i.e. placed within the fabric of the hull.

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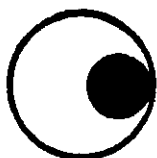
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