

ILLUSTRATED GLOSSARY OF SHIP AND BOAT TERMS

This glossary is intended to define the terminology used in this text, as well as that which researchers might be required to apply or interpret in their studies of shipwrecks and archives. It is limited to construction terminology. The reader is advised to consult one of the dictionaries listed in the bibliography for shiphandling, maneuvering, and general nautical terms. The same advice applies to specialized rigging terminology and details, although the text addresses or illustrates many of the most common rigs.

Words set in **bold type** are defined elsewhere in the glossary. Entries have been illustrated wherever possible, either within the glossary or in the text. Alternate terms or spellings are listed in brackets after the entry. Alternate definitions for a single entry are commonplace; this is the result of diffusion, varying localities, and technological progress. However, the reader is cautioned that many of the timbers and devices listed here might have had additional identifications, often the invention of the writer or in local slang; some difficulty may be experienced in identifying such entries in various documents. The confusion extends to modern publications. One marine dictionary shows the knee of the head as being located behind the gripe, while most of the others call this timber an apron and properly place the knee of the head just below the bowsprit. I have tried to sort out this confusion where possible.

Ancient ships contained structural arrangements that had disappeared by the medieval period, and therefore they remain unlisted in publications. A few of them have been assigned terms in archaeological publications; the rest I hope I have anticipated and defined accurately.

One more word of caution. Many of the illustrations in the glossary are composite drawings, in some cases including features of several vessels or vessel types in the same drawing. Unless otherwise stated, these illustrations are not intended to represent construction details of specific watercraft.

Adze [Adz] (Fig. G-8). An axe-like tool with its blade at right angles to the handle, used for shaping and dressing wood.

Amidships. The middle of a vessel, either longitudinally or transversely.

Anchor (Figs. G-1 and G-2). A wooden, stone, or metal device that, when connected to a vessel with a cable or chain, was used to secure the vessel to the bed of a waterway to prevent it from drifting.

Anchor bed. A reinforcement or platform, fitted on the side or deck of a vessel, on which an anchor or stack of anchors was stowed.

Best bower. One of the principal anchors of a ship, normally the one used first; in the last several centuries, it was usually the second largest anchor and was carried on the starboard bow.

Bill. The tip of the anchor's palm; also called a *pea*, *peak*, or *pick*.

Bower. One of the principal anchors of a vessel, permanently attached to a cable or chain and stowed ready for immediate use.

Crown. That portion of an anchor where its arms joined the shank.

Fluke. The pointed or chisel-shaped end of an anchor arm, which was designed to dig into the bottom.

Grapnel (Fig. G-2h). A relatively small anchor, usually fitted with four or five arms, used variously for making fast to other vessels, snagging cables, or anchoring small boats.

Kedge. A light anchor used for moving a vessel or temporarily holding it in a waterway.

Palm. The triangular flat face of an anchor's fluke.

Shank. The shaft of an anchor.

Sheet anchor. The heaviest anchor of a large vessel, shipped in a ready position to be used for any emergency. In the later years of large sailing ships, this was the third bower and was usually carried

in the starboard bow next to the best bower. It was also called the *sacred anchor*.

Shoe. A convex block of wood into which an anchor bill could be fitted to prevent damage to the ship's side when the anchor was hoisted.

Stock. A wooden, stone, or metal crosspiece near the top of and perpendicular to the shank; it was designed to cant one of the arms so that its fluke dug into the bottom.

Stream anchor. A smaller anchor, often about one-third the weight of the best bower, which was carried in the stern and used to prevent a vessel from swinging in narrow waterways.

Anchor stock planking (Fig. G-11a). A form of planking in which the longitudinal shapes of the planks resembled anchor stocks. It was similar to the **top and butt** method of planking and was intended to prevent shifting and increase the longitudinal strength of wales and other stress-bearing planks.

Apron (Fig. G-3). A curved piece of timber fixed to the after surface of the stem or to the top of the forward end of the keel and the after surface of the stem; an inner stempost.

Athwartships. Across the ship from side to side; perpendicular to the keel.

Auger (Fig. G-8). A tool used for boring holes.

Average frame spacing. See **Room and space**.

Back piece (Fig. G-18b). The aftermost piece of a rudder.

Back rabbet (Fig. G-4c). The upper surface of a keel rabbet or the nesting surface of a post rabbet.

Back rabbet line (Fig. G-4d). The line formed by the junction of the inner plank surface and the upper, or inner, rabbet surface.

Balanced rudder (Fig. G-18a). A rudder whose stock is placed aft of its leading edge so that the water pressure is approximately equal on its forward and after surfaces; balanced rudders require less turning power than conventional rudders.

Ballast. Heavy material, such as iron, lead, or stone, placed low in the hold to lower the center of gravity and improve stability.

Batten. A thin plank or strip of wood used to determine hull curvatures or to temporarily connect timbers during construction.

Batten clamp. See **Sintel**.

Baulk (balk). See **Beam**.

Beakhead (Fig. 5-25). A platform or projecting structure forward of the forecastle.

Beam (Figs. G-5 and G-7a-G-7e). A timber mounted athwartships to support decks and provide lateral strength; large beams were sometimes called *baulks*. See also **Breadth**.

Beam arm [Curved half-beam] (Fig. G-7a). A curved partial beam whose inboard end was scarfed or tenoned into the side of a deck beam and outboard end terminated at the shelf clamp. Beam arms were

used to reinforce potentially weak areas adjacent to hatches, bitts, masts, etc. They were essentially long knees laid as half beams.

Bearding line (Fig. G-4d). The line formed by the junction of the outer garboard surface with the keel, or the outer surfaces of planking ends with the posts.

Beetle (Fig. G-8). A heavy wooden mallet used to drive treenails, wedges, etc. See also **Mallet**.

Belfry. The structure in which the ship's bell was hung. Belfries were usually mounted in the forecastle, although they sometimes appeared near the helm or mainmast; in some instances they were elaborate and ornate.

Berth deck [Birth deck] (Fig. G-5). The deck immediately below the **gundeck**.

Bevel (Fig. G-12f). The fore-and-aft angle or curvature of an inner or outer frame surface.

Beveled edge. See **Chamfer**.

Bevel gauge (Fig. G-8). A tool used to determine frame face bevels.

Beveling. The technique of shaping a frame timber to its correct fore-and-aft curvature.

Bilge. The area of the hull's bottom on which it would rest if grounded; generally, the outer end of the floor. When used in the plural, especially in contemporary documents, **bilges** refers to the various cavities between the frames in the floor of the hold where bilge water tends to collect.

Bilge boards. Loose boards placed over the bilges to protect cargo from bilgewater damage; see Figure 4-10 for an example of transverse bilge boards on the Serçe Limani vessel.

Bilge clamp. On ancient ships, a thick strake of ceiling fastened to the inner frame faces at or just above the turn of the bilge; thick ceiling opposite a bilge wale. See also **Ceiling**.

Bilge keel (Fig. 3-7). A secondary keel placed beneath the bilge or at the outer end of the floor. Sometimes called a **sister keel**.

Bilge ledge (Fig. 4-10). A rabbeted longitudinal timber fastened over the frames above the bilge to support transverse ceiling planking.

Bilge strake [Bilge plank] (Fig. G-5). A thick strake of planking placed at or below the turn of the bilge; its purpose was to reinforce the area of the bilge or floor heads. Infrequently it is called a bilge wale.

Binding strakes (Fig. G-5). The closest full-length strakes, or belts of strakes, to the middle of the deck. They reinforced the many openings (hatches, mast steps, pumps, etc.) between them. Binding strakes were so named only when they were thicker than the rest of the deck planks, being fitted into notches in the tops of deck beams.

Bite [Bitar (pl.)] (Fig. 4-32). An athwartship beam in a Viking vessel.

Bitt [Bit] (Fig. G-10). A strong upright post used for securing lines and cables. Figure G-10 shows several bitt arrangements.

Boat. An open vessel, usually small and without decks, intended for use in sheltered water. This term is discussed in the introduction.

Bobstay piece (Fig. G-13d). Part of the knee of the head.

Body lines. *See* **Station lines**.

Bollard timbers. *See* **Knightheads**.

Bolt. A cylindrical metal pin used to fasten ships' timbers together.

Boss. *See* **Wart**.

Bottom. The underwater portion of a fully loaded hull; also used as a general designation for a seagoing vessel.

Bow. The forward part of a hull, specifically, from the point where the sides curve inward to the stem.

Bow drill [Fiddle drill] (Fig. G-8). A device with a hollowed handle in which a spindle rotates; the spindle is connected to a drum, around which a cord is wrapped and run back and forth by means of a bow to rotate the drill bit.

Bowsprit (Figs. G-3, G-15d, G-15e, and G-15f). A spar projecting forward from the bow.

Boxing [Boxing joint] (Fig. G-11b). A type of scarf used primarily to join the keel to the stem or keel timbers to each other.

Brace (Fig. G-18). A metal housing and straps used to secure the stock of a quarter rudder to its blade. Also, the straps of a **pintle** or **gudgeon**.

Bracket. A small brace or knee used to support the gratings in the head of a ship.

Breadth. The width of a hull; sometimes called **beam**, which is technically the length of the main beam.

Breaming. *See* **Graving**.

Breast hook (Figs. G-3 and G-13). A large, horizontal knee fixed to the sides and stem to reinforce and hold them together.

Breastwork. Ballustrades along the upper decks.

Bulkhead. A vertical partition, either fore-and-aft or athwartships.

Bulwark (Fig. G-5). The side of a vessel above its upper deck.

Burden [Burthen]. The cargo capacity of a vessel.

Butt (Fig. G-11b). The lateral end of a hull plank or timber.

Butt joint (Fig. G-11b). The union of two planks or timbers whose ends were cut perpendicularly to their lengths; sometimes called *carvel joint*.

Buttock. The convex part of the hull beneath the stern deck.

Buttock lines (Figs. 2-10 and 2-11). Projections on a lines drawing that reveal vertically oriented longitudinal hull shapes. A complete description of their function is found in chapter 2.

Cable locker [Cable tier]. The compartment where the anchor cable was coiled and stored. Large vessels often had elaborate drainage systems for disposing of the seawater that seeped from recently hauled cables, including tier decks with raised beams that allowed the water to pass beneath the coils.

Caboose [Camboose]. A vessel's galley, or kitchen.

Camber [Crown] (Fig. G-5, no. 31). The arch, or convexity, of a timber; decks were usually cambered so that water would run to the sides and out the scuppers.

Cant frame [Cant timber] (Figs. G-13a and 5-59). A framing member mounted obliquely to the keel centerline in the ends of a vessel; canting provided better frame distribution and permitted more nearly rectangular cross sections of the timbers along the vessel's incurving ends.

Cap [Capping piece]. A block used to cover the exposed ends of timbers and spars.

Caprail [main rail, cap] (Fig. G-5). A timber attached to the top of a vessel's frames.

Capstan [Capstern] (Figs. 5-51, 5-56, and 8-10). A spool-shaped vertical cylinder, mounted on a spindle and bearing, turned by means of levers or bars; used for moving heavy loads, such as hoisting anchors, lifting yards, or careening vessels.

Careen. To deliberately list a vessel so that part of its bottom was exposed for caulking, cleaning, repairing, etc.

Carling [Carline] (Figs. G-7a-G-7d). Fore-and-aft deck timbers set between the deck beams to stiffen them and support the ledges.

Carrick bitt (Fig. G-10). An upright timber supporting the shaft of a windlass; also called a **carrick head** or **windlass bitt**.

Carvel-built (Fig. G-5). Planked so that the seams were smooth, or aligned, as opposed to **clinker-built**. Northern European scholars reserve "carvel-built" for frame-first forms of construction; thus, the flush-laid bottom planks of a cog are not described as "carvel" laid planks.

Carvel joint. *See* **Butt joint**.

Cathead (Fig. G-3). A beam, or crane, projecting from the bow and used for hoisting the anchor clear of the bow after it had surfaced.

Cattail. The inboard end of a cathead.

Caulk [Calk]. To drive oakum, moss, animal hair, or other fibrous material into the seams of planking and cover it with pitch to make the seams watertight. *See* also **luting**.

Caulking batten [Caulking lath]. A thin wooden strip used to close caulked seams and hold the caulking material in place. *See* also **Ribband carvel**.

Caulking iron (Fig. G-8). A chisel-shaped tool used to drive caulking into seams.

Caulking mallet (Fig. G-8). A short-handled mallet used to strike caulking irons.

Ceiling (Fig. G-5, nos. 9, 11, 12, 15, and 23). The internal planking of a vessel.

Centerboard [Drop keel, Sliding keel] (Fig. 5-67, bottom). A wooden or iron plate that could be raised and lowered within a watertight housing called the **trunk**; the trunk was built over a slot in the keel or in the hull bottom next to the keel. Centerboards increased lateral resistance and therefore reduced **leeway** when tacking or sailing off the wind.

Chamfer [Beveled edge] (Fig. G-12f). The flat, sloping surface created by slicing the edge off a timber.

Channel [Chain wale] (Fig. 5-62a). A thick, horizontal plank projecting from the side of a vessel and used to support the shrouds and keep them clear of the bulwarks.

Channel wale (Fig. 5-62a). A wale, or belt of wales, located at the line of the channels, to which the chains of the shrouds were fastened.

Charley Nobel (Fig. G-3). The chimney, or flue, of the galley hearth or stove.

Chase port (Figs. 5-56 and 5-61). A gunport placed in the bow or stern to accommodate fore-and-aft mounted guns.

Check. See **Shake**.

Cheek [Cheek knee] (Figs. G-3 and 3-48). On later vessels, a knee or brace between the side of the bow and the knee of the head; on ancient warships, a protuberance at the side of the stem against which the side planking was stopped.

Chine (Fig. 3-62). The angular junction of the bottom and side of a vessel; usually found on flat-bottomed hulls, or those with little deadrise. Can also refer to a longitudinal timber located just inside the junction, to which athwartships bottom planks are fastened.

Chock (Figs. G-3 and G-13). An angular block or wedge used to fill out areas between timbers or to separate them; chocks were used to fill out deadwoods and head knees, separate frames and futtocks, etc.

Cistern. A term applied variously to pump wells or to collecting basins at the discharge ends of pumps.

Clamp (Fig. G-5, nos. 18 and 25). A thick ceiling strake used to provide longitudinal strength or support deck beams; clamps were often located directly opposite the wales and acted as internal wales; a clamp that supported a deck beam was called a *shelf clamp*.

Clench [Clinch] (Fig. G-9g). To secure a nail or bolt by bending or flattening its projecting end over the surface it last penetrated; a nail whose tip and shaft were both clenched is said to be *double-clenched*, as in the fastening of ancient ship frames and planks (Fig. 3-28).

Clenched lap [Lapstrake]. See **Clinker-built**.

Clinker-built [Clincher-built, Clencher-built] (Figs. 4-24 and 4-32). A vessel constructed so that its outer planking overlaps, and is fastened to, the plank

immediately below it. Where planks overlap the ones above them (there have been no European vessel finds to support this alleged method), the procedure is known as *reverse clinker*. The surface of a plank overlapped by a neighbor is called a **land**, and this double thickness is normally held together with closely spaced rivets or nails clenched over metal washers called **roves**. Northern European specialists limit the term "clinker-built" to vessels whose planks are rivetted together; hulls whose overlapping planks are fastened with clenched nails, as in most cog construction, are called *clenched lap* or *lapstrake* hulls.

Coak (Figs. G-9m and G-9n). A rectangular or cylindrical pin let into the ends or seams of timbers about to be joined in order to align or strengthen the union.

Coaming [Combing] (Fig. G-7c). A raised border at the edge of a hatch whose function was to prevent water from entering the space below.

Cockpit. The surgeon's compartment; the sick bay. On yachts, the well from which the vessel is directed.

Common ceiling (Fig. G-5, no. 12). The ordinary ceiling used to prevent cargo and ballast from falling between the frames; common ceiling was usually made from relatively thin planking and seldom contributed longitudinal strength to the hull structure.

Companion. A covering over a cabin hatchway.

Companion way. A stairway or ladder leading from one deck to another.

Compass timber [Compassing]. Naturally curved timbers used for frames and construction in the ends of a hull.

Copper-bottomed [Coppered]. A vessel whose bottom was sheathed in copper to prevent fouling and worm infestation.

Copper fastened. A vessel whose fastenings were made of copper.

Cordage. A general term for ropes and cables.

Counter (Fig. G-14). Technically, the transverse section between the bottom of the stern and the wing transom. However, many documents and drawings refer to the counter as the entire transverse area between the top of the sternpost and the rail or taffrail.

Counter timbers (Figs. G-14a-G-14c). Vertical timbers framing the counter.

Crab. A small capstan, usually portable and lacking a drumhead at the top of its barrel.

Cradle. A structure for supporting a vessel out of water.

Crone (Fig. 4-26). An English translation of an old Norse term denoting the elongated mast steps on Viking vessels.

Crossbeam (Fig. G-10). A substantial timber placed across a pair of bitts.

Cross pillar. See **Pillar**.

Crotch [Crotch timber] (Fig. 5-17). A V-shaped or Y-shaped frame or floor timber made from the crotch

- of a tree; usually mounted on the keel or deadwood in the ends of a vessel.
- Crow** [Crow bar] (Fig. G-8). A strong iron bar, pointed or chisel-shaped at one end, used for prying or moving heavy timbers.
- Crown.** *See* **Camber.**
- Crutch** (Figs. G-3 and G-15a). A bracing timber used to prevent a mast step from shifting laterally; also, a curved or angular timber, similar to a breast hook and used for a similar purpose in the lower part of the stern. On modern vessels, a support for booms at rest.
- Cuddy.** A cabin or shelter in the forward part of a small vessel.
- Curved scarf** [Curved butt, S-scarf] (Fig. G-11). The union of two planks or timbers whose ends were canted in the shapes of reverse curves.
- Cutting-down line.** The elevations of the tops of the floor timbers and deadwoods; in most cases, the curved line formed by the bottom of the keelson, stemson, and sternson.
- Cutwater** (Fig. G-3). The forwardmost part of the stem; the stem piece or nosing that parts the water.
- Dagger knee** (Figs. G-3 and G-5). A knee set angularly on the inside of the hull; a knee that is neither vertical or horizontal.
- Dagger piece.** Any piece of timber, but usually a frame timber, mounted at an angle to the vertical or horizontal planes.
- Dead flat.** The flat part of the hull in the area of the midship frame; generally, the widest part of the hull, which separated the forward part from the after part.
- Deadrise** (Fig. G-5). The amount of elevation, or rising, of the floor above the horizontal plane; the difference between the height of the bilge and the height of the keel rabbet.
- Deadwood** (Fig. G-3). Blocks of timber assembled on top of the keel, usually in the ends of the hull, to fill out the narrow parts of a vessel's body. *See also* **Rising wood.**
- Deadwood knee** (Fig. G-3). A knee placed within the deadwood to support the sternpost.
- Deadwork.** The part of the hull above the full-load waterline.
- Deal.** A thin plank of fir or pine, most commonly used to sheath hulls.
- Deck beam.** *See* **Beam.**
- Deck hook.** (Figs. 5-50 and G-13b). A breast hook placed beneath a deck to support it at or near the stem.
- Deck transom** (Fig. G-14d). A transom that supported the after ends of deck planks.
- Depth of hold.** The distance between either the bottom of the main deck or the bottom of its beams and the limber boards, measured at the midship frame.
- Diagonal braces** (Fig. 5-20). Pillars or posts set angularly in the hull to stiffen it; although used in pairs, they differed from cross pillars in that each brace occupied only one side of the hull.
- Diagonal framing.** Frames or riders placed diagonally over the regular frames or ceiling to provide additional stiffening to a hull.
- Diagonals** (Fig. 2-10). Lines on a hull drawing representing specific oblique sections of the hull. Chapter 2 has a complete description of their functions.
- Diagonal scarf** [Diagonal butt] (Fig. G-11b). An angular junction of two planks or timbers.
- Diminishing strakes** (Fig. G-5). Belts of outer planking above and below the wales that were successively reduced in thickness, providing a more gradual transition from the protrusion of the wales to the thickness of the side planking.
- Double-ender.** A vessel whose bow and stern have approximately the same horizontal shape, such as rounded, pointed, or square ends.
- Double framing** (Fig. G-12). A general term signifying frames composed of two rows of overlapping futtocks.
- Dowel** [Dowel pin] (Fig. G-9n). A cylindrical piece of wood (of constant diameter) used to align two members by being sunk into each. A cylindrical coak. Unlike treenails and pegs, dowels served an alignment function only, additional fastenings being necessary to prevent separation of the joint.
- Draft** [Draught]. The depth to which a hull is immersed; also, a drawing or plan.
- Draft marks** [Draught marks, Load lines] (Fig. 5-58). Figures or lines cut into, or attached to, the stem and sternpost to indicate the depth at which each end of the hull is immersed.
- Drag.** The difference between the draft of a vessel's stern and its bow.
- Drawknife** (Fig. G-8). A knife with two handles mounted at right angles to the blade; drawknives are used for shaping and beveling.
- Drift.** The difference between the diameters of a bored hole and the bolt that is driven into it.
- Drift bolt.** A cylindrical bolt, headed on one end, that is slightly larger in diameter than the hole into which it is driven.
- Drop keel** [Sliding keel]. *See* **Centerboard.**
- Drop strake** (Fig. G-11). A strake of planking that is discontinued near the bow or stern because of decreasing hull surface area. A central stealer.
- Dunnage.** Brushwood, scrapwood, or other loose material laid in the hold to protect the cargo from water damage or prevent it from shifting, or to protect the ceiling from abrasion.
- Ekeing** [Lengthening piece] (Fig. G-13b). A timber used to lengthen another timber, such as the extension of a deck hook or knee.

Entrance [Entry]. The foremost underwater part of a vessel.

Eye bolt (Fig. G-9i). A bolt with a circular opening at one end.

Eyes. A name sometimes given to the hawse holes or the areas around them; on ancient ships, ocular decorations at the same locations.

Fair. To shape or adjust a timber or timbers to the correct curvature or location; also, to correct discrepancies in a ship's drawings.

Fair curve [Fair line]. A shape or line whose curvature agrees with the mold loft or that is mechanically acceptable and seaworthy.

Fall home. *See* **Tumblehome**.

False keel [Shoe] (Figs. G-3, G-4a, G-4b, and G-5). A plank, timber, or timbers attached to the bottom of the keel to protect it in the event of grounding or hauling; on large ships, false keels were sometimes made quite thick in order to increase the size and strength of the keel. In North America from the eighteenth century onward, and perhaps in other areas, false keels were called **shoes**.

False keelson. *See* **Rider keelson**.

False stem (Fig. 5-42). An outer timber fixed to the forward surface of the stem to strengthen or protect it, or to provide better symmetry to the cutwater. Also, a name sometimes given to the apron in English documents.

False sternpost (Fig. 3-38). A member attached to the after surface of the sternpost to reinforce or protect it.

Fashion piece [fashion timber] (Fig. G-14a). A timber that framed the shape of the stern.

Fay. To fit or join timbers closely together.

Figure piece (G-13d). A name sometimes given to the upper piece of the knee of the head, upon which the figurehead rested.

Filling frame (Fig. G-12e). A frame composed of a single row of timbers, usually scarfed together, that filled the space between the main, or double-rowed, frames of a large ship.

Filling piece [Filler] (Fig. G-12e). A single timber or block used to fill out an area, such as the side of a gunport where it did not coincide with a frame, or in the spaces between frames to maintain rigidity.

Fine lines. A descriptive term applied to a vessel with a sharp entrance and a narrow hull.

Fish (Fig. 4-26). An English term for the modern Norwegian word describing the fishtail-shaped mast partners on Viking vessels.

Fish plate (Fig. G-9). A metal plate used to join two timbers externally.

Flare. The upward and outward curvature of a vessel's bows; a curved outfall.

Flat scarf (Fig. G-11b). The union of two planks or timbers whose diagonal ends were nibbed (cut off)

perpendicular to their lengths. When planking is scarfed vertically, the ends are not nibbed.

Floor. The bottom of a vessel between the upward turns of its bilges.

Floor head. The outer extremity of a floor timber.

Floor head line. *See* **Rising line**.

Floor ribband [Floor ribbon]. The floor rising line; specifically, a ribband or batten fastened to the outside of the frames at the heads of the floor timbers; used for fairing and to determine the shapes and lengths of intermediate frames.

Floor timber (Fig. G-12). A frame timber that crossed the keel and spanned the bottom; the central piece of a compound frame.

Flush deck. A deck running continuously from bow to stern, without breaks or raised elements.

Foot wale [Footwaleing] (Fig. G-5, no. 15). **Thick** longitudinal strakes of ceiling located at or near the floor head line or turn of the bilge. Some eighteenth-century English documents called the thick strakes next to the limber strake, or sometimes all of the ceiling, **footwaleing**, in which case the heavy strakes near the turn of the bilge were known as **thick stuff**.

Forecastle. Various, a short, raised foredeck, the forward part of the upper deck between the foremast and the stem, or the quarters below the foredeck.

Forefoot (Fig. G-3). A curved piece between the forward end of the keel and the knee of the head; the **gripe**. In some documents describing large ships, it is the name given to the rounded forward portion of the gripe, inserted as a separate piece.

Fore hood. The end of a plank at the stem rabbet.

Forelock bolt (Fig. G-9h). An iron bolt with a head on one end and a narrow slot at the other; secured by placing a washer over its protruding end and driving a flat wedge, called a **forelock**, into the slot. Forelock bolts were one of the most popular of shipbuilding fastenings, being commonly used to secure major timbers from Roman times until the nineteenth century.

Forepeak. The forward extremity of the hold.

Frame (Fig. G-12). A transverse timber, or line or assembly of timbers, that described the body shape of a vessel and to which the planking and ceiling were fastened. Frames were sometimes called **timbers** or, erroneously, **ribs** (*see* **Rib**). Ancient ships often had frames composed of lines of unconnected timbers; later ships usually had compound frames composed of **floor timbers**, **futtocks**, and **top timbers**. **Square frames** were those set perpendicular to the keel; in the bow and stern there were **cant frames**, running obliquely to the keel. Forward of the cant frames and fayed to them, in large round-bowed vessels, were the frames running parallel to the keel and stem, sometimes called **knuckle timbers**; more accurately,

these were the **hawse pieces** and **knight heads**, the latter being the frames adjacent to the apron or stemson that extended above the deck to form bitts and support the bowsprit. The aftermost frames were the **fashion pieces**, which shaped the stern. Frame details are illustrated in Figs. G-3, G-5, G-12, G-13, and G-14.

Frame head. *See* **Timber head.**

Frame heel. *See* **Timber heel.**

Freeboard. The distance between the waterline and upper deck.

Furring. *See* **Sheathing.**

Futtock (Fig. G-12). A frame timber other than a floor timber, half-frame, or top timber; one of the middle pieces of a frame.

Futtock plank. In English shipbuilding, the first ceiling plank next to the limber strake.

Gallery. A balcony projecting from the stern or quarter of a large ship.

Galley. A seagoing vessel propelled primarily by oars, but usually one that also could be sailed when necessary. Also, a name given to a vessel's kitchen.

Gammoning hole [Gammoning slot] (Fig. G-13d). An opening in the knee of the head through which the bowsprit gammoning (lashing) passed.

Gammoning knee. A curved timber attached to the top of a vessel's stem, to which the bowsprit was lashed; sometimes used in lieu of a more elaborate knee of the head.

Gammon piece (Fig. G-13d). The part of the knee of the head containing the gammoning hole.

Garboard strake [Garboard] (Figs. G-4 and G-5). The strake of planking next to the keel; the lowest plank. Also, the lowest side strake of a flat-bottomed hull.

Girdling [Girding]. The practice of adding timber to the sides of ships to increase their breadth and thereby improve stability. The practice was most common on sixteenth- and seventeenth-century British vessels and was employed to overcome design flaws due to inability to calculate metacentric height.

Grating. A latticework hatch cover used for light and ventilation. Also, a term applied to the latticework deck in the heads of large ships.

Graving [Breaming]. The practice of cleaning a hull's bottom by burning barnacles, grass, and other foul material preparatory to recoating it with tar, sulphur, etc. The vessel was careened or drydocked to perform this task.

Graving iron (Fig. G-8). A hook-like tool used for removing old caulking.

Graving piece (Fig. G-11a). A wooden patch, or insert, let into a damaged or rotted plank.

Gripe (Fig. G-3). A curved piece joining the forward end of the keel to the lower end of the knee of the head. Generally, the same as **forefoot**.

Gudgeon (Fig. G-18b). A metal bracket attached to the sternpost into which a rudder **pintle** was hung; the female part of a rudder hinge.

Gundeck (Fig. G-6). The deck where the guns were located; large ships had as many as three gundecks (a three-decker), called the lower, middle, and upper gundecks.

Gunport framing. (Fig. G-3). The **sills**, **lintles**, and **filling pieces** that shape and reinforce the gunports.

Gunwale [Gunnel] (Fig. G-5, no. 35). The upper edge of a vessel's side. In sixteenth-century vessels, the wale against which the guns rest.

Half beam (Figs. G-5 and G-7d). A beam extending from the side to a hatch or other obstruction. *See* also **beam arm**.

Half-frame (Figs. 3-34, 4-5, and 5-53). A frame whose heel began at or near one side of the keel or deadwood and spanned part or all of that side of the hull; half-frames normally were used in pairs.

Hanging knee (Fig. G-5, no. 29). A vertical angular timber used to reinforce the junction of a beam and the side.

Harpins [Harpings]. The forward planks of wales that were strengthened by increased thickness near the stem; usually found on large, round-bowed vessels. Also, a term applied to specially shaped battens fitted to the cant frames or other areas of extreme curvature during construction; used to check and adjust frame bevels.

Hatch [Hatchway] (Fig. G-7c). A rectangular opening in a vessel's deck.

Hatch beam (Fig. G-7c). A removable beam that supported the hatch cover and provided lateral strength when the hatch was not in use.

Hatch coaming. *See* **Coaming.**

Hawse block. A wooden plug used to close a hawse hole in heavy weather.

Hawse bolster. One of the heavy planks fixed around or below the hawse holes to protect the hull planking.

Hawse hole (Fig. G-3). A cylindrical hole in the bow through which the anchor cable passed.

Hawse hook. A breast hook above the upper foredeck; usually, the highest breast hook.

Hawse piece [Hawse timber] (Figs. G-3 and G-13a). A fore-and-aft framing timber whose heel was fayed to the forwardmost cant frame and which reinforced the bow of a large, round-bowed vessel; hawse pieces were so named because the hawse holes were partially cut through them.

Hawse pipe. The tube through which the anchor cable passed between the hawse hole and windlass or capstan deck.

Hawser. A strong rope used to tow or tie up a vessel.

Head. In a general sense, the forward part of a vessel; the extreme bow area; also, a name sometimes given to

- the **figurehead** or, on later vessels, to the latrine. See also **Timber head**.
- Head knee**. Sometimes a designation for **cheek knee** (**cheek**), but more frequently an alternate term for **knee of the head**.
- Head ledge** (Fig. G-7c). An athwartships hatch coaming.
- Headrails** (Fig. G-3). Curved rails extending from the bow to the knee of the head.
- Head timber**. Any small timber in the head, but usually those supporting the gratings.
- Heel** (Fig. 5-17). The junction of the keel and sternpost; also, an angular timber connecting the keel to the sternpost. Separate heel timbers on cogs and cog-like vessels are most frequently called **hooks**.
- Heel knee** [Stern knee] (Fig. 5-17). An angular timber reinforcing the junction between the keel and the sternpost.
- Helm**. The tiller or steering wheel; in a general context, the wheel, tiller, and rudder.
- Helm port** [Rudder hole] (Figs. G-14a and G-14c). The opening in the stern where the rudder stock entered the hull.
- Helm port transom** (Figs. G-14a and G-14c). The timber reinforcing the helm port.
- Hog** [Hogging]. The strain on a hull that causes its ends to droop.
- Hog** [Hog timber]. See **Rising wood**.
- Hogging truss** [Hogging frame]. A strong fore-and-aft framework built into a vessel to prevent hogging; hogging trusses were most commonly seen in canal boats and other long inland vessels. In ancient vessels, it was a strong cable supported by forked posts and attached to the ends of the hull to serve the same purpose (see Fig. 3-6).
- Hold** (Fig. G-6). In a general sense, the interior of a hull. The term is more commonly used to describe the part of a merchant ship's interior where the cargo and ballast were stowed or, on a warship, the room below the deck where stores and ballast were kept.
- Hooding ends** [Hoods, Hood ends]. The ends of planks that fit into the stem and sternpost rabbets; hooding ends were sometimes reduced in thickness to permit a better join with the posts.
- Hook** (Fig. 4-40a). A knee-like timber that connected the keel or central plank to the stem or sternpost. A northern European designation, it is used almost exclusively in reference to cogs and cog-like vessels. In later English documents, bow hooks were called **gripes**; stern hooks were called **heels**.
- Hook and butt** (Fig. G-11a). A method of planking whereby one edge of the plank was straight while its opposite side had sloping edges locked by a hook. Infrequently, the term was also used to denote a hook scarf.
- Hook bolt** (Fig. G-9). A bolt with a hook-shaped head used for securing detachable lines, tackle, and other gear.
- Hook scarf** (Fig. G-11b). The union of two planks or timbers whose angular ends are offset to lock the joint. Hook scarfs are sometimes locked with wedges, or keys.
- Horning** [to horn]. A process by which frames were aligned to assure that they were level and exactly perpendicular to the keel. See **Horning pole** for a description of the process.
- Horning pole** (Horning board, Horning line). A batten, pole, or line used to align frames; one end was mounted over the keel centerline, or atop the stem or sternpost, while the other end was marked and swung across each frame head to ensure that each side of the frame was equidistant from, and perpendicular to, the keel centerline.
- Horseshoe** [Horseshoe clamp, plate] (Figs. G-3 and G-9l). A U-shaped iron plate fastened across the seam of the stem and forefoot to strengthen it.
- Horsing**. A term used to describe the process of driving caulking into planking seams.
- Hypozomata**. A cable or assembly of cables installed in ancient galleys to overcome hogging.
- Inner stempost**. The inner timber or timbers of a double-layered stem; unlike an apron, an inner stempost ends at the keel-stem scarf; see Figure 3-24 for an example of the Kyrenia ship's inner stempost.
- Inner sternpost** (Fig. G-14). A vertical timber attached to the forward surface of the sternpost to increase its strength, and in some cases, to support the transoms.
- Intermediate timbers** (Figs. 3-23 and 3-34). Those individual timbers installed between the sequential frames for additional localized strength. They could span part of the bottom, turn of the bilge, or side. The term applies primarily to ancient ships and inshore craft, where they reinforced the areas around beams, mast steps, bilge sumps, etc., or extended upward as frames for bulkheads and weather screens.
- Inverted knee**. See **Standing knee**.
- Iron knee**. See **Plate knee**.
- Jeer bitts** (Fig. G-10). Upright posts used for staying the various courses or halyards.
- Jib-boom**. A spar extending the length of the **bowsprit**.
- Joggles** (Fig. 3-3). Notches cut into the surface or edge of a timber, as in the exterior frame surfaces of clinker-built hulls or in the edges of some ancient Egyptian hull planks.
- Keel** (Figs. G-3 and G-4). The main longitudinal timber of most hulls, upon which the frames, deadwoods, and ends of the hull were mounted; the backbone of the hull.
- Keel plank** [Central plank, Kingplank]. A central hull plank that was substantially thicker than the rest of

the bottom planking and whose breadth was at least twice as great as its thickness; a thick bottom plank used in lieu of a **keel**.

Keelson [Kelson] (Figs. G-3, G-4a, and G-4b). An internal longitudinal timber or line of timbers, mounted atop the frames along the centerline of the keel, that provided additional longitudinal strength to the bottom of the hull; an internal keel.

Most commonly, a single keelson was installed that was no larger than the keel. On very large vessels, however, various combinations of as many as a dozen keelsons were assembled. Where extra molding was required, one or more additional keelsons, called **rider keelsons** or **false keelsons**, were bolted to the top of the main keelson. They could be of identical size to, or smaller than, the main keelson. Auxiliary keelsons bolted along-side the main keelson were known as *sister*, (U.S.), *side*, *auxiliary*, or *assistant keelsons*. However, care should be exercised in interpreting the various keelsons from contracts. For instance, some nineteenth-century American contracts for large schooners refer to the keelson above the main keelson as the *sister*, and the one above that as the *assistant sister keelson*. On occasion, large square timbers were placed at the floor head line or near the bilge, usually above the bilge keels. These were called **bilge keelsons** or, in some British document, **sister keelsons**. Secondary keelsons did not necessarily run the full length of the hull, terminating at the ends of the hold, the last square frames, or some other appropriate location. Figure G-4 illustrates some typical arrangements.

Keel staple [Keel clamp] (Figs. G-3 and G-4a). A large metal staple used to attach the false keel to the keel.

Kevel head. The extension of a frame or top timber above the bulwarks to form a bitt, to which ropes were secured.

Kingplank [Central strake, Kingstrake]. Various, the central strake of a flush deck or the central strake of a hull without a keel.

Knee [Knee timber] (Figs. G-5, nos. 17, 19, and 29; G-7a, G-7b, G-7c, and G-7e). An angular piece of timber used to reinforce the junction of two surfaces of different planes; usually made from the crotch of a tree where two large branches intersected, or where a branch or root joined the trunk. See also **Dagger knee**, **Hanging knee**, **Lodging knee**, and **Standing knee**.

Knee of the head [Head knee] (Fig. G-13d). A knee or knee-shaped structure, fixed to the forward surface of the stem, that formed the cutwater at its lower end and supported the headrails and figurehead at its upper end.

Knightheads (Figs. G-3 and G-13a). The forwardmost frame timbers, which ran parallel to the stem, their heels being fayed to the forwardmost cant frames

and their heads extending above deck level to form bitts that supported the bowsprit between them. Also, a name given to a pair of bitts, located just aft of the foremast on merchant ships, that supported the ends of the windlass, or to any bitt whose upper end was carved in the shape of a human head.

Knuckle. A sharp angle in a frame.

Knuckle timbers (Fig. G-13a). A name sometimes applied to the fore and aft frames in the bow of a round-bowed ship. The **hawse pieces** and **knightheads**.

Land. The portion of a plank that is overlapped by another on a clinker-built vessel.

Lapstrake [Clenched lap]. See **Clinker-built**.

Larboard. See **Port**.

Ledge (Figs. G-7a and G-7b). A short beam set between and parallel to the deck beams to provide intermediate support of the deck; the ends of ledges were supported by **carlings**, **clamps**, or **lodging knees**.

Leeboard. A large plate, or assembly of timbers, mounted on the side of a hull and lowered when sailing off the wind to increase lateral resistance and reduce **leeway**.

Leeway. The sideways drift of a vessel when sailing with the wind abeam.

Lengthening piece. See **Ekeing**.

Level lines. Another name for the **waterlines** on hull plans; they described the horizontal sections of the hull.

Light [Light port]. An opening in a vessel's side or deck, usually glazed, to let light into a compartment.

Limber boards (Fig. G-5, no. 8). Ceiling planks next to the keelson which could be removed to clean the limbers; on some ancient vessels, limber boards were laid transversely above the centerline of the keel (see Fig. 3-31). Holes or slots were sometimes cut into limber boards so that they could be lifted more easily.

Limber holes [Watercourses] (Figs. G-5, no. 10, and G-12). Apertures cut in the bottom surfaces of frames over, or on either side of, the keel to allow water to drain into the pump well.

Limber ledges (Fig. 3-31). Rabbeted timbers running parallel to the keel and atop the floor timbers for the purpose of supporting transverse ceiling planks.

Limbers. Watercourses or channels alongside or central to the keel or keelson, through which water could drain into the pump well.

Limber strake (Fig. G-5, no. 9). The lowest permanent ceiling strake, fastened to the tops of the frames next to the limber boards and keelson.

Lines [Hull lines]. The various shapes of a hull; expressed graphically, a set of geometric projections, usually arranged in three views, that illustrates the shape of a vessel's hull. A description of lines drawings is in chapter 2.

Lining (Fig. G-5). The common ceiling of the orlop, berthing, and gun decks of ships, set between the

spirketting and the clamps. The lining was frequently called **quickwork**, a term more commonly used in British documents.

Lintle (Fig. G-3). The upper horizontal timber framing a gunport, large square light, or gallery door.

Load line. In some cases the term **load line** denoted full-load draft. *See* **Draft marks**.

Locked pintle. A **pintle** that was flanged or keyed in order to prevent the rudder from accidentally unshipping.

Lodging knee [Lodge knee] (Figs. G-5, no. 19, G-7a, and G-7b). A horizontal, angular timber used to reinforce two perpendicular beams or the junction of a beam and the side of the hull.

Longitudinal. *See* **Stringer**.

Loof. The after part of the bow, where the side began curving inward toward the stem.

Loom. Another term for the stock of a quarter rudder. Also, the stock, or pole piece, of an oar or sweep.

Luting. A term used frequently to describe the caulking of lapstrake (clinker-built) hulls. In most cases, animal hair, wool, or moss was soaked in pitch or resin and laid in a **luting cove**, which was cut in the lower inside surface of the overlapping plank. Luting generally refers to caulking inserted between two hull members before they were assembled, as opposed to driven caulking (see **Caulk**). The term is also applied to any plastic material used between two adjacent members.

Main. In shipbuilding, the adjective applied to the most important timbers, or those having the greatest cross-sectional area; thus, on ancient vessels the main wale was usually the lowest and largest, while on later warships it was the one below the gunports; also, main breadth, main hatch, main hold, main keelson, etc.

Main frame. A term sometimes applied to frames composed of two rows of futtocks to distinguish them from filling frames, the single-rowed frames placed between them; it applies to larger vessels of the last few centuries. The term was also used infrequently to denote the **midship frame**.

Main piece (Fig. G-13). The longest and largest timber in the knee of the head. Also, a term sometimes applied to the main vertical timber, or stock, of a rudder (Fig. G-18b).

Mallet (Fig. G-8). A large hammer with a short handle and a cylindrical wooden head, sometimes hooped with iron to prevent it from splitting, used for caulking (caulking mallet) and general shipwrightery. The heaviest mallets were also called **beetles**.

Manger. A small compartment, located just inside the hawse hole, whose after bulkhead (called a **manger board**) diverted water entering the hawse hole into the limbers.

Margin plank. *See* **Nibbing strake**.

Mast carlings (Fig. G-7d). Fore-and-aft beams that helped support a mast where it pierced a deck; also called **mast partners**. *See* **Partners**.

Mast partner (Figs. G-7d and 5-50). *See* **Partners** and **Mast carlings**.

Mast step (Figs. G-15a-G-15c). A mortise cut into the top of a keelson or large floor timber, or a mortised wooden block or assembly of blocks mounted on the floor timbers or keelson, into which the tenoned heel of a mast was seated. Various types of mast steps are shown in Figure G-15 and throughout chapters 3, 4, and 5.

Maul (Fig. G-8). A heavy wood or iron hammer, primarily used to drive large bolts.

Meginhufr (Figs. 4-27 and 4-31). A thick plank separating the bottom, or *lower ship*, of a Viking hull from its sides. Either rectangular or L-shaped in cross-section, meginhufrs evolved from the triangular-sectioned sheer strakes of earlier, simpler Norse hulls.

Metacenter. The intersection of a vertical line drawn through the center of gravity of a vessel when it is stable with a vertical line drawn through its center of buoyancy when the vessel is heeled. *See* chapter 2 for a description of its application.

Midship [Midships]. A contraction of **amidships** and consequently, in a general sense, it refers to the middle of the ship. In construction, however, it is often used as an adjective referring to the broadest part of the hull, wherever it may be.

Midship beam (Fig. G-5, no. 30). The longest beam in a vessel, located at or near the **midship bend**.

Midship bend (Fig. G-5). The broadest part of the hull; the widest body shape, formed by the centerline of the **midship frame**.

Midship flat [Midship body, Midsection, Midship section]. The extent of the broadest part of the hull, formed by the midship frame and all adjacent frames of the same breadth.

Midship frame (Fig. G-5). The broadest frame in the hull; the frame representing the midship shape on the body plan.

Mold [Mould] (Fig. G-16). A pattern used to determine the shapes of frames and other compass timbers. Molds were usually made from thin, flexible pieces of wood. Convex molds were called *bend molds*, concave molds were known as *hollow molds*, and *compound* or *reverse molds* included entire frame shapes. The degree of bevel and other pertinent information was written on the molds. The process of shaping outer frame surfaces with molds was known as **beveling**. Figure G-16 illustrates several types of molds. *See* also **Whole molding**.

Molded [Molded dimension]. The various dimensions of timbers as seen from the sheer and body views of construction plans; the dimensions determined by the molds. Thus, the vertical surfaces (the sides) of

keels, the fore-and-aft sides of the posts, the vertical or athwartships surfaces of frames, etc. Normally, timbers are expressed in sided and molded dimensions, while planks and wales are listed in thicknesses and widths. Molded and sided dimensions are used because of the changing orientation of timbers, such as frames, where "thick" and "wide" or "height" and "depth" become confusing.

Molded depth. The depth of a hull, measured between the top of the upper deck beams at the side and a line parallel to the top of the keel.

Molding. See **Mold** and **Whole molding**.

Mold loft. A protected area or building in a shipyard where the hull lines, from which the molds were produced, were drawn full size on a specially prepared flat surface.

Mortise (Fig. G-17). A cavity cut into a timber to receive a tenon. Large mortises were sometimes referred to as *steps*.

Mortise-and-tenon joint (Fig. G-17). A union of planks or timbers by which a projecting piece (tenon) was fitted into one or more cavities (mortises) of corresponding size. The most common types are:

Fixed tenon and single mortise (Fig. G-17a). A tenon was shaped from the end on one timber and inserted into the mortise of the other. When the tenon of a large vertical timber was left unlocked, as in masts, and sternposts, it was said to be stepped.

Free tenon and two mortises (Fig. G-17b). The most common method of edge-joining planking in ancient and early medieval vessels in the Mediterranean area, it also was used to secure adjoining surfaces of parallel timbers, such as stems and floor timber chocks. Corresponding mortises were cut into each planking edge; a single hardwood tenon was inserted into the lower plank and the adjacent plank fitted over the protruding tenon. In many instances, the joint was locked by driving tapered hardwood pegs into holes drilled near each strake or timber edge.

Free tenon and three or more mortises (Fig. G-17c). Used in superstructure fabrications or places where hull planking was too narrow to provide sufficient seating for the desired tenon length.

Although small planking joints whose tenons are unpegged and contribute no structural strength are essentially **coak joints**, the term mortise-and-tenon joint has become universally accepted for all such forms of edge joinery.

Mortising chisel (Fig. G-8). A specialized chisel used for shaping narrow mortises.

Narrowing line (Fig. 5-19). A curved line on the half-breadth drawing of a hull, designating the curve of

maximum breadth or the ends of the floor timbers throughout the length of the hull. The former was called the *maximum breadth line*; the latter was known as the *breadth of floor line*. See chapter 5 for details.

Nib [Nibbing end] (Fig. G-7f). The practice of squaring the ends of deck planks where they terminated at the sides of the hull to avoid fine angles and subsequent splitting and distortion.

Nibbing strake [Margin plank] (Fig. G-7f). A plank running adjacent to the waterways in the ends of a vessel, into which the nibbed ends of deck planks were fitted. English documents most frequently referred to this timber as a margin plank; American contracts more commonly called it a nibbing strake.

Oakum [Oakham]. Caulking material made from rope junk, old rope, and rope scraps; it was unwound, picked apart, and the fibers were rolled and soaked in pitch before being driven into planking seams.

Oar port (Fig. G-3). An opening in a vessel's side through which the looms of oars or sweeps passed. See also **sweep port**.

Orlop deck (Fig. G-6). The lowest deck of a large ship.

Outboard. Situated near or on the outer side of a vessel; toward the outer side.

Outer stem. (Fig. 3-24). A name sometimes given to the main stempost or to the forward layer of timbers in a double-layered stem.

Outfall. The outward slant of a vessel's sides. See also **flare**.

Overhang. The part of a vessel's stern that projects aft of the rudder stock.

Packing piece (Fig. G-7a). A short piece of timber used to fill open areas between structural timbers; used most frequently at the sides between deck beams or lodging knees.

Parcel (Fig. 5-14b). To surround or enclose with strips of flexible material, as in the reinforcement of caulked planking seams (usually lead strips) or between ropes and their servings (usually strips of canvas).

Partners (Fig. G-7d). The timbers surrounding the deck openings for masts, pumps, bitts, and capstans; their primary purpose was to strengthen the deck around the opening and counteract strain. Partners were also used on occasion to steady masts on undecked vessels.

Patch tenon (Fig. G-17d). In ancient vessels, a headed tenon inserted from the exterior or interior surface of a plank. Patch tenons were normally used in the replacement of rotten or damaged planking. The name comes from their installed appearance as square patches in the sides of hulls.

Pay. To coat; to cover a hull bottom with a protective layer of pitch, resin, sulphur, etc.

Peak. The upper portions of the narrow ends of a vessel; cited individually in some documents as **forepeak**

and **afterpeak**. Also, a term used to designate the tip of an **anchor palm**.

Peg [Tenon peg] (Fig. G-17b-d). A tapered wooden pin driven into a pre-drilled hole to fasten two members or lock a joint. Pegs came in a variety of sizes and tapers; they could have square, round, or multi-sided cross sections. The important difference between dowels and pegs in ancient construction was that the former were of constant diameter and lightly set, while the latter were tapered and driven with appreciable force. The most common use of pegs in ancient construction was the locking of mortise-and-tenon joints.

Pillar (Fig. G-6). Large vertical stanchion, usually turned or dressed for aesthetic reasons, used to support deck beams or reinforce potentially weak areas. By the seventeenth century, pairs of pillars, called **cross pillars**, were set diagonally across the hull to provide transverse strength.

Pin rail. A long rack, usually attached to the inside of bulwarks, for holding belaying pins; a short pin rail was called a pin rack.

Pintle (Fig. G-18). A vertical pin at the forward edge of a stern-hung rudder that fit into a gudgeon on the sternpost to form a hinge. On most vessels, they were welded or cast to a bracket whose arms were fastened to the sides of the rudder.

Pitch [Tar]. A dark, sticky substance used in caulking seams or spread over the inner or outer surfaces of hulls as waterproofing and protection against some forms of marine life. Pitches were variously derived from the resins of certain evergreen trees; from bitumens, such as mineral pitches; or from the distillation of coal tar, wood tar, etc.

Planking (Fig. G-5). The outer lining, or shell, of a hull.

Planking strake [Strake, Streak]. A continuous line of planks, usually running from bow to stern; the sum of a row of planks.

Planksheer [Sheer plank] (Fig. G-5). The strake that described the sheer line of a vessel, attached to the toptimbers from stem to stern at the level of the upper deck. Also, in various times and places, the name given to the uppermost continuous strake of side planking or the upper edge of the uppermost strake. In later English documents, a sheer rail or one of the drift rails.

Plate knee [Plate] (Fig. G-7e). A knee made from iron plate. Normally superimposed over a timber or wooden chock, iron knees were introduced in the latter part of the eighteenth century.

Plug treenail (Fig. 3-28). A piece of straight-grained wood through which metal fastenings were driven. In some cases, pilot holes are said to have been pre-bored through their lengths. They were not driven into the holes of the planks, but fit rather loosely and

expanded tightly when the nails were driven through them. Plug treenails were commonly used on the exterior hull surfaces of ancient ships to prevent leakage and splitting of the planks around the fastenings.

Poop [Poopdeck]. The highest and aftermost deck of a ship.

Port [Port side, Larboard]. The left side of a vessel when facing forward.

Pump well [Sump] (Fig. G-3). The cavity or compartment in the bottom of a hull, usually near amidships, where bilgewater collected and from which it was pumped out or bailed. Wells ranged from simple sumps between frames to watertight compartments extending the full height of the hold.

Quarter. The after part of a vessel's side.

Quarterdeck. The after part of the upper deck, from the mainmast to the poop.

Quarter gallery. A small balcony on the side of a ship near its stern.

Quarter rails. Rails, balustrades, or planking running along the quarterdeck.

Quarter rudder. *See* **Rudder**.

Quarter timber. A frame in a vessel's quarter.

Quickwork (Fig. G-5). The common ceiling of the orlop, berthing, and upper decks as well as the gun-deck. It was so named because it did not require caulking or precision joinery and therefore could be erected comparatively quickly. *See also* **Lining**.

Rabbet (Figs. G-3 and G-4). A groove or cut made in a piece of timber in such a way that the edges of another piece could be fit into it to make a tight joint. Generally, the term refers to the grooves cut into the sides of the keel, stem, and sternpost, into which the garboards and hooding ends of the outer planking were seated.

Rabbet plane (Fig. G-8). A plane used in smoothing rabbets.

Reg bolt (Fig. G-9). A bolt whose shaft was barbed to prevent it from working out of its hole.

Rail of the head. *See* **Headrails**.

Rake. The inclination of the stem and sternpost beyond the ends of the keel; also, the inclination of the masts from the perpendicular.

Ram (Fig. 3-44). A strong projection on the bow of an ancient warship, usually sheathed in metal, used as a weapon to strike another vessel. Specifically, the ram included the ramming timber, the forward bow timbers configured to reinforce the ramming timber, and a metal sheath; in actual practice, the metal sheath is usually called the **ram**. The **Athlit ram** is discussed in chapter 3. Rams were also used, with little success, on iron warships after the middle of the nineteenth century.

Ram bow. Any bow with a projecting forefoot or ram. Ram bows sometimes served non-military functions: a

means of reinforcing the bow construction externally, a method of lengthening the waterline to improve lateral resistance and maneuverability, or a decoration or symbol.

Ramming timber (Figs. 3-45 and 3-46). The main timber of an ancient ram, projecting forward from its envelope of bow planks and timbers to reinforce the head of the ram.

Reaming beetle [Reeming beetle] (Fig. G-8). The heaviest caulking mallet, used with a **reaming iron** for opening seams so that caulking could be driven into them.

Reaming iron [Reeming iron] (Fig. G-8). An iron chisel used for opening planking seams for caulking.

Rib. A small transverse member, often flexible and composed of one or several pieces, that stiffened the outer skin of a hull. Although often a layman's term for **frame**, rib is more properly applied to small craft, such as canoes, small boats, certain heavy frames that run from gunwale to gunwale in clinker-built vessels, or vessels whose skin is made of material other than wood.

Ribband carvel. The designation for a carvel-planked hull whose seams were covered with battens, or ribbands, to prevent the caulking from working out.

Ribbands [Ribbons, Battens]. Long, flexible strips of wood most commonly used as temporary keepers by nailing them across the outside of standing frames while the vessel was being built. When the term *framed on ribbands* was popular in the last few centuries of wooden shipbuilding, the ribbands were sometimes carefully arranged to represent certain rising and narrowing lines, from which planking and intermediate frame shapes were derived.

Rider [Rider frame] (Fig. G-6). An internal frame seated atop the ceiling, to which it was fastened; riders could be single pieces, but more often they were complete frames composed of floor timbers, futtocks, and top timbers. Installed either transversely or diagonally, they provided extra stiffening.

Rider keel (Fig. G-4b). One or more additional keels bolted to the bottom of the main keel to increase its strength. It should not be confused with a **false keel**, whose primary purpose was to protect the keel's lower surface.

Rider keelson (Fig. G-4b). An additional keelson, or one of several additional keelsons, bolted to the top of the main keelson of a large ship. In some documents, it was called a *false keelson*. See also **Keelson**.

Riding bitts (Fig. G-10). Strong, upright timbers in the bow of a ship, to which the anchor cables and hawsers were secured.

Ripping iron (Fig. G-8). A claw-like tool used for removing old copper or wooden sheathing.

Rising line (Fig. 5-19). A curved line on the sheer drawing of a ship, designating the outer ends of the floor

timbers or the height of maximum breadth throughout the length of the hull. The former line was called the *rise of floor line* or the *floor head line*; the latter was known as the *height of breadth line*. See also **Narrowing lines**.

Rising wood [Deadwood, Hog] (Figs. G-3 and G-4a). Timbers fastened to the top of the keel and notched into the bottom of the floor timbers to better secure those members to each other and give the proper rising to the floor timbers. Rising wood was located between the apron or forward deadwood and the after deadwood, and was sometimes referred to as the central or keel deadwood.

Rocker keel (Fig. 3-24). A keel that is curved longitudinally so that it is deeper at its middle than at its ends. The term also refers to keels that are molded to a greater dimension amidships than at their ends. *Rocker* should not be confused with **sag**, which is an accidental rocker.

Room and space (Fig. G-12c). The distance from a molded edge of one frame to the corresponding point on an adjoining frame, usually measured at or near the keelson. The part occupied by the frame is called the *room*, while the unoccupied distance between it and the adjacent frame is called the *space*. On large ships of the last few centuries, where filling frames were placed between double frames, the term applied to the distance between the molded edge of one double frame to the corresponding point on the next double frame. Because of the uneven siding of forward frame faces, irregular spacing, and varying methods of fabrication, **room and space** is often a meaningless term in ancient hull documentation. A more definitive designation for ancient ships is **average frame spacing**, the average of distances between frame centerlines at a common appropriate location, taken throughout the hull or hold.

Round tuck stern. See **Tuck**.

Rove [Roove] (Fig. G-9). A small metal washer, used in clinker-built hulls, over which nail or rivet ends are flattened to lock the fastening. The term was also applied to washers used in bolting scarfs, floor timbers, etc.

Roving iron (Fig. G-8). An iron, hollow-ended tool used to drive **roves** over the ends of nails and bolts before clenching.

Rudder (Fig. G-18). A timber, or assembly of timbers, that could be rotated about an axis to control the direction of a vessel underway. Until the middle of the medieval period, the practice was to mount rudders on one or both stern quarters; these were known as *quarter rudders*. By the late medieval period, however, it appears that most vessels of appreciable size were steered by a single rudder hung at the sternpost; these were known as *stern-hung rudders*. For a brief period, the two types were sometimes used in combi-

- nation. Rudders were designed for the vessel and type of duty they served. In protected waters they could be made quite broad, while seagoing ships utilized longer, more narrow rudders. For the largest seagoing ships, rudder construction was complex and required huge timbers, the assembly sometimes weighing several tons.
- Rudder blade** (Fig. G-18). The flat part of the rudder that diverts the water.
- Rudder breeching**. A strong rope with one end attached to the rudder and the other inside the stern, used to relieve some of the weight on the **gudgeons**.
- Rudder chains**. Chains or ropes attached to each side of the rudder and to the stern, used to prevent the loss of a rudder if it accidentally became unshipped.
- Rudder head** (Fig. G-18). The upper part of the rudder stock.
- Rudder hole** (Fig. G-18). An opening in the stern through which the rudder stock passed.
- Rudder post**. A term infrequently used to describe either the outer sternpost or the rudder stock.
- Rudder sheath** (Fig. G-18). A wooden or metal protective covering placed over the leading edge of a quarter rudder blade.
- Rudder stock** (Fig. G-18). A strong vertical piece to which the tiller was fitted; on large, post-medieval vessels it was the main vertical timber of the rudder, and it was also known as the **mainpiece**.
- Rudder trunk**. A housing for the rudder stock, usually extending from the counter to the steering deck.
- Runghead**. *See* **Wronghead**.
- Sag** [Sagging]. The accidental rocker formed in a keel and bottom due to insufficient timbering or improper loading.
- Scantlings**. The principal timbers of a vessel.
- Scarf** [Scarph]. An overlapping joint used to connect two timbers or planks without increasing their dimensions. Figure G-11 illustrates various scarfs used throughout shipbuilding history.
- Scroll** [Scroll head, Fiddlehead]. Ornamental molding used in place of a figurehead.
- Scupper** (Fig. G-3). A hole or channel cut in a vessel's side or waterway to drain off deck water.
- Scuttle**. A small opening, usually covered with a lid, in the side or deck for utilitarian purposes, such as a ballast port.
- Seam**. The longitudinal joint between two timbers or planks; the term usually refers to planking seams, the longitudinal juxtaposition of the edges of planks in the sides or decks, which were made watertight.
- Shake**. A longitudinal crack or distortion in a timber, caused by sun, weather, or improper curing. Cracks occurring during curing are also referred to as *checks*.
- Sheathing**. A thin covering of metal or wood, to protect hulls from marine life or fouling, or to stabilize and protect surface material applied for that purpose. Sheathing was most commonly used in the form of copper, lead, zinc, or alloy sheets, or thin wooden planks known as *furring* or *deals*. Chapters 3 and 5 have more on sheathing.
- Sheathing nail** (Figs. G-9c and G-9d). A small nail or tack used to attach sheathing to a hull.
- Sheer**. The longitudinal sweep of a vessel's sides or decks.
- Sheer line**. Specifically, the line of the upper or main deck where it meets the side, but the term is often used to describe the sweep of the bulwarks or weather rail.
- Sheer plan**. The side view of a vessel's hull plan.
- Sheer plank**. *See* **Planksheer**.
- Shelf** [Shelf clamp, Shelf piece]. *See* **Clamp**.
- Shelf wale**. On ancient and early medieval ships, a thick strake of external planking that supported through-beams and other timbers penetrating the outer planking.
- Shell**. The external planking of a vessel.
- Shell-first construction** [Shell-built]. A modern (sometimes misleading) term used to describe the process by which all or part of the outer hull planking was erected before frames were attached to it. In pure shell-built hulls, outer planking was self-supporting and formed the primary structure; the framework fastened to it formed the secondary, or stiffening, structure.
- Shift**. The act of arranging butts and scarfs so that adjacent joints are not in vertical alignment, thereby avoiding possible hull weaknesses.
- Shim**. A thin piece of wood used to fill a separation between two timbers or a frame and a plank.
- Shipwright**. A master craftsman skilled in the construction and repair of ships. In many instances, the person in charge of a ship's construction, including the supervision of carpenters and other personnel, control of expenditures and schedules, and acquisition of materials. Probably in many more areas and periods than have been documented, the term designated a formal title, such as the shipwrights to the English monarchs, or a level of expertise qualifying admission to a guild or association.
- Shoe** (Figs. G-4 and G-5). A term variously applied to the cover for an anchor fluke or a protecting piece at the bottom of a keel or rudder. *See* **Anchor** and **False keel**.
- Shole** [Sole, Shoe] (Fig. G-18b). A horizontal piece of wood or metal fixed along the bottom of a rudder to protect the lower ends of the vertical rudder pieces and align the bottom of the rudder with the bottom of the false keel.
- Shore**. A prop or pole used to brace a vessel in an upright position when not afloat or supported by a cradle.
- Shot garland**. A rack with hollows cut into it for supporting a row of cannon shot.

- Shot locker** (Fig. G-3). A small compartment, usually located near the foot of the mainmast, where round shot was stored.
- Shroud.** A rope or wire support used to steady a mast to the side of a hull.
- Side.** Described variously as the part of a hull above the waterline or the part above the turn of the bilge.
- Sided** [Sided dimension]. The dimension of an unmolded surface; the distance across an outer frame surface, the forward or after surface of a stem or sternpost, or the upper surface of a keel or keelson. *See Molded* for further information on timber dimensions.
- Side keelson.** *See Keelson.*
- Side timbers** (Fig. 3-34). In ancient and medieval vessels, one of a series of **intermediate framing timbers** inserted to provide stiffness along the line of wales. *See also intermediate timbers.*
- Sill** (Fig. G-3). The lower horizontal timber framing a gunport, large square light, or gallery door.
- Sintel** [Batten clamp] (Fig. 4-49). A curved metal fastening resembling a staple, used to attach caulking batens to planking.
- Sister keel.** *See Bilge keel.*
- Sister keelson.** *See Keelson.*
- Skeg** (Figs. G-14e and G-14f). A triangular piece, resembling external **deadwood** placed above the after end of the keel; used to reinforce the sternpost and improve sailing qualities of small craft and flat-bottomed vessels. Alternately, the angular after end of the keel, or an extension of the keel, on which the rudder post was mounted or which was used to protect the forward edge of the rudder.
- Skeletal construction** [Frame-first construction]. A modern (sometimes misleading) term used to describe the procedure in which hulls were constructed by first erecting frames and then attaching the outer skin of planking to them.
- Sleeper.** A seventeenth-century term for thick ceiling; a bilge stringer or footwale. In eighteenth-century English documents, a transom knee.
- Sliding keel.** *See Centerboard.*
- Snelle** (Fig. 4-32). A winged, or partition-like, stanchion used to support beams in Viking vessels.
- Sny.** An archaic term used to describe the upward sweep of bow and stern planking.
- Spirketting** (Fig. G-5, no. 23). Thick interior planks running between the waterways and the **lining** or **quick-work**.
- Square frame.** *See Frame.*
- Square tuck stern.** *See Tuck.*
- Stanchion** (Fig. G-5, no. 7). An upright supporting post, including undecorated supports for deck beams and bulkheads.
- Standard.** *See Standing knee.*
- Standing knee** [Standard] (Figs. G-7e and 5-21). A knee mounted on a deck with its vertical arm pointed upward; most commonly used to reinforce the junction of the deck and side.
- Staple** (Figs. G-3 and G-4). A metal rod or bar whose sharpened ends were bent at right angles, used to fasten false keels to keels or to secure planking seams that tended to separate. Staples were used from the classical period to the present century.
- Starboard.** The right side of a vessel when facing forward.
- Station lines** [Body lines, Section lines] (Fig. 2-11). The projections on a lines drawing that represent the various body shapes of a hull. Chapter 2 includes a complete description of their functions.
- Stealer** (Fig. G-11a). A short plank inserted between two strakes of planking so that the regular strakes did not have to be made too wide; usually located at the bow or stern ends of bottom or lower side strakes.
- Steering gear** (Fig. G-18). The mechanism, consisting of chains, ropes, blocks, etc., used to transfer movement of the wheel to the tiller. In more general terms, the various components composing any steering mechanism.
- Steering oar.** An oar used to steer a small vessel, either from the side or the stern. A steering oar should not be confused with a **quarter rudder**, which is the device commonly used to steer ancient vessels and is permanently mounted and turns about a fixed axis.
- Stem** [Stempost] (Fig. G-3). A vertical or upward curving timber or assembly of timbers, scarfed to the keel or central plank at its lower end, into which the two sides of the bow were joined.
- Stem head** (Fig. G-13d). The upper end of the stem.
- Stemson** (Fig. G-3). A curved timber mounted on the inner surface of the apron; usually, the forward and upward extension of the keelson.
- Stern.** The after end of a vessel.
- Stern framing** (Fig. G-14). The assembly of timbers consisting of the sternpost, transoms, and fashion pieces.
- Stern knee** (Fig. G-14e). An angular timber that reinforced the joint between the keel or lower deadwoods and the sternpost or inner sternpost. Also known as the **knee of the post**.
- Stern port** (Figs. 5-56 and 5-61). An opening in the stern for guns, cargo loading, or light and ventilation.
- Sternpost** (Figs. G-14a, b, d). A vertical or upward-curving timber or assembly of timbers stepped into, or scarfed to, the after end of the keel or heel.
- Sternson** (Fig. G-14a). A curved timber joining the keelson and inner sternpost; usually an extension of the keelson and was mounted on top of the deadwood.
- Sternson knee.** A knee fitted atop or abaft the sternson to reinforce the upper part of the sternpost.
- Stern walk** [Stern gallery]. A balcony mounted across the stern.
- Stocks.** A structure supporting a vessel under construction or repair.

- Stopwater** (Fig. G-11b). A wooden dowel inserted athwartships in the scarf seams of external timbers to prevent shifting of the joint or to discourage water seepage along the seams.
- Strake** [Streak]. A continuous line of planks, running from bow to stern.
- Stringer** [Longitudinal]. A general term describing the longitudinal timbers fixed to the inside surfaces of the frames; the ceiling, other than the common ceiling.
- Sump.** *See Pump well.*
- Surmark** [Sirmark]. A mark denoting the location or sweep of a ribband or batten.
- Sweep port** (Fig. G-3). An opening in the bulwarks to accommodate a sweep (large oar).
- Tabernacle.** A timber assembly or housing that supported a mast or post at deck level. A common support for a hinged mast.
- Taffrail** [Tafferal] (Figs. G-14a-c). Various, the upper part of the stern or the rail on top of the stern.
- Tenon** (Figs. G-14e and G-17). A wooden projection cut from the end of a timber or a separate wooden piece that was shaped to fit into a corresponding mortise. *See Mortise-and-tenon joint.*
- Tenon-built.** A term used to denote vessels whose planking edges were joined by means of **mortise-and-tenon joints**.
- Thick stuff** (Fig. G-5). A term referring to the thick ceiling of the bottom.
- Thole** [Tholepin]. A pin, or one of a pair of pins, set vertically in the gunwale to serve as the fulcrum for an oar.
- Through-beam** (Fig. G-18a). An athwartships timber that extended through and beyond the outer hull planking. Through-beams were most common on ancient and medieval hulls, where they supported the quarter rudders or provided athwartships stiffness to the upper part of the hull.
- Thwart.** A transverse plank in a boat or galley; used to seat rowers, support masts, or provide lateral stiffness.
- Tiller** (Fig. G-18). A wooden or metal level fitted into the rudder head, by which the rudder could be moved from side to side.
- Timber and room.** *See Room and space.*
- Timber head** (Fig. G-12a). The upper extremity of a hull timber.
- Timber heel** (Fig. G-12a). The lower extremity of a hull timber.
- Timbers.** In general context, all wooden hull members; specifically, those members that formed the frames of a hull.
- Tons burden.** *See Burden.*
- Top and butt** (Fig. G-11a). A method of planking whereby one edge of the planks were straight while their opposite sides had two sloping edges of unequal length, reducing the plank widths to half. It was used to increase longitudinal strength and to prevent shifting of wales and other stress-bearing planks.
- Top timber** (Fig. G-12a). The uppermost member of a frame.
- Transom** (Figs. G-14a-d). One of the athwartship members, fixed to the sternpost, that shaped and strengthened the stern.
- Transom beam.** *See Transom.*
- Transom knee** (Fig. G-14c). An angular, horizontal reinforcing timber bolted to a transom and the side.
- Treenail** [Trunnel, Trennal] (Figs. G-9o and G-9p). A round or multi-sided piece of hardwood, driven through planks and timbers to connect them. Treenails were employed most frequently in attaching planking to frames, attaching knees to ceiling or beams, and in the scarfing of timbers. They were used in a variety of forms: with expanding wedges or nails in their ends, with tapered or square heads on their exterior ends, or completely unwedged and unheaded. When immersed, treenails swelled to make a tight fit.
- Tuck** (Fig. G-14d). The place where the ends of the bottom planks terminated under the stern or counter. When planks ended in a convex curvature, a vessel was said to have a round tuck; when the stern and counter lay perpendicular to the posts, the vessel was said to have a square tuck.
- Tumblehome** [Fall home] (Fig. G-5). The inward curvature of a vessel's upper sides as they rose from the point of maximum breadth to the bulwarks. Tumblehome reduced topside weight and improved stability.
- Turn of the bilge.** The outboard part of the lower hull where the bottom curved toward the side.
- Underwater body.** The portion of the hull below the waterline.
- Upper deck** (Fig. G-6). The highest deck extending unbroken from bow to stern.
- Upper wale** (Fig. 3-31). The highest wale.
- Waist.** The part of a vessel between the quarterdeck and the forecastle.
- Wale.** A thick strake of planking, or a belt of thick planking strakes, located along the side of a vessel for the purpose of girding and stiffening the outer hull.
- Wart** [Boss] (Fig. 4-29). A horizontal hardwood block or projection, attached to the starboard side of a Viking ship's stern, upon which the rudder post rotated.
- Waterlines** [Level lines] (Figs. 2-10, 2-11). Lines on a hull drawing representing the horizontal sections of the hull. Chapter 2 completely describes their function.
- Waterway** (Fig. G-5). A timber or gutter along the side of a deck whose purpose was to prevent the deck water from running down between the frames and to divert it to the scuppers.
- Way.** The stocks; a structure on which a vessel was built.
- Weather deck.** Any exposed deck.
- Well.** *See Pump well.*

Wheel [Steering wheel] (Fig. G-18c). A vertical steering device, fixed to a deck and linked to the tiller by ropes, chains, or gear.

Whipstaff (Fig. G-18d). A vertical steering lever that preceded the wheel; it was connected to the tiller by a toggle arrangement, and it was mounted in a bearing on the deck above the tiller.

Whole molding (Fig. 5-24). A process to determine the transverse shapes of hulls by means of one or more standard molds, which were shifted as necessary to produce fair shapes without the use of compasses and complex drafting methods. The process was not as precise as determining individual hull shapes from

lines drawings or with compasses and scales, and it was usually limited to the production of small craft after the seventeenth or early eighteenth century.

Windlass (Fig. G-10). A horizontal cylinder, supported by bitts or brackets, used to haul anchors and hawsers.

Wing transom (Figs. G-14a, c, d). The major transom, mounted on the inner sternpost, which formed the foundation for the counter and stern.

Withy. A flexible twig or root, most frequently worked by hammering to make it more pliable, used for binding the seams of planks and timbers.

Wronghead [Runghead] (Fig. G-12a). The head, or extremity, of a floor timber.

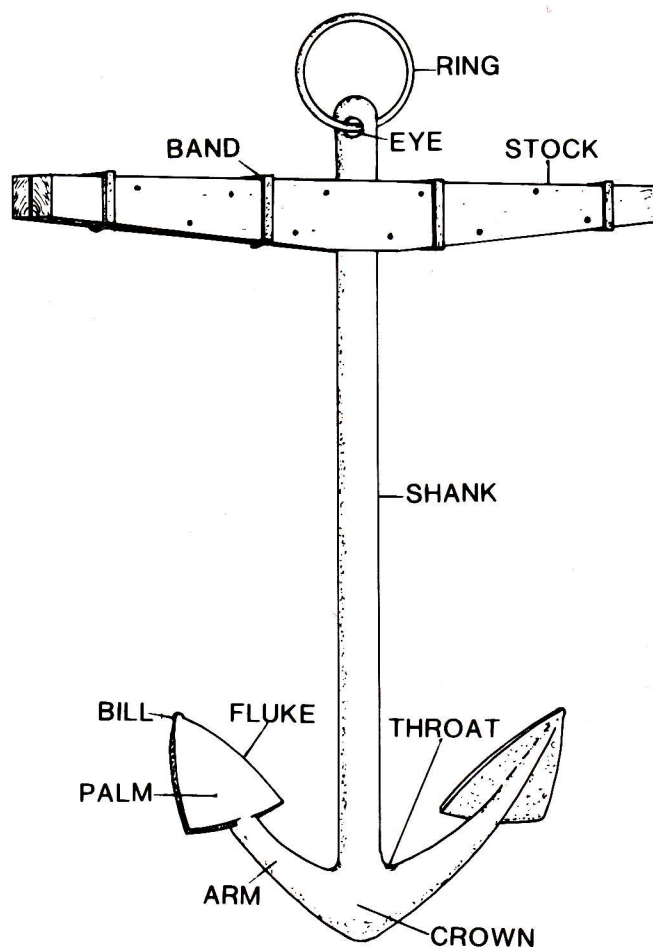


FIG. G-1. The parts of an Admiralty anchor.

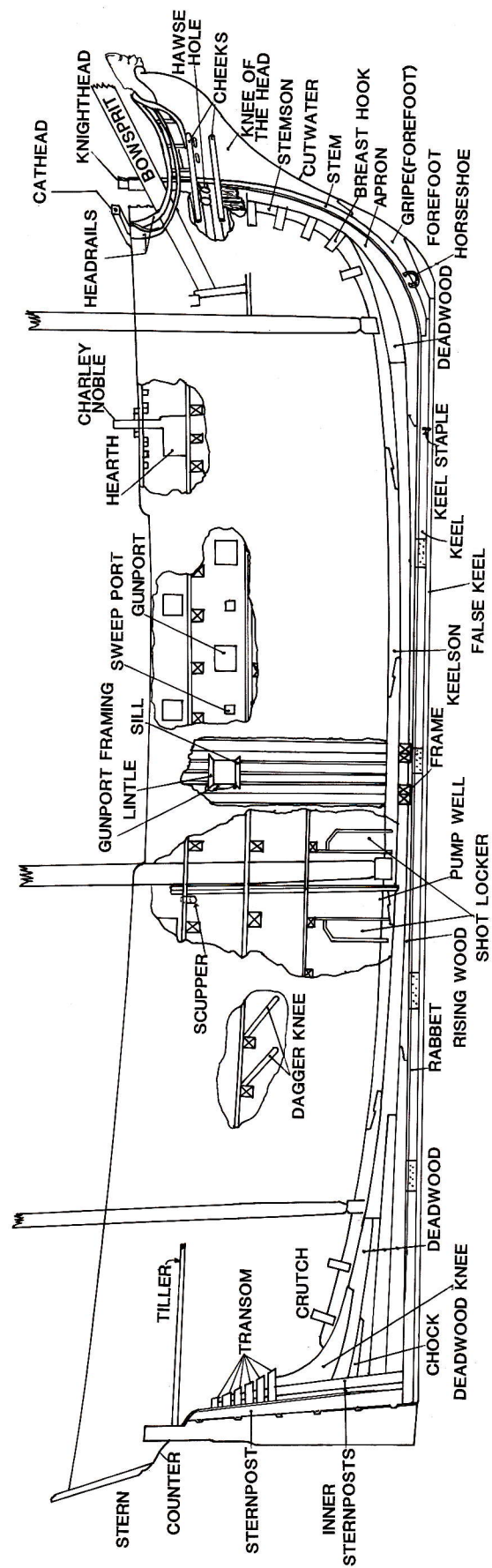


FIG. G-3. Hull timbers; side views.

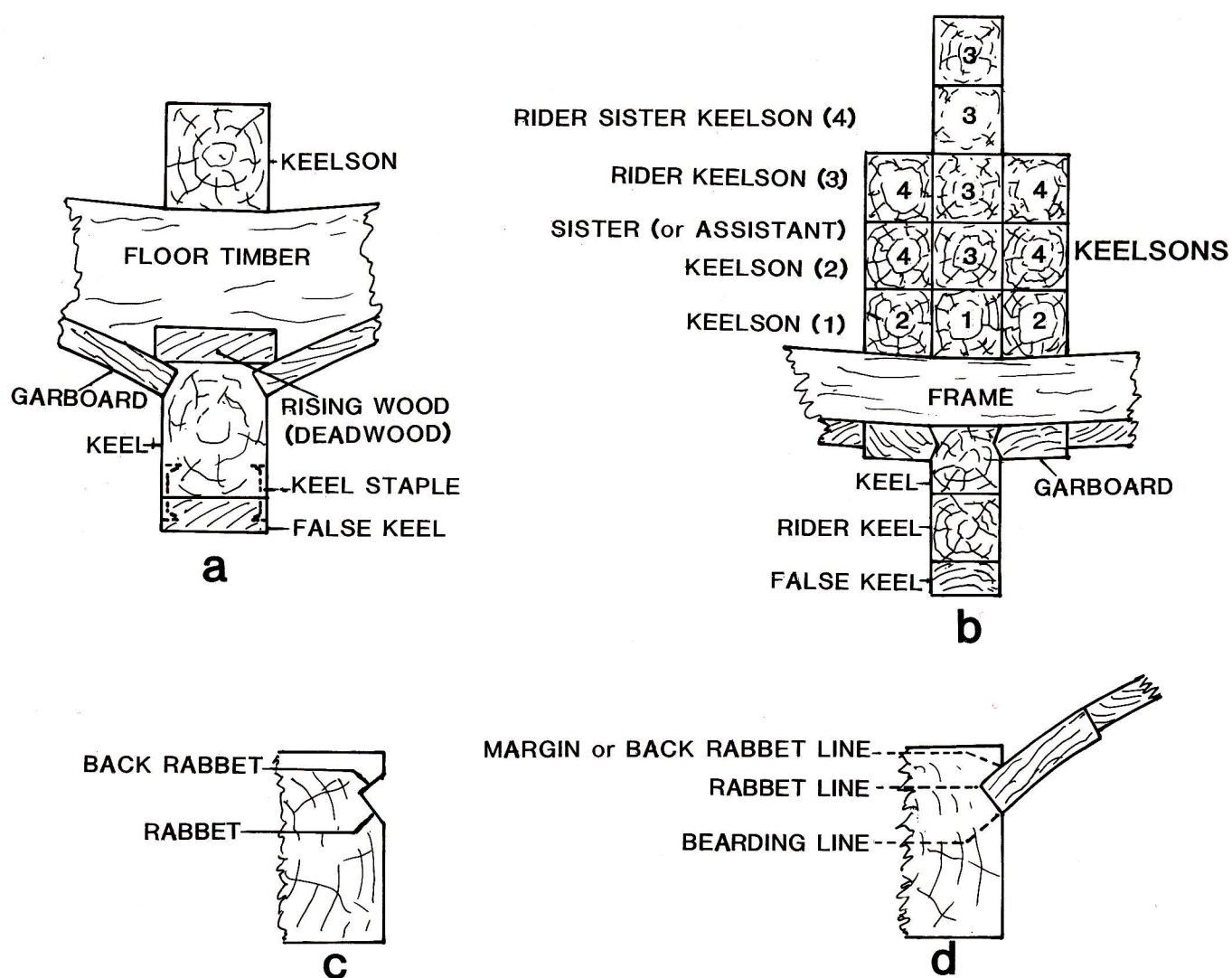


FIG. G-4. Principal timbers; sectional views: (a) a popular arrangement for small and medium sized craft; (b) a typical arrangement of principal timbers for large vessels, this for an early twentieth-century four-masted schooner with a 200-ft-long double keel; (c) the designations of keel and post rabbet surfaces; and (d) the designations of the lines formed by the junction of the rabbet and garboard surfaces.

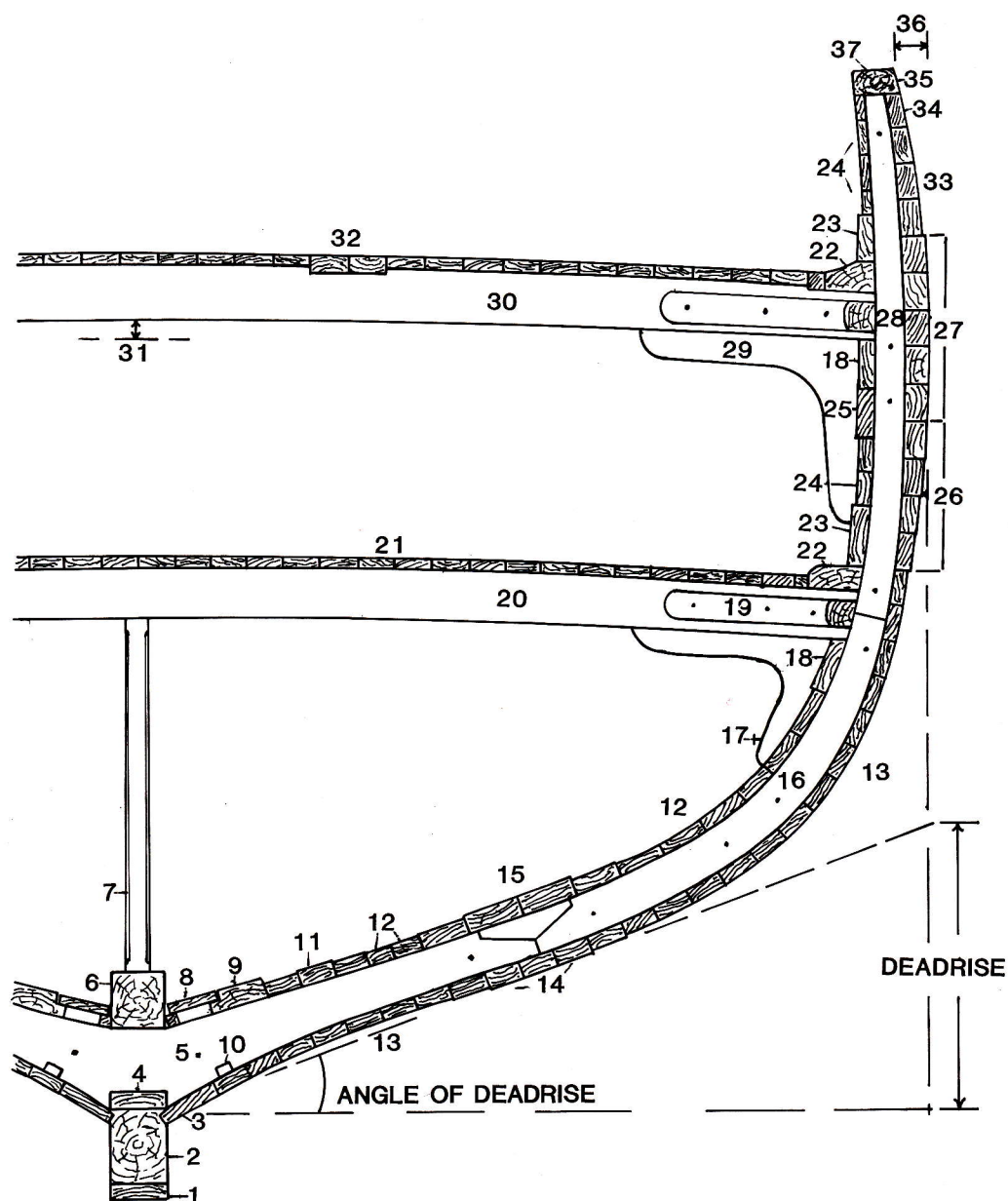


FIG. G-5. Hull timbers; a composite sectional view, using the form of the ship-sloop *Peacock* from fig. 5-62: (1) false keel; (2) keel; (3) garboard; (4) rising wood [deadwood]; (5) floor timber; (6) keelson; (7) stanchion; (8) limber board; (9) limber strake; (10) limber hole; (11) thick stuff [footwaling]; (12) common ceiling; (13) bottom planking; (14) bilge strakes; (15) footwale; (16) second futtock; (17) dagger knee; (18) shelf clamp; (19) lodging knee; (20) lower [or berthing] deck beam; (21) lower deck planking; (22) waterway; (23) spirketting; (24) lining [quickwork]; (25) clamp; (26) diminishing strakes; (27) wale; (28) top timber; (29) hanging knee; (30) upper deck beam; (31) camber; (32) binding strake; (33) bulwark; (34) planksheer; (35) gunwale; (36) tumblehome; (37) caprail.

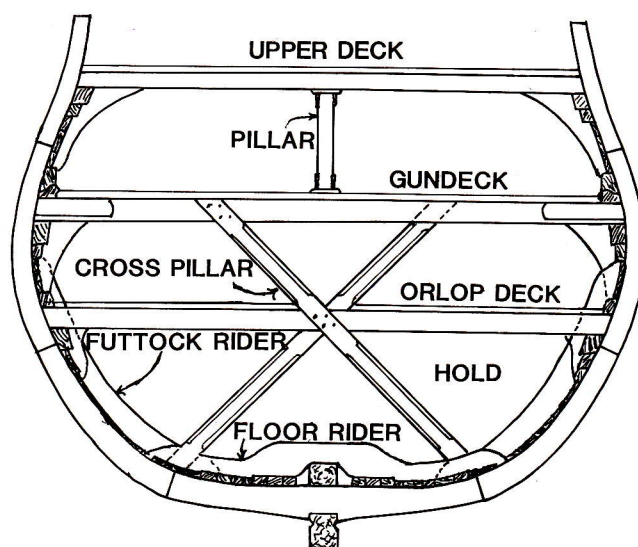


FIG. G-6. Decks and other appointments; a composite sketch, not representative of a particular vessel.

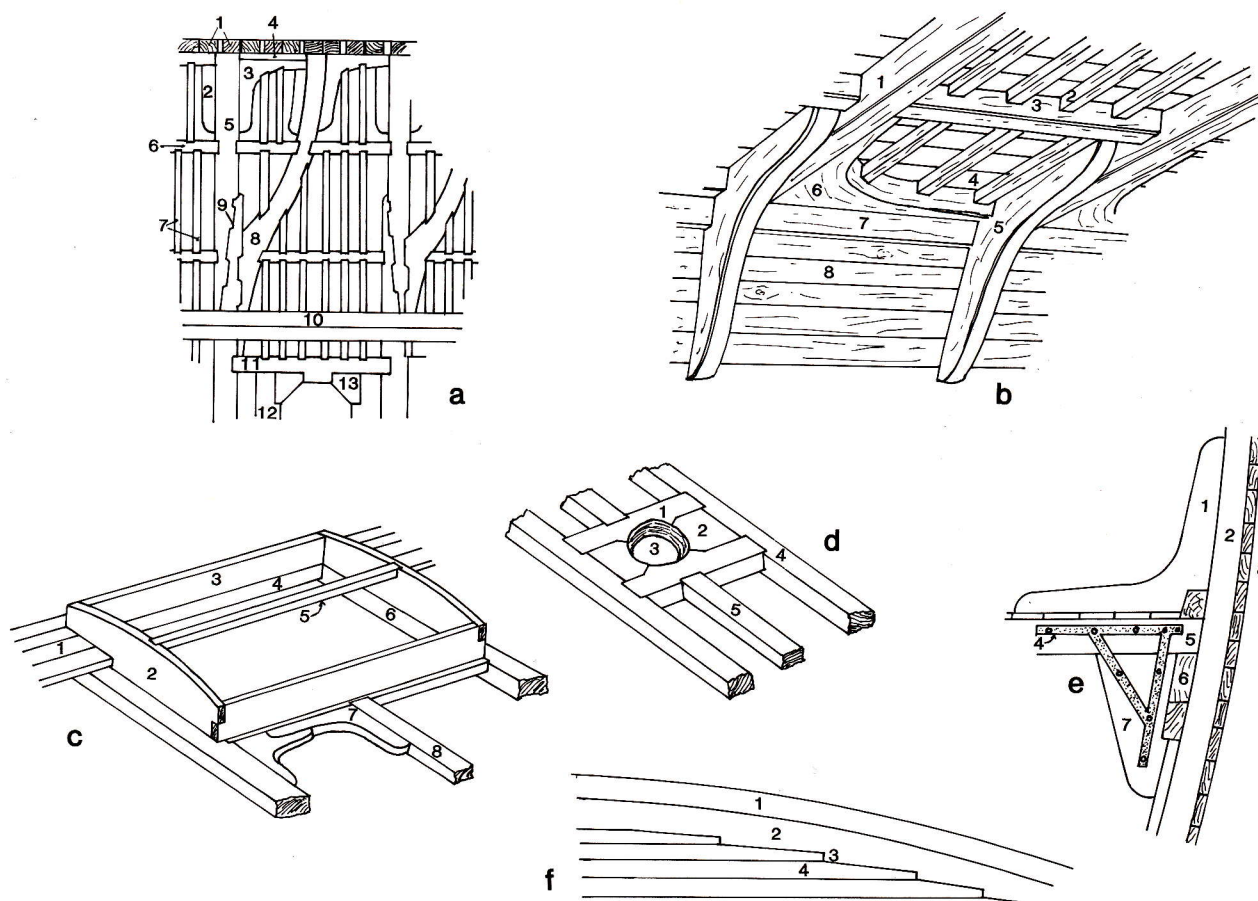


FIG. G-7. Deck framing and details. [a] deck framing at the mainmast of a large warship: (1) frames; (2) hanging knee; (3) lodging knee; (4) packing piece; (5) deck beam; (6) carlings; (7) ledges; (8) beam arm; (9) deck beam scarf; (10) binding strake; (11) mast carling; (12) mast partner; (13) chock; [b] typical deck framing and supporting features (after John R. Stevens, p. 29): (1) deck beam; (2) ledge; (3) carling; (4) deck planking; (5) hanging knee; (6) lodging knee; (7) shelf clamp; (8) ceiling [quickwork]; [c] a common form of hatch construction: (1) deck planking; (2) head ledge; (3) hatch coaming; (4) carling; (5) hatch beam; (6) deck beam; (7) lodging knee [only one set shown]; (8) half beam; [d] a typical mast partner for small merchant ship: the partners are (1) carlings and (2) chocks; (3) mast hole; (4) deck beam; (5) half beam; [e] standing and plate knees: (1) standing knee; (2) frame; (3) outer planking; (4) plate knee; (5) deck beam; (6) shelf clamp; (7) chock; [f] a method of terminating deck planks at the incurving sides of ships: (1) waterway; (2) nibbing strake [margin plank]; (3) nibbed end; (4) deck plank.

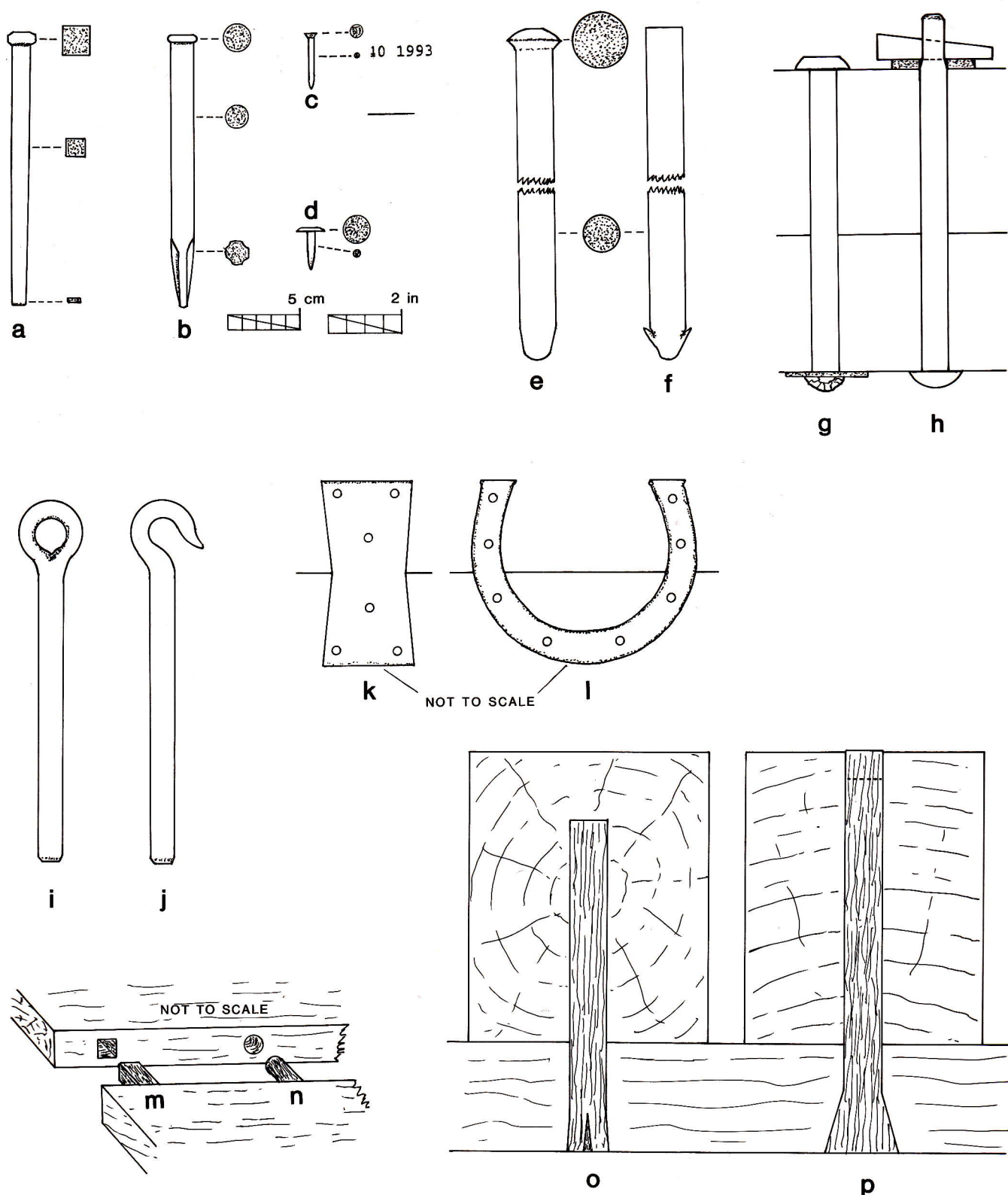


FIG. G-9. Typical fastenings: (a) square-headed spike used for planking and general fastening; (b) round-headed dump used for similar fastening; (c) nineteenth-century copper nail used to attach copper sheathing to hull bottoms; (d) fourth-century B.C. copper nail used to fasten lead sheathing to hull bottoms; (e) a short drift bolt; (f) unheaded rag bolt, barbed with a chisel to deter withdrawal; bolts were sometimes made without heads, the head being formed by pounding; they could be used with or without roves (washers); (g) clench bolt, often designated as "bolt" in contemporary documents (see figs. 3-28 and 4-28 for other forms of clenched fastenings); (h) forelock bolt; (i) eye bolt; (j) hook bolt; (k) fishplate; (l) horseshoe plate; (m) planks being aligned with a rectangular, or block, coak and (n) with a cylindrical coak (dowel); (o) a wedged treenail in a blind hole; (p) a headed treenail in a through hole; it is wedged at its inner end.

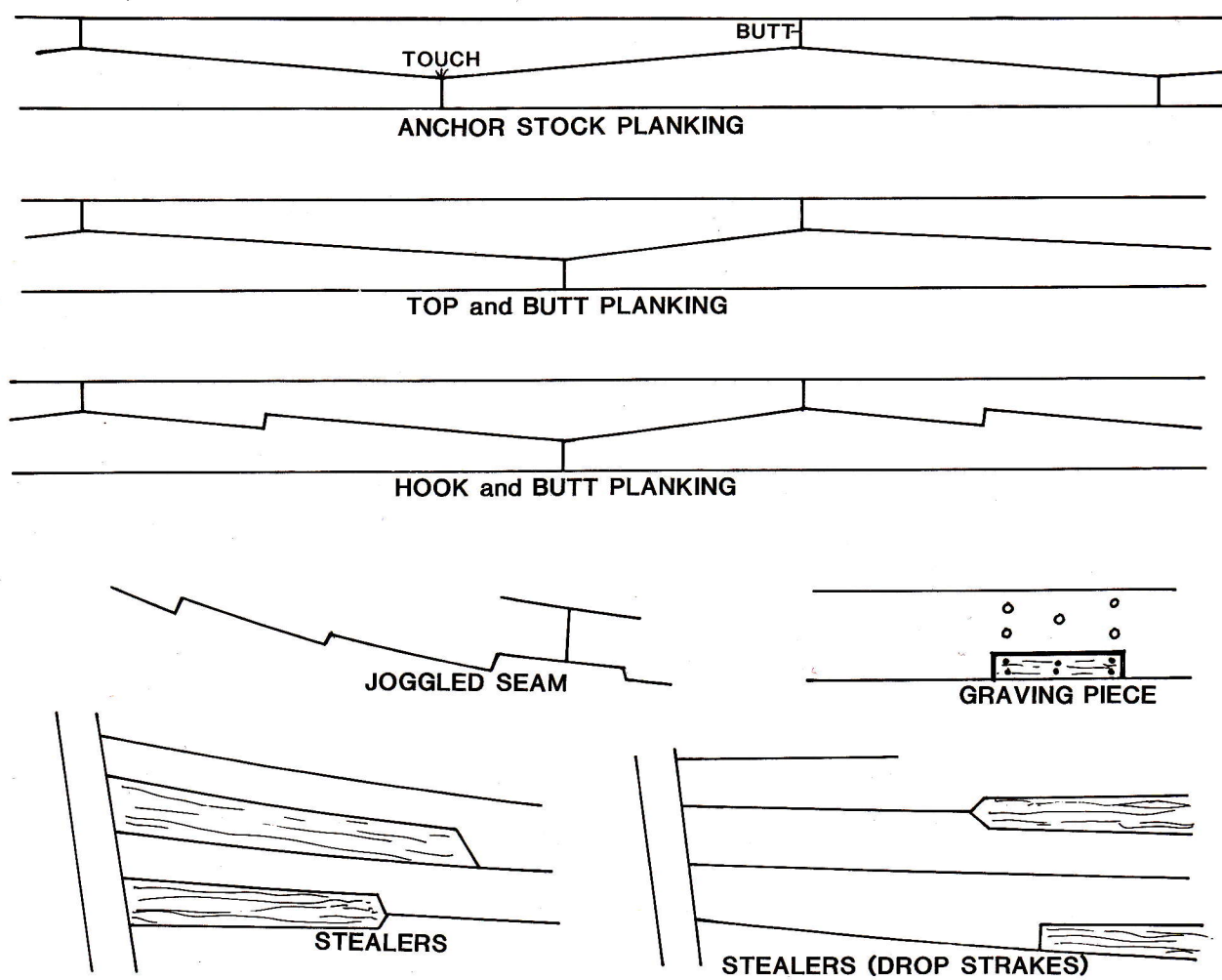


FIG. G-11a. Scarfs and seams.

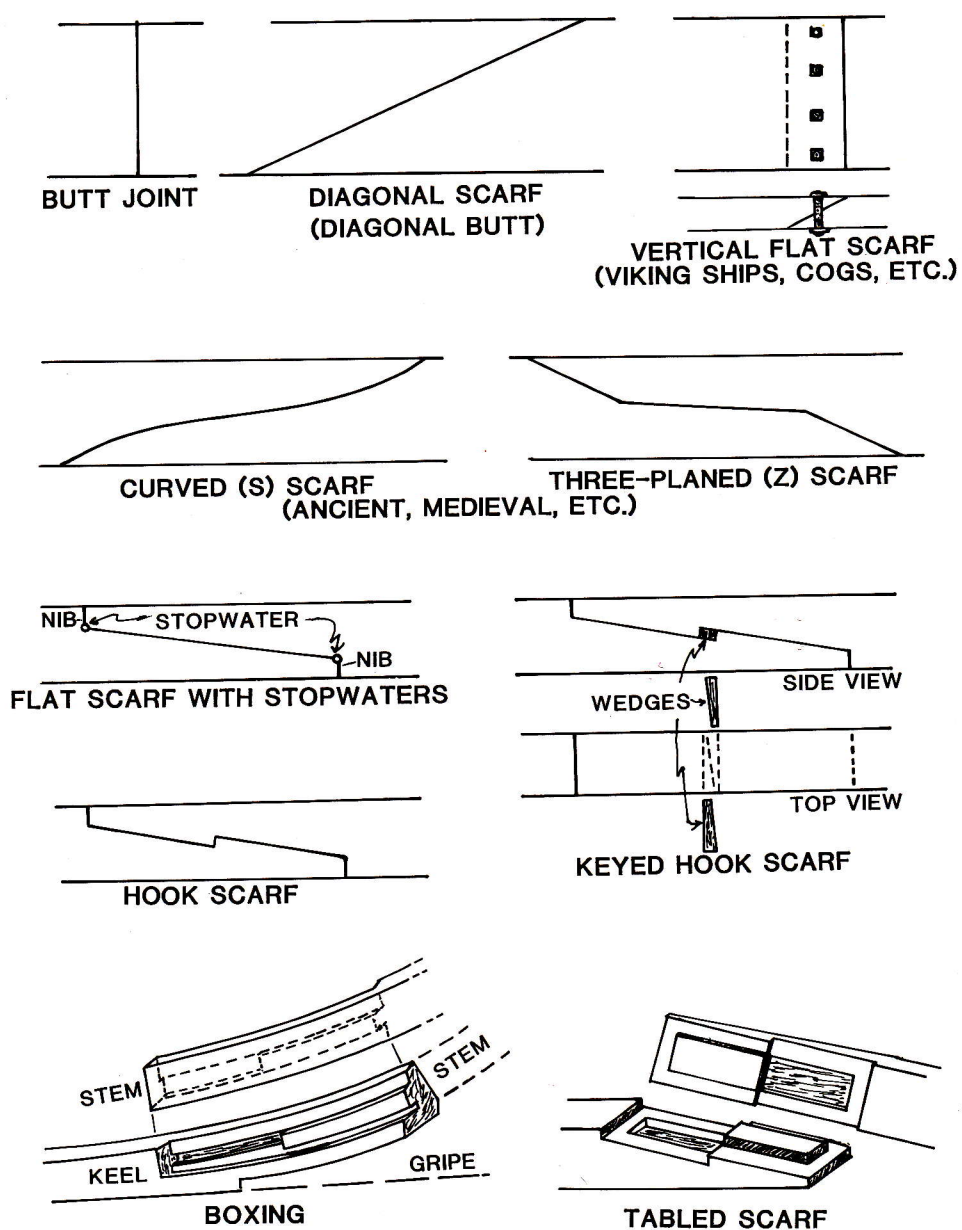


FIG. G-11b. Scarfs and seams.

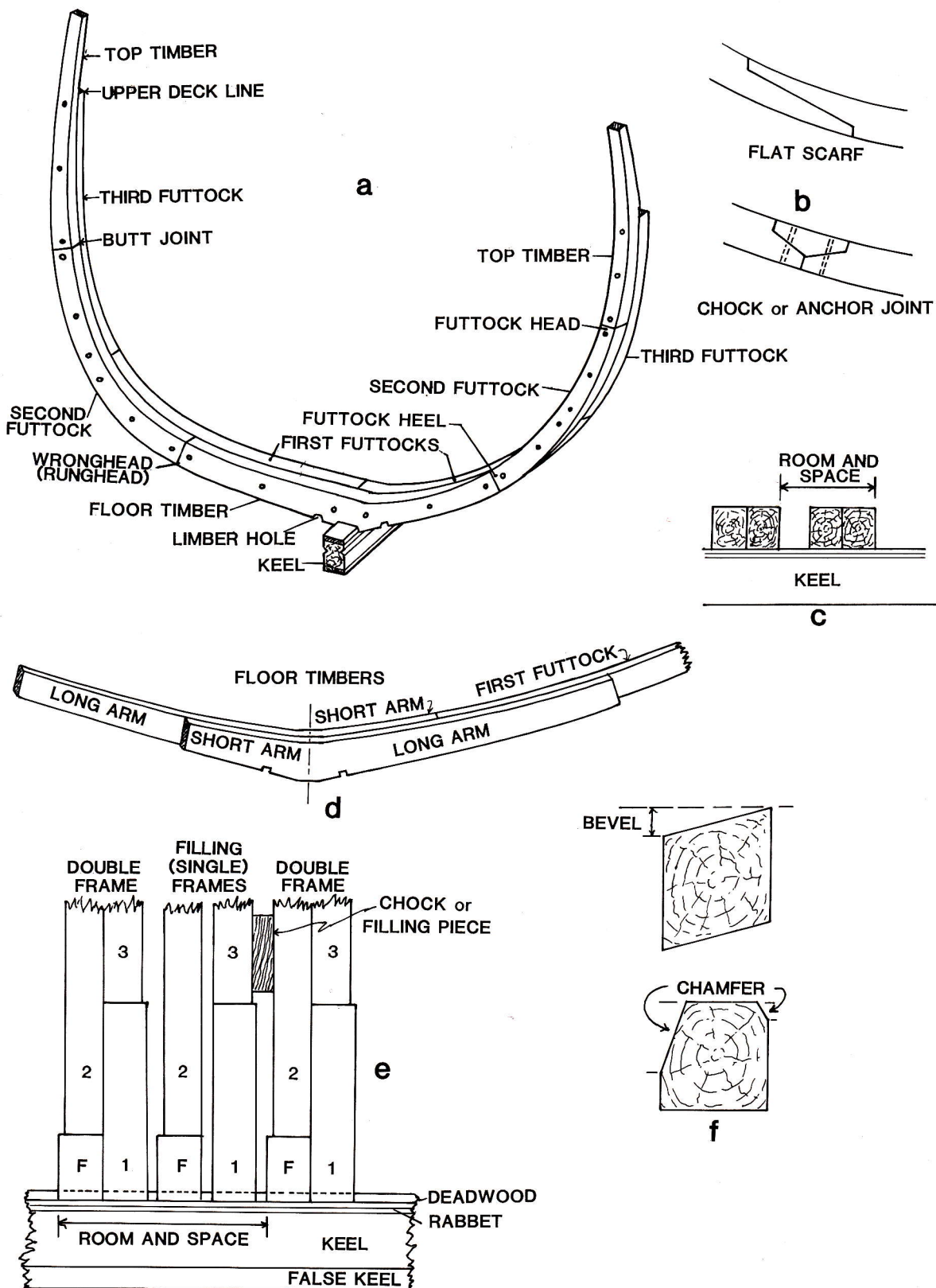


FIG. G-12. Frames: (a) an example of double framing—a square frame of an early nineteenth-century merchant ship; (b) two additional commonly used frame timber joints; (c) room and space of a popular framing plan; (d) some vessels were framed with a pair of overlapping floor timbers having arms of unequal length, resulting in an even number of timbers in each frame; (e) lower side view of the framing plan of a large warship, where a pair of single frames (called *filling frames*) were set between double frames; futtocks, marked F, are shown by number; in such an arrangement, the room and space included the filling frames; (f) bevels and chamfers.

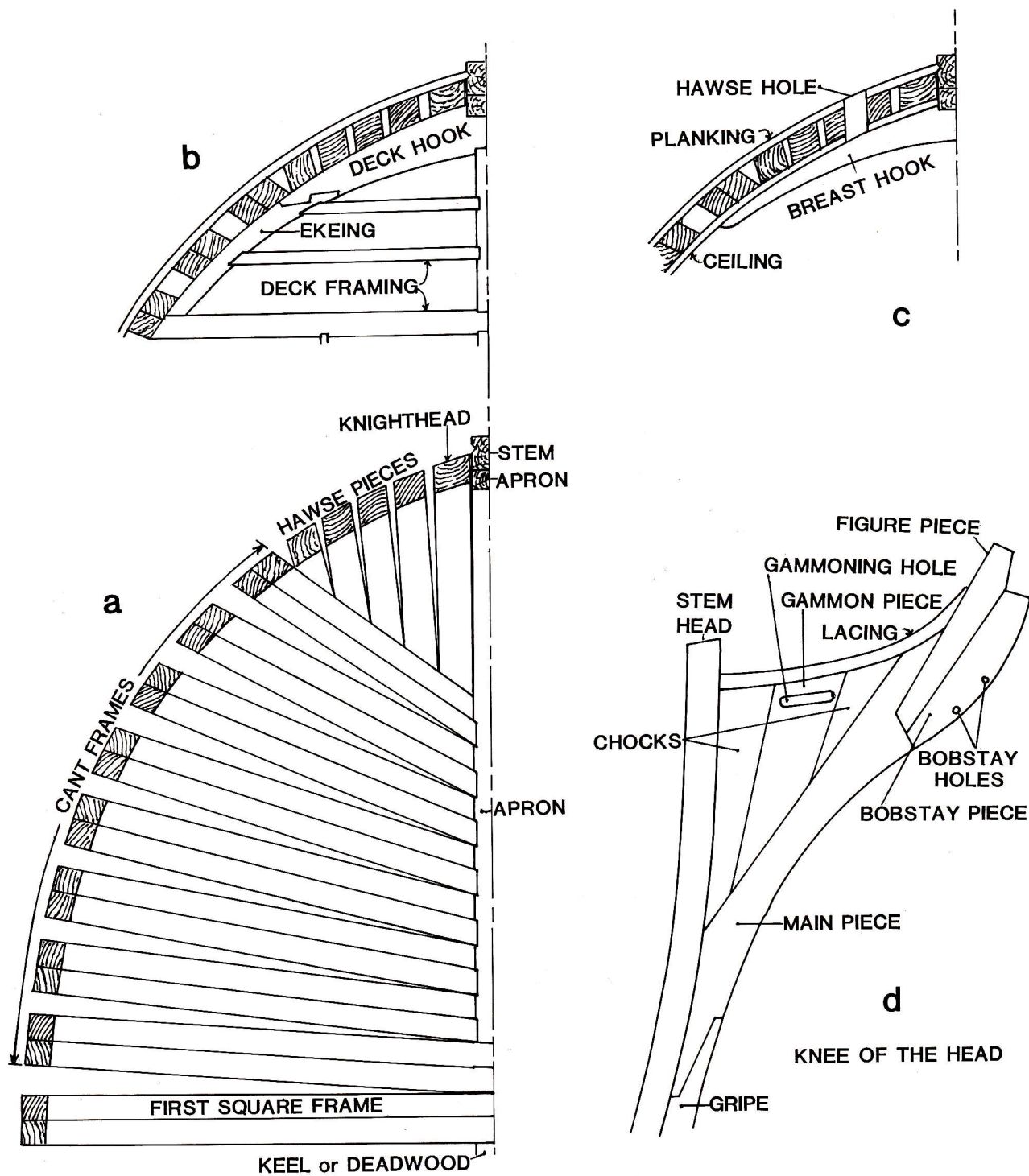


FIG. G-13. Bow construction: (a) top view of port frames; (b) deck hook; (c) breast hook and hawse hole; (d) one of many arrangements used for assembling the knee of the head.

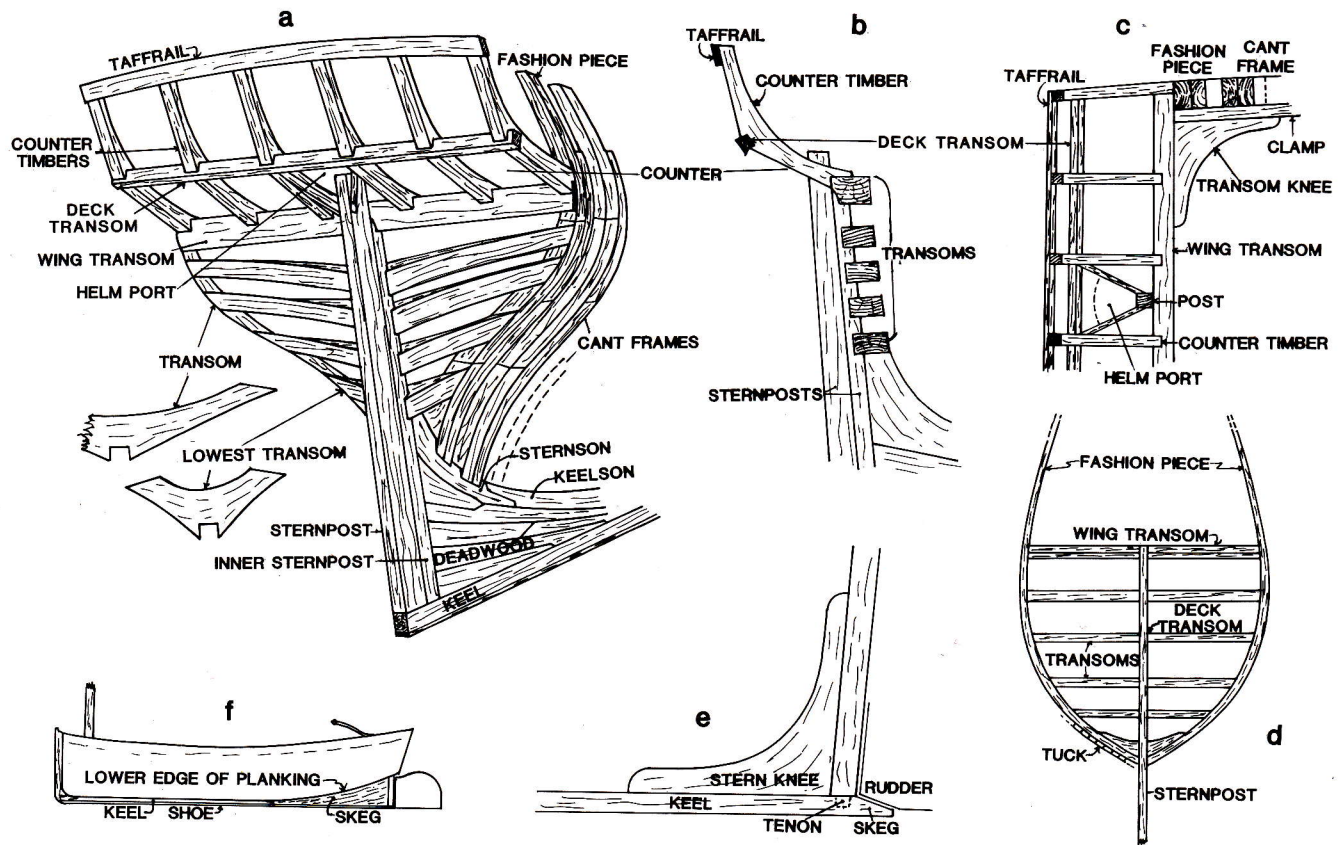


FIG. G-14. Stern construction: (a) stern framing of an eighteenth-century brig; (b) partial side view of the same stern near the post; (c) partial top view of the same stern; (d) lower stern framing of a galleon (see fig. 5-15 for planking and orientation with the rest of the hull); (e) alternate stern details; (f) one form of skag installation on a small sloop.

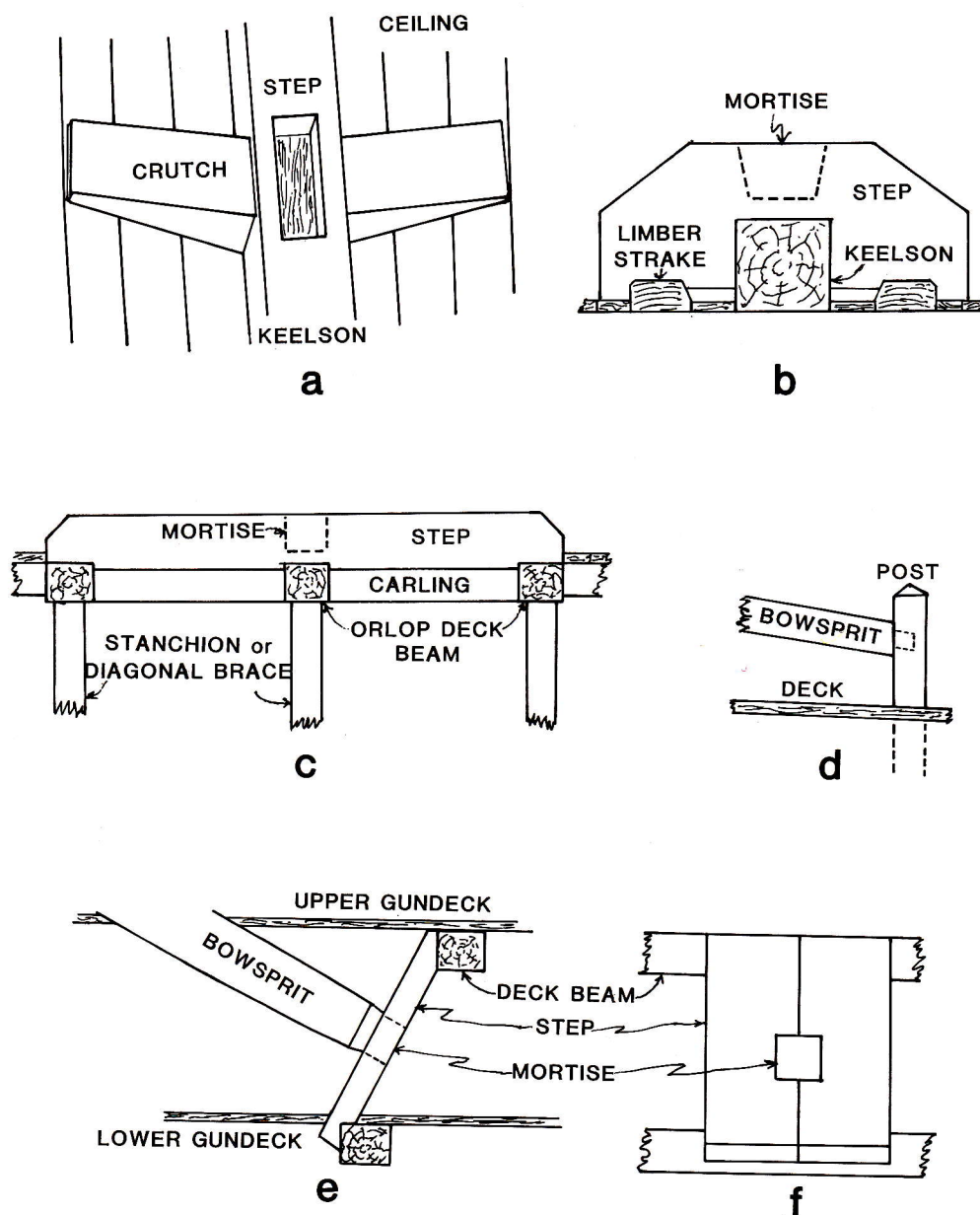


FIG. G-15. In addition to the variety of mast and stanchion steps illustrated in chapters 3, 4, and 5, the following composite sketches, gleaned from a variety of sources, illustrate additional arrangements likely to be encountered on shipwrecks: (a) crutches brace the foremast step on the Revolutionary War privateer *Defence* (see fig. 5-60); (b) a mainmast step of the type used on very large eighteenth-century warships; (c) one of a variety of methods for stepping a mizzenmast; (d) bowsprits of smaller vessels were sometimes stepped above deck in a broad sampson post as illustrated, or between pairs of riding bitts just below deck; (e) the bowsprit of a large eighteenth-century warship and (f) an athwartships view of the forward surface of the same step, showing its two-piece construction.

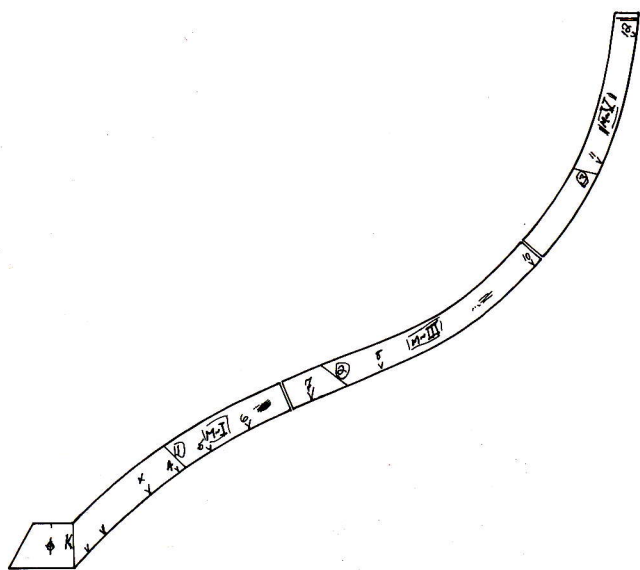


FIG. G-16. Two bend molds and a hollow mold are fitted together to form a compound mold or half of a square frame. Individual molds, probably representing futtocks of frame M, are numbered in Roman numerals. Diagonals taken from the loft are indicated, as are carets which probably denote bevel measurements; the numbers and symbols may refer to degrees of bevel or settings on the shipwright's bevel gauge. K is the side of the keel, ⊕ the centerline, and S probably indicates the sheer line. Redrawn from old notebook sketches. For molds used in whole molding, see figure 5-24.

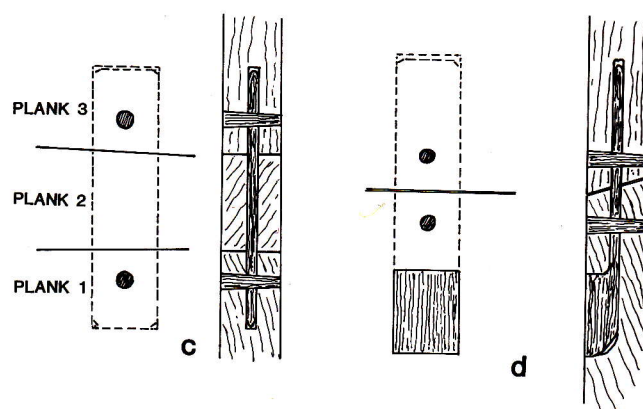
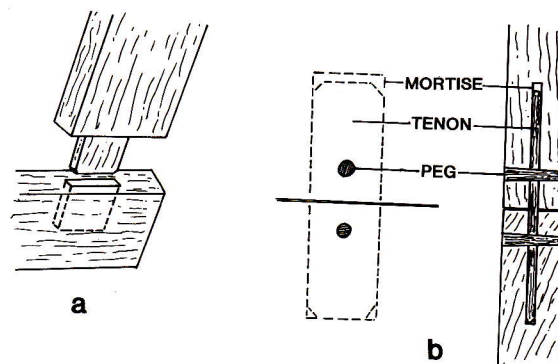


FIG. G-17. Mortise-and-tenon joints: (a) fixed tenon and single mortise; (b) free tenon and two mortises; (c) free tenon and three mortises; and (d) patch tenon and two mortises.

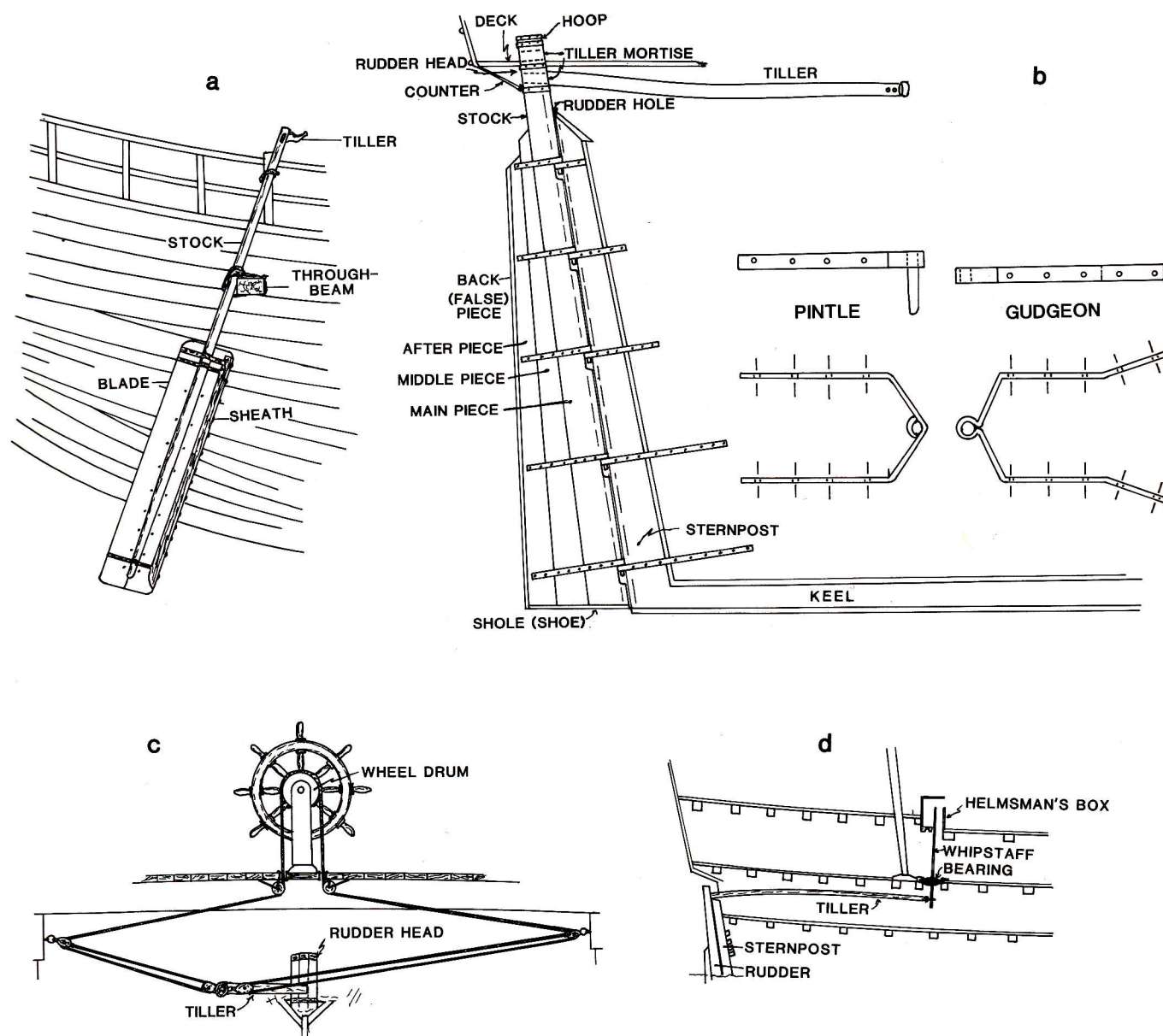


FIG. G-18. Steering devices: (a) a Mediterranean balanced quarter-rudder system, ca. fourth century B.C.; (b) terminology of an eighteenth-century frigate-sized rudder, which includes a mortise for a manual tiller to be used in the main steering gear failed; details of the hinges—the pintles and gudgeons—are also shown; (c) a common steering wheel rig for medium-sized vessels, eighteenth and nineteenth centuries; (d) steering with a vertical lever called a whipstaff (also see Fig. 5-25 as used on the *Vasa*).