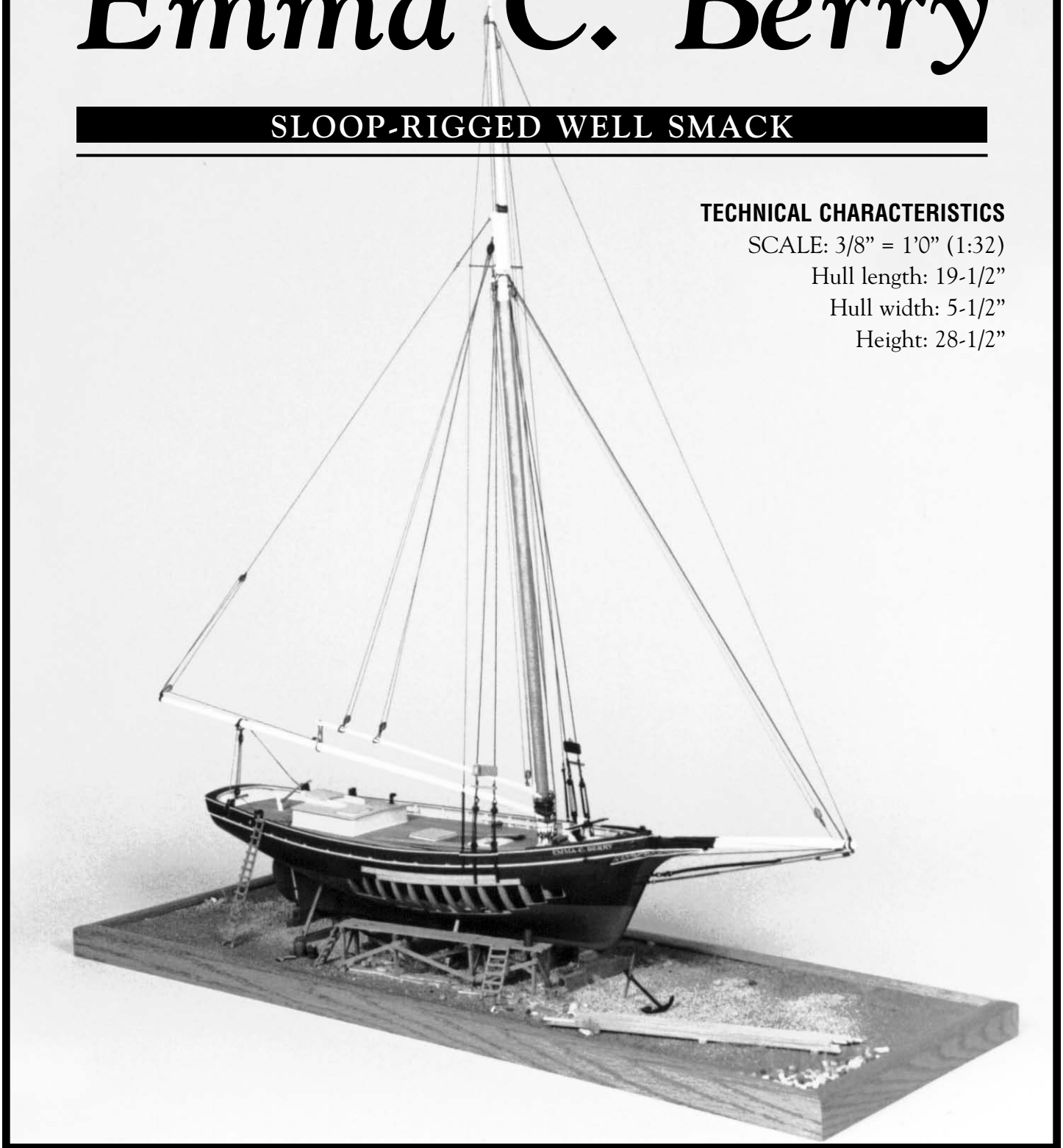
INSTRUCTION MANUAL

Emma C. Berry

SLOOP-RIGGED WELL SMACK

TECHNICAL CHARACTERISTICS

SCALE: 3/8" = 1'0" (1:32)
Hull length: 19-1/2"
Hull width: 5-1/2"
Height: 28-1/2"



MODEL SHIPWAYS KIT NO. MS2150

HISTORY

Emma C. Berry was designed and built by R. & J. Palmer Boatyards in Noank, Connecticut. The sloop, named after Captain John Henry Berry's daughter, was launched June 5, 1866. For 28 years she operated as a well smack, transporting live mackerel to market. Because sloops were fast and sturdy, they were popular East Coast fishing craft. However, as schooners became prevalent, *Emma C. Berry* was converted to a schooner rig.

In 1890, she was sold to Maine interests where she was registered in the fishery and coastal trades. She was abandoned 30 years later when the vessel wore out. Luckily, *Emma C. Berry's* hull lines attracted a new owner. Fixed up, she began a new career as a coaster, but was out of service again in 1931. She was rescued by F. Slade Dale, who purchased the boat for a yacht. In 1969, he presented *Emma C. Berry* to the Marine Historical Association in Mystic, Connecticut.

Between 1969 and 1971, Mystic Seaport replaced her rotted timbers, restored the wet well and rerigged her as a sloop. From 1987 to 1988, The museum rebuilt her original deck and cabin trunk then developed restoration drawings.

Photos in this manual depict *Emma C. Berry* as she looked in 1995. At that time she was missing her topmast shrouds, spreader, and windlass barrel. For more information on the *Emma C. Berry*, and the other ships at Mystic Seaport, please contact: Mystic Seaport P.O. Box 6000 Mystic, CT 06355. Or call 1-888-9SEAPORT

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Instruction Manual

Sloop-Rigged Well Smack

EMMA C. BERRY

1866

Plans and Instructions
By Ben Lankford

Model by John Fryant

Model Shipways developed the *Emma C. Berry* kit in 1996. The model is based on drawings and documentation provided by Nancy d' Estang, Supervisor of Shipyard Research and Documentation at Henry B. duPont Preservation Shipyard at Mystic Seaport. The museum has reviewed *Emma C. Berry's* plans and instructions for accuracy.

This kit offers true plank-on-frame construction. At 3/8" = 1'0" scale (1:32), it is large enough for extensive detailing. More than 190 laser-cut parts simplify the building process. The model can be completed in different configurations. The hull can be fully planked or presented Navy Board style to reveal underlying frames and deck timbers. Interior detailing can be included or only partially completed as if the boat were under construction or being repaired. The model can be painted, or left natural and stained.

Frames will be erected like a real ship, i.e. with the hull upright. Although a little more difficult than building it upside down, this permits adding all the inboard details. Parts for a building fixture are included, but the model builder must supply a building board.

Before You Begin

Emma C. Berry is an attractive sailing craft and makes a splendid model. Assembling the plank-on-frame hull develops an understanding of how real ships are built, while laser-cut parts assure an accurate shape. Take your time building this model. Parts are delicate and the frame setup is critical. Always complete one stage before moving to the next. When something goes awry, consider doing it over. A second attempt usually surpasses the first. Practice does make perfect.

Tools Needed to Start Construction

The following items are recommended. Those who have modeled before may have their favorites.

A. Knives and Saws
1. Hobby knife
2. #11 blades
3. Razor saw or jeweler's saw

B. Files and Planes
1. Set of needle files
2. Small block plane

C. Clamps
1. A few small C-clamps
2. Wooden spring-type clothes pins (craft shops have small versions)
3. #16 and #33 rubber bands

D. Carving Tools
A small woodcarving set, or individual gouges and chisels for carving keel rabbets and tapering the stem.

E. Sharpening Stone
Keeps tools razor sharp.

F. Boring Tools
1. #60 to #80 miniature bits
2. 1/16", 3/32", and 1/8" bits
3. Pin vise

G. Miscellaneous
1. Tack hammer
2. Tweezers (a few)
3. Small, fine pointed scissors
4. Miniature pliers
   a. round nose
   b. flat nose
5. Small bench vise
6. Soldering iron or torch
   a. solder
   b. flux
7. Sewing thread for seizing (other rigging in kit)
   a. black
   b. tan
8. Beeswax block (for treating rigging lines)
9. 1/2" or 3/4" masking tape
10. Wire cutters (for cutting fine wire and strip metal)

H. Sandpaper
1. Fine and medium grit garnet or #100 to #220 aluminum oxide
2. #400 wet-or-dry sandpaper

I. Sailcloth
Light weave cotton or linen for making sails. Model Expo sells a suitable cotton cloth (MS0567).

J. Finishing
1. Paintbrushes
   a. Fine round point for details
   b. 1/4" to 1/2" flat square for hull

K. Supplies
1. Paints
2. Primer
3. Stains and varnish
4. White (polyvinyl acetate or PVA) or woodworker's glue (aliphatic resin)
5. Cyanoacrylates (generic name is Super Glue)
6. Five-minute epoxy
7. Wood filler

Note: White or woodworker's glue in yellow or tan will suffice for most of the model. Five-minute epoxy provides extra strength for affixing fittings. Cyanoacrylates, such as Jet, Flash, or Zap, produce quick adhesion. For most applications, the medium viscosity, gap-filling variety is best. The thin type is recommended for filling a narrow crack and tacking frames to the keel or planking to the frames.

How To Work With Plans and Parts

Before starting the model, carefully examine the kit and study the plans. First, determine if all the listed parts are present. Handling them will produce a better understanding of the kit's requirements. Try to visualize how every piece will look on the completed model. Also, determine ahead of time what must be done first. The instructions will help, but a thorough knowledge of the plans at the outset is essential.

To avoid losing small fittings and hardware, sort them into labeled boxes or compartments. These should have lids to keep out dirt.

1. The Plans

Four plan sheets are provided:

1. Laser-Cut Wood Patterns
2. Hull Construction
3. Hull Arrangements and Spar Details
4. Rigging and Sail Plan

Sketches throughout the manual illustrate various construction techniques.

The *Emma C. Berry* kit is manufactured to a scale of 3/8" = 1'0". Each plan sheet is drawn to that scale, except areas enlarged to show detail. Most dimensions can be lifted directly off the plans by using draftsman dividers or a "tick" strip (piece of paper such as an adding machine roll). Lay the paper strip over the plan, carefully mark the item's length with a sharp pencil, then transfer the marks to the wood. For additional accuracy, almost every timber is dimensioned in imperial and metric units.

A 3/8" architect's scale or metric ruler is a handy tool. Measuring and cutting parts using the scale gives a better feel for real sizes. Because these are model-builders' plans, actual measurements have been converted to the nearest 1/64" (0.4mm) or 1/2" (13mm) full scale.

2. Understanding Hull Lines

Beginners may not be familiar with the following hull lines. *Buttock lines* are vertical longitudinal planes cutting through the hull. *Waterlines* are horizontal planes, and *sections* are transverse vertical planes. *Diagonals* are planes cut almost perpendicular to the station lines. These lines define the hull's shape and are used by the draftsman to fair it (create even curves).
A complete set of hull lines is not needed for this model, because laser-cut frames and keel define the hull. Sheet 2 shows the frames. They are similar to a ship's body plan or sections, and illustrate how the hull curves from top to bottom.

3. Using Basswood

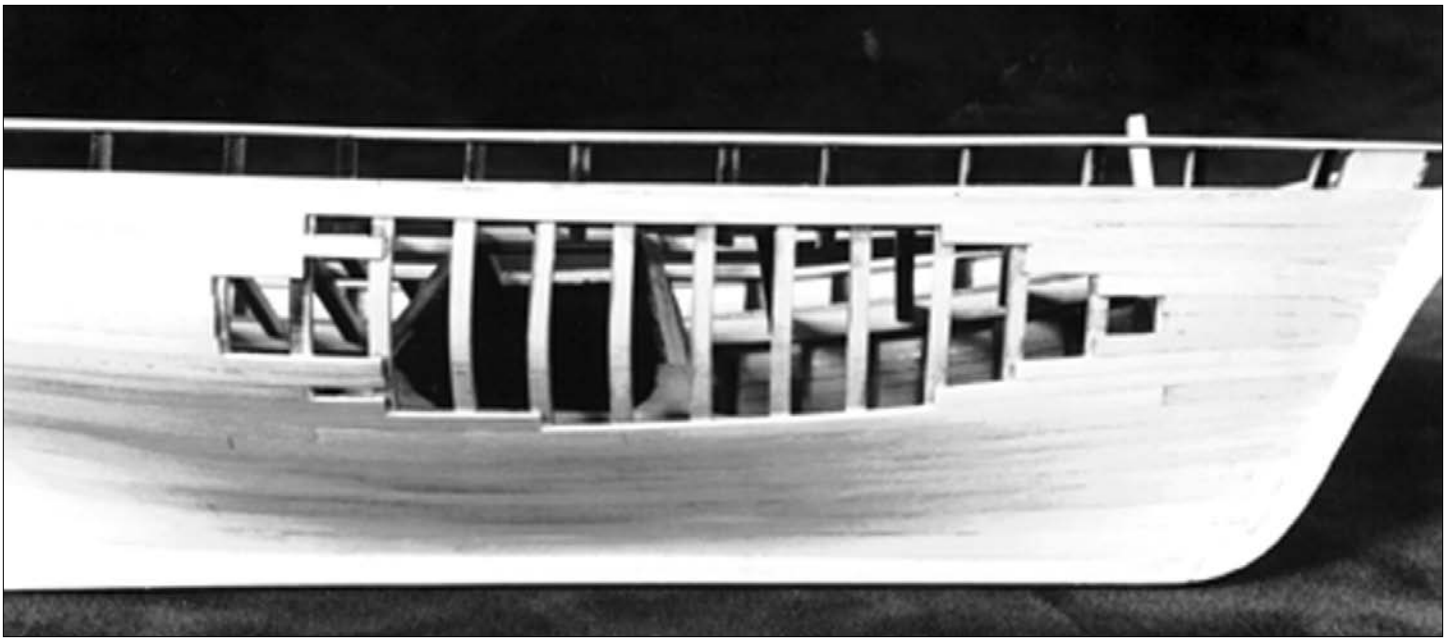
Basswood comes in 1/32", 3/64", 1/16", 3/32", 1/8", 5/32", 3/16", 1/4", and 1/2" thick sheets and strips. Strip widths are in the same increments, while sheets may be 1", 2", 3", or 4" wide.

Note: Model Shipways occasionally substitutes lime (*Tilia vulgaris*), a European wood, for basswood (*Tilia americana*). Both have a fine, uniform texture and straight grain. Lime, however, has superior steam-bending qualities. It is often called basswood in Europe.

Based on *Emma C. Berry's* 3/8" = 1'0" scale, 1/64" equals 1/2" on the real ship, 1/32" equals 1", and so on. Generally, basswood strips or sheets can be used as is. Occasionally, a strip must be thinner than the supplied size. To maintain scale, sand the strip to the required thickness with a sanding block before making the part. If too wide, reduce the width with a hobby block plane or cut it off with a straightedge and hobby knife.

Another way to reduce stock is with a hobby sanding thickness planer (sold commercially). If you don't own one, chuck a sanding drum into your drill press, clamp a block alongside the drum to act as a fence, then insert the strip between the drum and block. This make shift tool works quite well.

Sorting the wood in the kit by thickness saves time. After selecting and cutting what is needed, return the remaining stock to the proper thickness pile. Don't worry about using a piece for one item that was intended for another. Model Shipways supplies enough extra wood to complete the model before running out.



4. Britannia Metal Fittings

Before painting metal fittings, remove any mold joint flash with a #11 hobby blade, then file or sand smooth with fine sandpaper. Clean parts in dishwashing liquid and warm water to remove traces of mold release agent and any body oils your fingers have deposited. Rinse thoroughly and allow to dry completely before applying primer.

5. Soldering and Working with Brass

Emma C. Berry has metal bands on her masts, bowsprit, gaff, and boom as well as bow plates, chain plates, and rudder straps. These are best made from brass strip and wire. Although paper could be substituted, at this large scale the effect will not be satisfactory. Consequently, make these fittings from brass and solder the parts. Here are a few tips on metal cutting and soldering:

Cut brass sheet and strips with a small pair of tin snips or heavy scissors. Thicker brass will require a jeweler's saw. After cutting, smooth the edges with needle files followed by wet-or-dry fine sandpaper used dry. Cutting slivers from brass sheet curls and bends it sideways. To straighten, grip the ends with a pair of small pliers and pull in opposite directions. Thin brass sheets can be scored with a utility knife and metal straightedge, then snapped off. Use two or three light passes, cutting against a maple chopping block, birch board, or glass backing.

Drilling holes in brass with a pin vise is a slow process. The solution is to mount a handpiece for flex-shaft machines in a hobby drill press. Several companies manufacturer this tool and it is worth the cost. When working with brass, use a 1/4" or thicker piece of maple or birch for backing. (Avoid softwoods, as these flare the exit hole.) To prevent the bit from wandering, mark the spot with a small center punch. Lubricate the bit with light oil and drill slowly to avoid breakage. Keep rpms under 2,000, or excessive heat buildup will also break the bit. Caution: The brass will become hot, so clamp the pieces to the drill press table or hold them down with a wooden stick. Do not touch the brass!

Until recently, modelers used pure silver solder to avoid the corrosive qualities of lead in soft solder. Today, many solders are lead free. They're composed of tin and antimony, are strong, and melt at less than 450º F. Some brands are mixed with 3% or 4% silver, but still melt easily. Consequently, no reason exists to use pure silver solder (melts at 1300º F).

The key to soldering is keeping the brass clean. Use a solvent, lightly sand, or both. Once the parts are cleaned, don't touch them. Your fingers will leave greasy spots. Soldering is easy if your work is set up properly. First, immobilize the parts in a fixture or other holding device, then add just enough flux to the joint to do the job. Remember, solder flows where flux is applied, and paste flux is easier to control than liquid flux.

Next, cut a small piece of solder and lay it on the joint before heating. Experiment with various sizes to learn how much solder it takes to just fill a joint. The joint should look like the real thing, not a big glob of fillets. Heat the joint with a small torch or pencil soldering iron. This sequence is important. The larger the parts, the longer it takes to heat the brass and melt the solder. Remove excess solder with needle files.

Figure 5-1 in Stage 5 illustrates some methods for making metal bands.

Painting and Staining the Model

Beginning with directions on applying finishes may seem strange, but it isn't. Much time and effort can be saved and more professional results obtained if the finishing process is carried out during construction. Paint small parts, masts, and spars before they are installed on the model. The painting sequence must be well thought out; otherwise, assembly difficulties can arise. For example, painting a cabin or hatch coaming is easier if it isn't glued to the deck. Store parts in covered containers until they are ready to be installed. Proper timing when applying finishes or using masking tape to define painted edges should eliminate unsightly glue marks and splotchy, stained surfaces. Take advantage of these general suggestions:

1. Preliminaries

Sanding and cleaning: Rub down external surfaces with 220 grit sandpaper, then wipe off every speck of dust. Give untreated surfaces two light coats of primer. Sand very lightly after the last application. Don't sand down to bare wood. After washing your hands, use a soft brush and clean, soft cloth or tack rag to gently dust the hull. Use a spackling compound, such as Pic-n-Patch or DAP, to fill any scratches and defects, then sand and prime again.

Choosing paint: Glossy surfaces are not desirable on ship models. A flat finish or one with a slight sheen is best, because it doesn't reflect daylight or artificial lights. Consequently, details show up better. However, the undercoat or primer should be dead flat. A primer gives the surface a little tooth and helps top coats adhere better.

Any of these hobby paints are satisfactory: Floquil, Polly-S, Testors Model Masters and Humbrol. Jo Sonja artists' paints (used by bird carvers) or Holbein Acryla Gouache are also acceptable. They are a combination acrylic-gouache.

Hobby paints have a variety of reflectance levels. For example, Floquil's model railroad and military colors are basically flat. Its marine paints, designed to match original ship colors, vary from gloss to flat and have a reflectance reducer. When using a mixed group of reflectance levels, finish the completed model with a flat, clear coat. It provides durability and seals any decals or rub-on lettering.

When using Floquil's colors, spraying on a coat of reducer will blend the colors and subdue a gloss to almost flat. Because of resins in the reducer, subsequent applications raise the reflectance level from flat to about semi-gloss or satin finish. Consequently, for nearly dead flat, use one coat of reducer. For a little more sheen, apply several coats. If you start with flat paint and want some gloss, finish with a crystal or high gloss coat.

Jo Sonja paints are dead flat. To finish, use either a flat acrylic varnish for durability or a gloss varnish to increase reflectance. Other manufacturers have similar paint mixes and flat or gloss finish coats. Always read the manufacturer's instructions.

Brush painting: Painting with fine, soft bristle brushes is probably best for the beginner. Many skilled modelmakers prefer the brushed-on technique, because its subtle imperfections impart a more lifelike appearance to the model. Brushes must be soft and of the highest quality. Artist grade sable or synthetics are the best. Use wider brushes for painting broad surfaces. If too narrow, the bristles will cause excessive streaking.

When applying paint or stain with a brush, lay down one thin coat in a single stroke, then move to an adjacent area and coat it with a single stroke. Never go back over fresh paint. That will tear up the surface. Wait until it has dried to a hard finish before applying a second coat.

Spray Painting: Although slightly expensive, a Paasche, Badger, Testors, Revell-Monogram, or similar airbrush will produce a first-rate job and is worth the investment. Airbrushes are either single action (trigger controls only airflow) or double action (trigger controls air and paint) and easy to use. Spray patterns can vary from thin to about 1/2" wide by either adjusting the needle or

installing a different, sealed nozzle. In some brands, paint travels through the airbrush body to the needle. These require disassembling to clean. Other designs bypass the body and bring paint directly to the nozzle. These clean by simply spraying solvent through them.

Paints are either water (acrylic) or solvent-based. Solvent- based paints spray best. This includes Floquil's lacquers (thin about 25%) and Model Master's enamels. Polly-S and Model Master's acrylics are difficult to spray, and must definitely be used with the manufacturer's special thinner. Thinning water-based paints with water creates surface tension problems, resulting in poor coverage and spray atomization. Experiment when using acrylics. Some modelers have success and others don't.

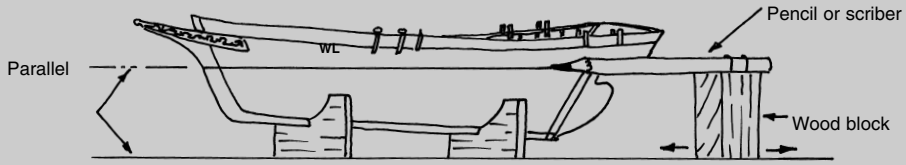
When using solvent-based paints, work outdoors or equip your shop with a spray booth. These fumes are toxic.

Many brands of aerosol paints produce good results. However, test them on scrap wood before spraying the model. Aerosols put out a lot more paint than an airbrush, so be careful to avoid runs.

Floquil, and other brands, has special thinners for its various paint lines. Follow each manufacturer's recommendations. Mixing brands is not a good idea, because they may not be compatible. Sometimes, however, no other option exists. If so, apply each brand separately and allow to thoroughly dry before adding the next. Always test to make sure the final flat or gloss finish is compatible with the paint it will cover.

Masking surfaces: Masking can be a tricky process. Some brands of masking tape are worthless, because they allow paint to seep underneath their edges. For masking fine stripes or straight and curved lines, use a graphic arts tape such as Chart Pak. It comes in widths as fine as 1/32" and 1/64". Chart Pak tapes have superb adhesion and won't bleed when firmly applied (burnishing is recommended). Black plastic electrician's tape and Scotch Removable Magic Tape are also excellent. Scotch's tape has the same, low stick adhesive as its famous Post-It pads. In fact, Post-It Correction Cover-Up Tape can be used for masking. Rolls are 58-feet long and come in 1/6", 1/3", and 1" widths.

Fig 1 Scribing the Waterline



Scribing the waterline: This can be done in a variety of ways. One method is to mount the hull so the waterline is parallel to the bench top, then mark the waterline using a height gauge and sharp pencil or scriber (Figure 1). With or without the aid of masking tape, paint the bottom and topside colors precisely to this line. The scribed line acts somewhat as a barrier against transgressions by either color, but a steady hand is needed.

A second approach is to guess where the waterline will lie, but deliberately overrun it when spraying or brushing on the bottom color. Once it has dried, scribe the waterline onto the hull with a height gauge, then paint down to it. Those with shaky hands should first apply masking tape to the waterline.

2. Emma C. Berry Color Scheme

The color scheme is shown on the plans. Below are Mystic's formula, followed by Floquil mixes. Floquil equivalents are marine colors, unless marked RR (model railroad), and stains. Since most are gloss, give the completed model a coat of Floquil flat, clear finish.

Buff: Kirby #53 unleaded (same base color used for the cream mix). Floquil: 1 part Deck Tan + 2 parts Panama Buff

Cream: 4 parts Kirby Marine Outside White plus 1 part Kirby #53. Floquil: 1 part Deck Tan + 2 parts Panama Buff + 12 parts Bulwark White

Note: Those who don't like to mix can substitute Floquil Deck Tan for Buff and Hull Cream for Cream. Although Deck Tan is a little too dark and Hull Cream too yellow, they have a pleasing contrast and are a close enough match.

Black: Mystic Satin Black. Floquil: Dull Black, Engine Black (RR), Iron Black, or Weathered Black (RR). Can also be used on the anchor and ironwork

White: Mystic White. Floquil: Bulwark White or Reefer White (RR)

Oxide red: Gloucester oil-based Copper Red #540. Floquil: Anti-Fouling Oxide Red or Oxide Red (RR)

Gray: Mystic French Gray by Kirby. Floquil: Slate Gray or Navy Light Gray

Gold: One Shot #191L Imitation Gold. Floquil: Bright Gold

Oiled: Nothing from Mystic. Floquil: Maple Flo-Stain. Newly oiled areas should appear tan to maple, while weathered wood is grayer. Flo-Stain Natural Pine provides a grayish hue.

Following the 1971 restoration, *Emma C. Berry* was painted green and gray. (Mystic has a post card showing her like this.) The present colors, based on further research, more closely match her original color.

Note: Kirby's colors for M.S.M. are custom mixed not readily (not stock colors) commercially.

STAGE 1

Framing the Plank-on-Frame Hull

1. Bending Wood

Building a P-O-F hull requires bending some wood without distorting its desired position (doing so stresses glue joints and fasteners). Although the term steam bent is used to identify the process, there are three ways to do it.

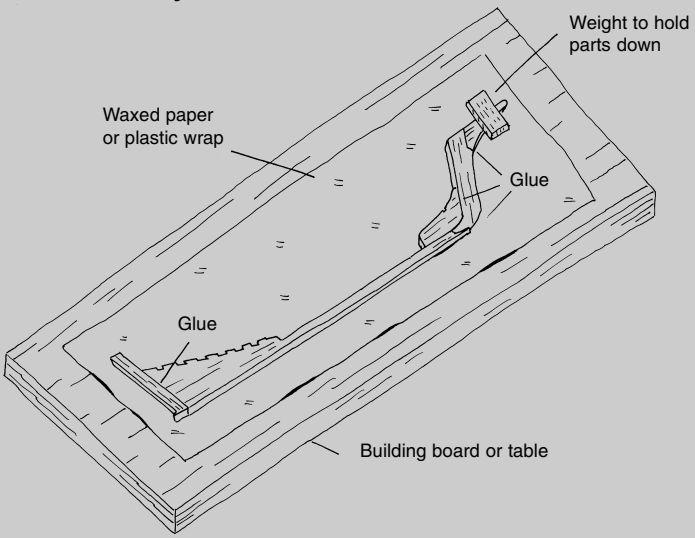
Steam bending: Hold the piece over a kettle of boiling water and bend. Hold the wood in position until it cools. It should remain in that position, but may spring back slightly.

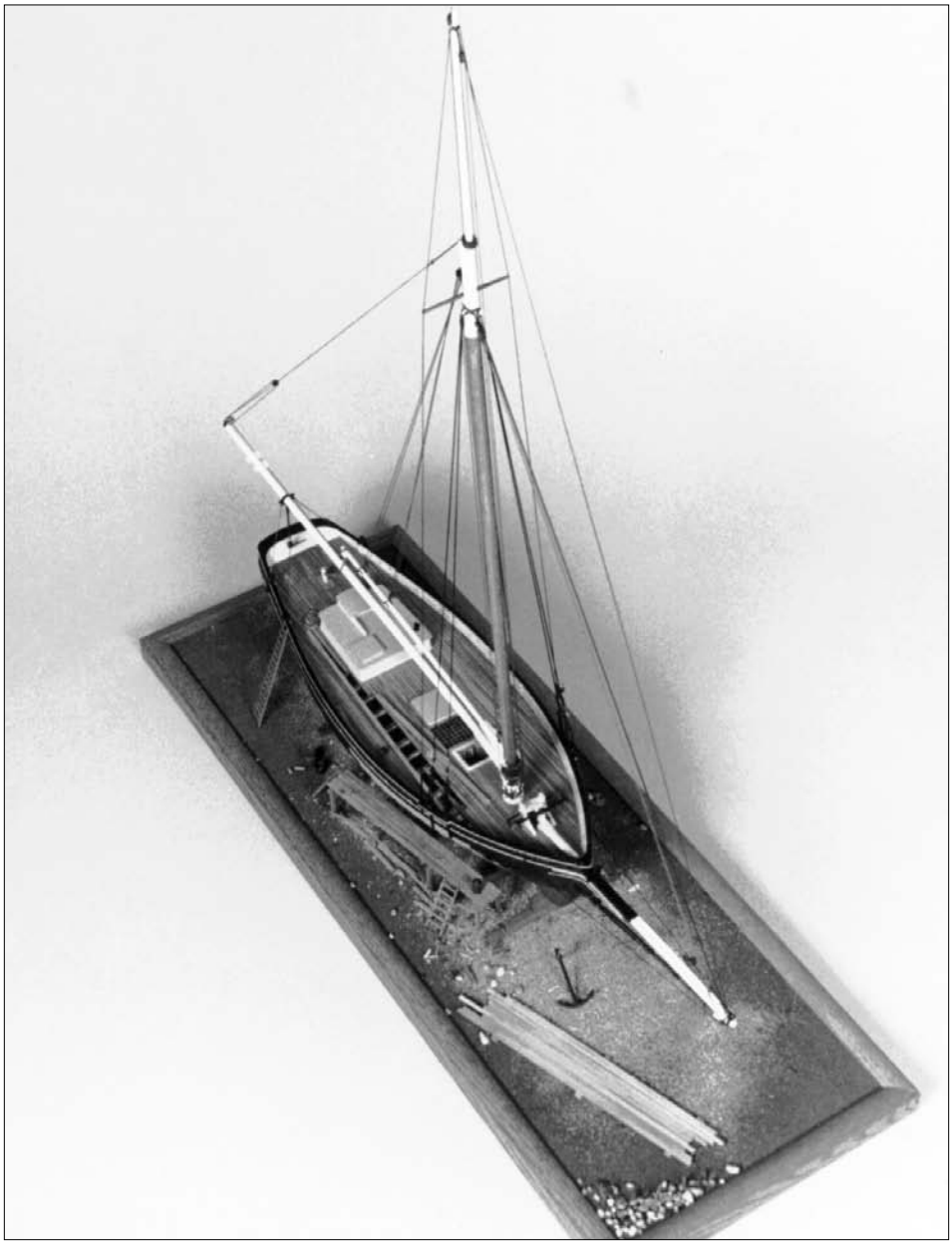
Soaking: Submerge the piece in warm water for several hours. Try adding a little household or pure ammonia. This speeds up the soaking process and makes the fibers slippery so the wood is easier to bend. After soaking, hold the piece in position with a fixture and let it dry completely.

Soldering iron: Large soldering irons with a tubular end are ideal. Clamp the iron upright in a vise. While the iron heats, soak the strip of wood in tap water. Some modelers prefer bending around the tube near the handle (it's not as hot), while others use the shank. Move the strip back and forth against the iron. Its heat turns water into steam and drives it into the wood. The trick is to wait until you feel the wood wanting to yield before starting the bend. Begin too soon or apply too much pressure and the strip will break.

Wood dries rapidly, so care must be taken to avoid scorching. Resoak and reapply it to the iron until the desired shape is achieved. Once the piece is formed, it can go directly on the model. Because the wood's memory has been permanently altered, it will never spring back to its former shape, meaning no stress on any timber or fasteners. Spend some time acquainting yourself with this method and you'll never bother with fixtures again.

Fig 1-1 Keel Assembly





2. Keel Assembly

The first step in constructing the hull is to assemble the laser-cut keel-skeg unit, stem, deadwood/stem knee unit, cutwater, and sternpost. Although the keel also consists of the laser-cut keelson, do not install it now.

Place the plan on a flat building board or table, lay a sheet of waxed paper or plastic wrap over it, then position the parts on top. Affix the joints with white or woodworker's glue. If necessary, add weights to hold down the parts. Let the adhesive dry for several hours (Figure 1-1).

Horn Timbers and Rudder Stock Box: After removing the keel from the waxed paper or plastic wrap, glue the side horn timber-box units to the centerline horn timber-knee. Glue the assembly to the keel-skeg (Figure 1-2). On the real craft, the rudder stock passes through this watertight box.

The kit combines some separate hull timbers into units on Sheet 1. To delineate the individual timbers, scribe lines on the laser-cut parts (Figure 1-3).

3. Cutting the Rabbet

The rabbet is the line where the exterior surface of hull planking butts against the keel and stem. The bearding line is the intersection of the keel or stem with the inside "face off" hull planks. Measuring from the plan, mark the rabbet and bearding line on both sides of the keel. Using a hobby knife, cut the rabbet to the required depth. Cut the groove from the bearding line to the bottom of the rabbet with a chisel. Now the planks will lie flush on the cut portion from bearding line to rabbet when installed. To help judge the rabbet's angle, position a scrap piece of plank against the frames as you cut (Figure 1-4).

4. Setting Up the Building Fixture

Obtain a plywood or particle board at least 3/4" thick, 21-1/2" long, 7-1/2" wide, and as flat as possible for the building board. Mark each frame location in pencil on both sides of the keel before placing it on the building fixture.

Fig 1-2 Horn Timber Assembly

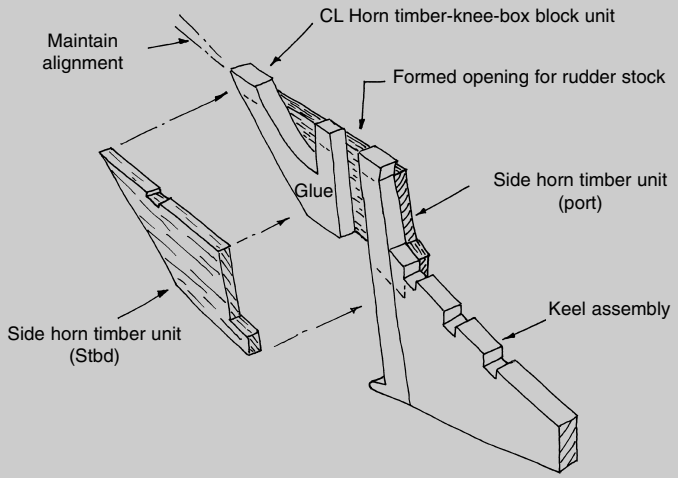


Fig 1-3 Scribing Separate Timbers

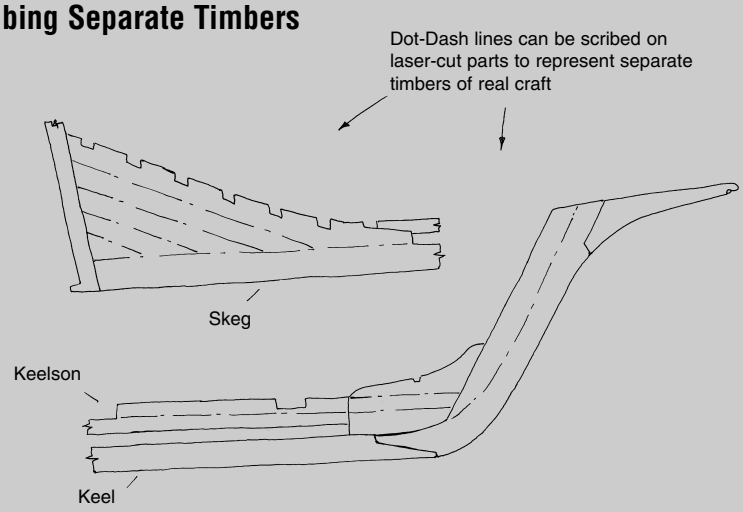
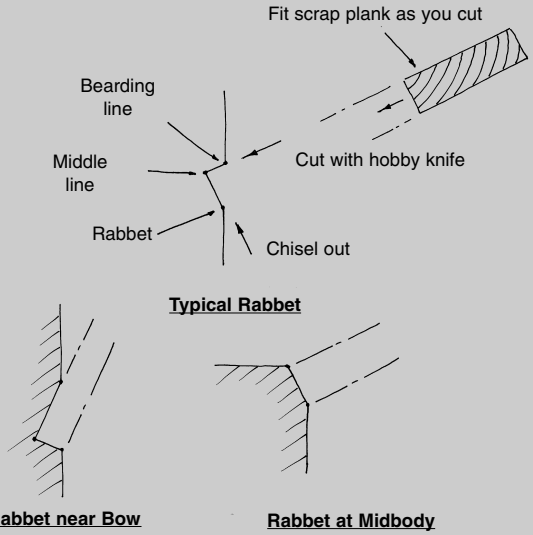


Fig 1-4 Cutting The Rabbet



The building fixture is laser-cut except for the stripwood side rails. Figure 1-5 and the plans show the assembly. For the frame clamp bar fixture, glue the feet so the frame sits 90 degrees to the board. Likewise, glue the feet of the keel support fixture perpendicular to the base.

Mark a centerline on the building board, then glue or nail the keel support on the centerline. Next, measure where the stripwood runners go and mark this line on both sides of the keel support. Position the stripwood, then place the frame clamp feet over them. Tack one end of the strips. Secure their length by sliding the frame clamp and tacking as you go. When completed, the frame clamp fixture should slide easily but snugly along the runners, and the frame clamp bar should be perpendicular to the keel support.

When everything is correct, place the keel assembly on the keel support. Transfer the frame locations from the keel to the support, then to the building board and out to the runners. These guidelines position the clamp bar.

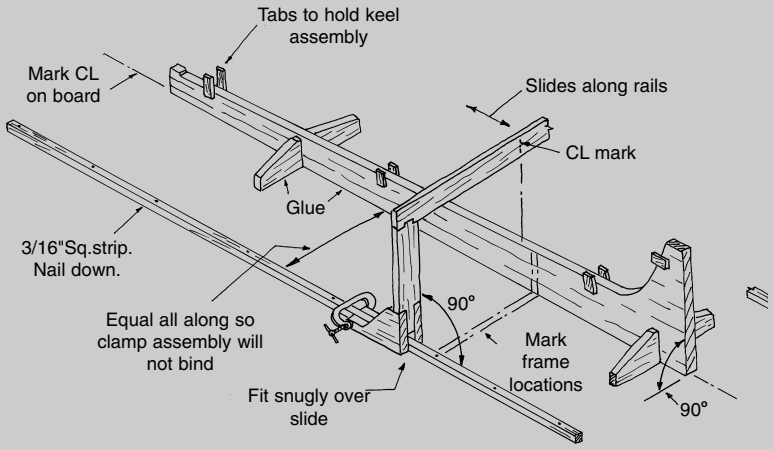
Following the plans, glue the small tabs at the keel support. When dry, insert the keel assembly. It should fit snugly. If not, add some shims. Or, stick pins in the keel support, then clamp a rubber band around the keel to hold it against the support.

5. Cutting Frame Bevels and Frame Assembly

The kit has three types of laser-cut frames. Those at the bow and stern have a port and starboard section, but don't meet at the bottom. They are glued to the deadwood (solid timbers at the bow and stern just above the keel). The rest of the hull has port and starboard frames joined at the bottom or with a floor.

Sort the frames per the patterns on Sheet 1. Next, mark and cut the bevels on the frames (Figure 1-6). Work slowly and be careful. If the hull is to be partially planked, unsightly bevels will show. Remember, bevel a frame's inboard and outboard edges. However, the inboard bevel isn't necessary if interior details and ceiling planks are omitted. Beveling the top inside portions of the frames will make it easier to fit the clamp (longitudinal stiffener for supporting deck beams).

Fig 1-5 Building Jig



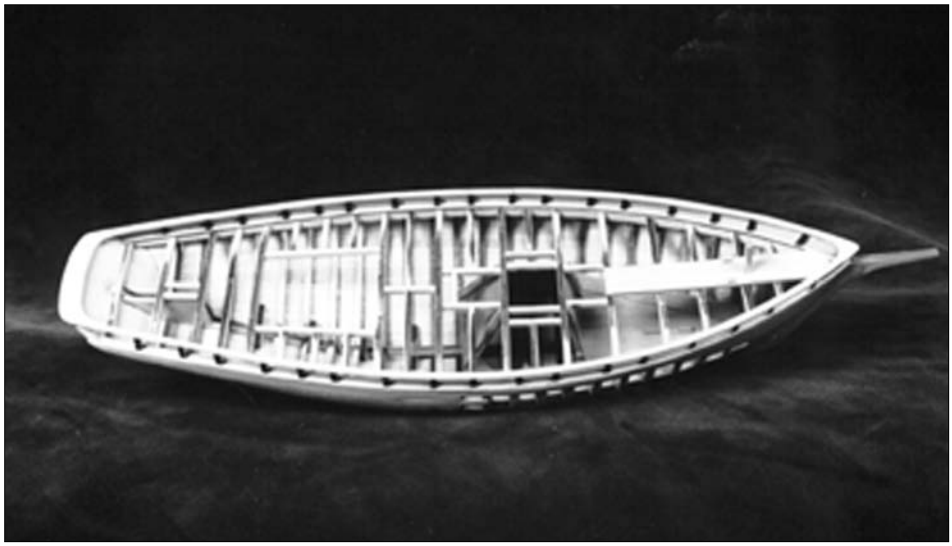
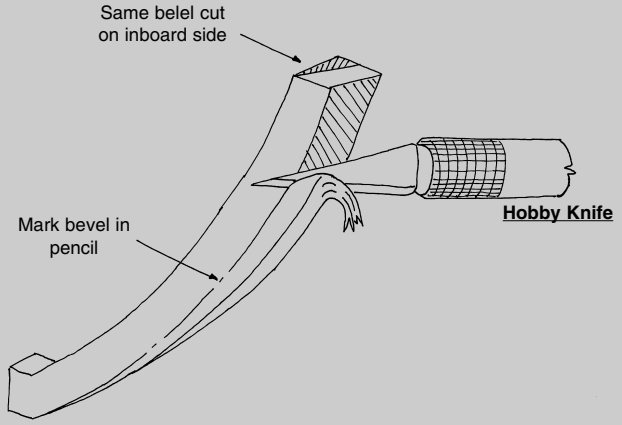


Fig 1-6 Cutting Frame Bevels



Place frame parts on Sheet 1. Glue together frames that meet at the centerline. If they have a floor, attach it. Tape or clamp temporary 1/8" square wood strips to the top of the frames to hold them in place until the adhesive sets. Forward frames will need a strip near the bottom as well (Figure 1-7). Frames 24 and 25 butt against the horn timbers. Because the box sides are in the way, adding a second strip is impossible. Don't remove these strips until the clamp and deck beams are mounted.

6. Frame Installation

Position one frame at a time and do not rush. Start at the bow and work aft. Note: Frames are perpendicular to the base line, not the keel. If the floor knee doesn't sit flush on top of the keel, sand a slight bevel on the bottom of the floor knee.

Caution! Refer to the plans and measure the distance from the baseboard to the top of each frame as it is installed. Set the frame at this height. Failure to do so could result in an uneven sheer curve at deck level. Then frame extensions would have to be added or the frames cut to the correct sheer curve.

The first fore and aft frames don't meet at the center, but are glued directly to the deadwood or stem.

Place the sliding frame clamp on the runners, and locate it for Frame 1. Clamp the feet to the runners to hold it in place. Position the frame and align it on the centerline. The centerline on the clamp bar should coincide with the centerline on the keel. When correctly aligned, tape or clamp (a clothespin works well) the frame to the clamp bar, then glue the frame in place (Figure 1-8). Wait a few minutes before removing the tape or clamp and sliding the clamp bar to the next frame. If the previous frame is still wobbly, clamp a temporary strut from the top of the frame to the building board. This will probably be necessary for larger frames.

When every frame is installed and accurately aligned, attach a 1/32" x 1/8" temporary batten at deck level to provide rigidity and ensure a fair hull (Figure 1-9). Extend the batten beyond the transom. If necessary, add a second batten at the turn of the bilge.

Fig 1-7 Frame Assembly

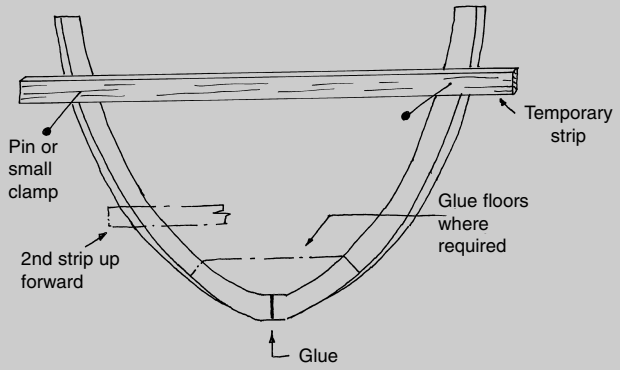


Fig 1-8 Installing the Frames

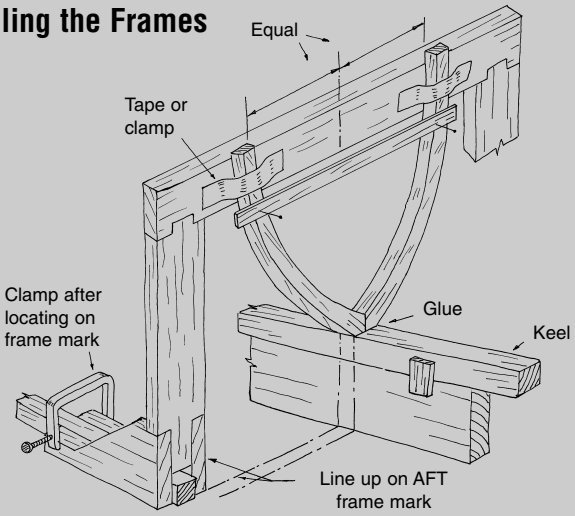
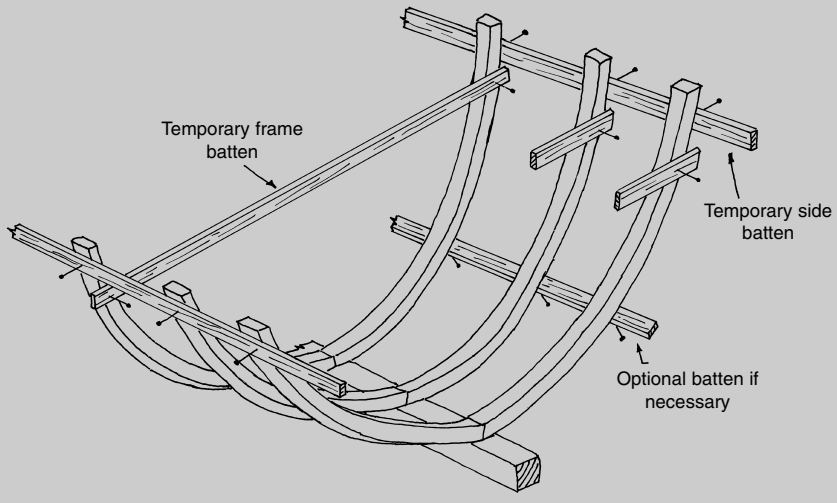


Fig 1-9 Temporary Battens



7. Completing the Keel Assembly

Glue strips to each side of the mast mortise on the keelson. Mount the keelson on top of the frames (Figure 1-10). Some temporary top strips may have to be removed to do this. Be careful not to hit any frames or they may break.

8. Installing the Transom and Transom Moulding

Emma C. Berry's transom consists of several stiffeners. It is fully planked outboard, but the interior is planked just down to the deck. Although the kit provides a laser-cut sheet for the transom, don't hesitate to scratch build it from stripwood.

Cut the bevels as shown on the plans. Shape the laser-cut elliptical moulding to a half round, then glue it to the transom.

Glue the transom to the keel assembly. Align it accurately (Figure 1-11). The temporary edge strip will help hold it in place.

Since everything is delicate, don't worry about a perfectly fair hull until some additional strengtheners are installed. However, if something is drastically out of line, correct it immediately. Slight unfairness can be sanded later.

9. Installing the Clamps

Port and starboard clamps support the ends of the deck beams and add rigidity to the frames. They run from bow to stern, tapering as they head aft. Steam bend the clamps to their final shape to avoid stressing the frames and possibly pulling them out of alignment.

When installing the clamps, position them so the large beams sit flush with the tops of the frames. Clamping a temporary batten the depth of the beams to the frames will help locate the deck clamps. It also will indicate where to sand bevels in the inboard frame edges. This is necessary if the covering board is to lay flat on top of them. When the battens are properly positioned, glue the clamps below them and to the frames (Figure 1-12).

Most of the frames' temporary strips must be removed to mount the clamps. After they are installed, add some temporary athwartships struts to prevent the clamps from pulling the frames inward. Struts are removed as deck beams are laid.

Fig 1-10 Installing the Keelson

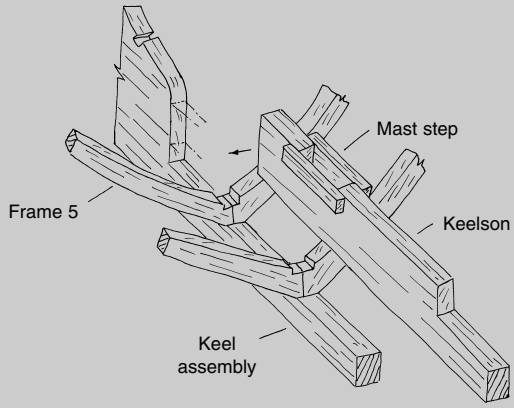


Fig 1-11 Transom Installation

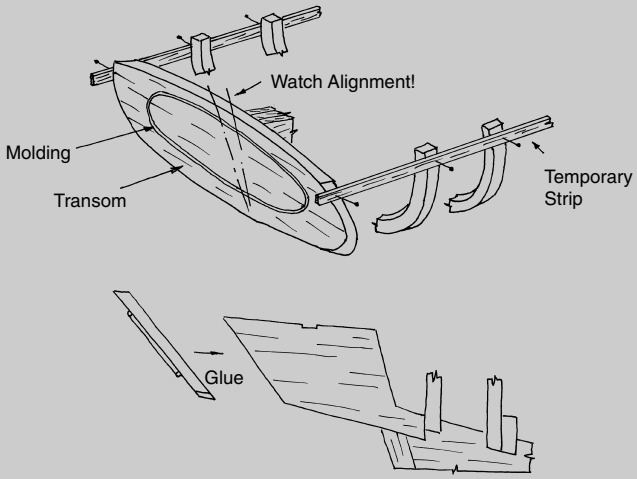
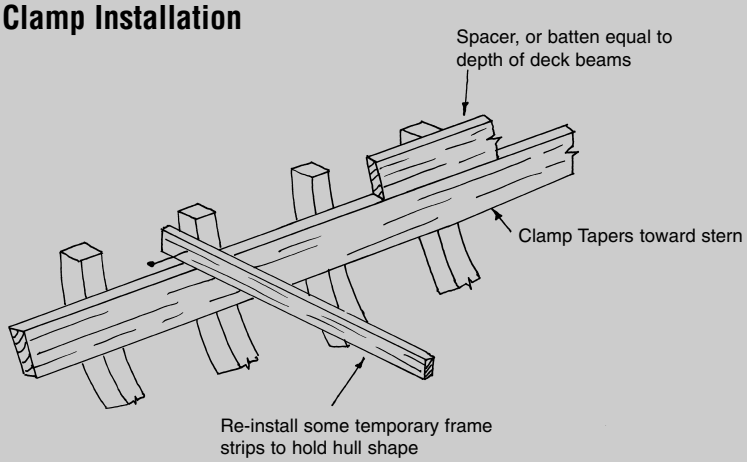


Fig 1-12 Clamp Installation



Note: Modelers electing not to bevel the inboard side of the frames can glue the clamps directly to their edges. Don't omit the clamps. They are important to the hull's rigidity and support those deck beams not attached to frames.

10. Interior Detail

Before installing the deck beams and planks, decide how much interior detail to add. The kit provides ceiling planks, cabin and forecastle soles (decks), and a wet well amidships. Options include installing only portions of these structures, omitting some hull or deck planks and detailing those exposed areas, or doing the entire job even if it won't be visible. You will know it's there!

The forward bowsprit pawl bitt extends to the keel and fits into the slot in the stem knee (Figure 1-13). The bitt is attached after the deck framing is completed, so don't do it now.

The wet well is a little tricky to install, because its corner posts secure to the deck beams. Therefore, mount the deck beams and carlings over the well as it is built. Display suggestion: Install the wet well's bed timbers and corner posts, but omit some upper side and end planks. The cabin has a small access ladder, as does each forward hatch. Construct them from thin stripwood. Figure 1-14 shows a fixture for making ladders.

Cabin Interior: Mystic Seaport hasn't determined how the cabin was arranged, and consequently hasn't outfitted it. Model Shipways' plans reflects an educated guess and should be considered an option. To model what is on the boat, simply add the cabin sole and extend the ceiling to it.

11. Deck Framing

Once the interior is completed to your satisfaction, add the deck beams and carlings. Laser-cut main deck beams are 5/32″ deep and intermediate ones 1/8″. Beams must be cut to length. Make carlings from stripwood. Plane 3/16″ wood for the 5/32″ carlings. To use 3/16″ stock as is, file the ends or adjust the clamps beforehand to accept the increased depth.

Note: Beams and carlings are notched where they join. Options include following the plans, using a full notch, or omitting the notch (Figure 1-15).

Fig 1-13 Bowsprit-Pawl Bitt

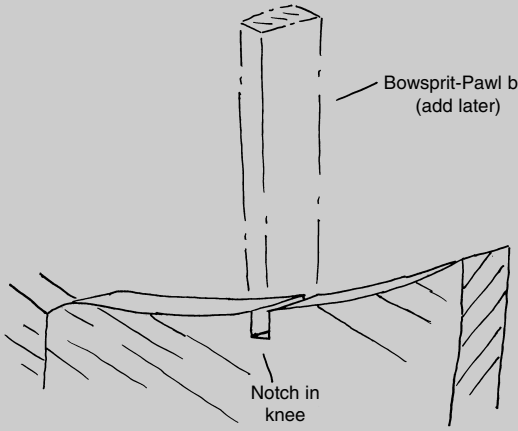


Fig 1-14 Building Ladders

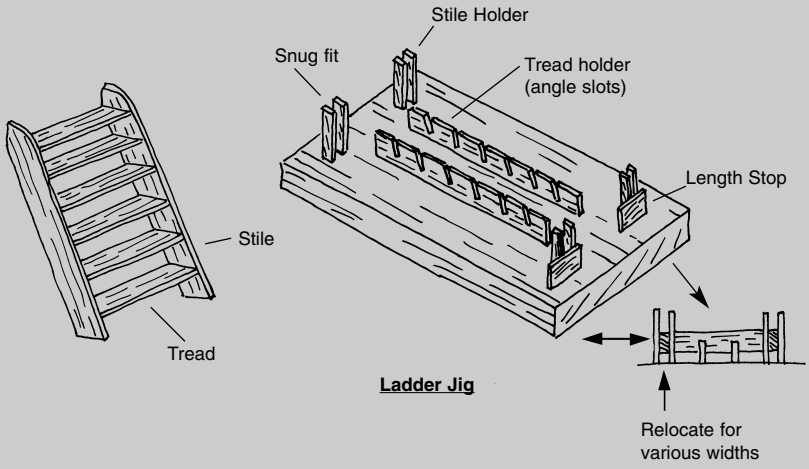
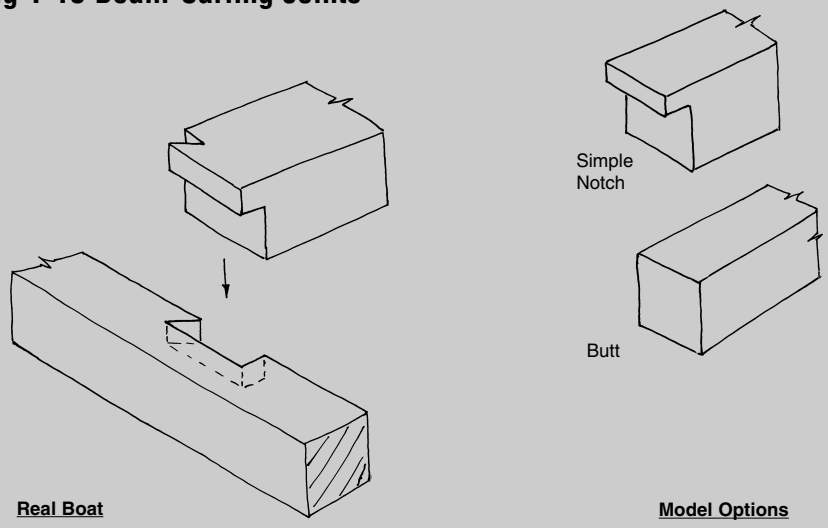


Fig 1-15 Beam-Carling Joints



Lodging knees, part of the deck framing, are the same thickness as the intermediate beams. Lodging knees can be cut from wide wood strips, or omitted if the deck is fully planked. If the latter, extend the intermediate beams to the frames. Since they are not as deep as main beams, place a 1/32" shim under their ends where they rest on the clamp (Figure 1-16).

The transom has a beam supporting the ends of deck planks. Cut it from stripwood and glue in position.

Most deck beams secure to frames, but some do not. Before gluing one in place, check the frame alignment. Has it sprung inward or outward distorting the hull? Although the temporary strips should prevent this, always double check. Start with the beams amidships and work forward and aft. When beams and carlings are installed, smooth the deck framing with a large sanding block. Sanding from side to side will produce the sheer bevel, so the deck planking will lie flush.

Add the lodging knees and blocking, then sand the framing again.

12. Installing the Covering Board

The laser-cut covering board has rectangular holes for the bulwark stanchions and knightheads. This was done on the real boat. Positioning the covering board is easy. The outboard edge of the stanchion holes should line up precisely with the outboard edge of the frames (Figure 1-17).

The covering board's outboard edge is a little wider than required. Sand it flush once the hull planks are installed.

Glue the covering board halves together. When the adhesive is dry, slip the covering board on top of the frames, then pin and glue it in place.

Fig 1-16 Intermediate Deck Beam Ends

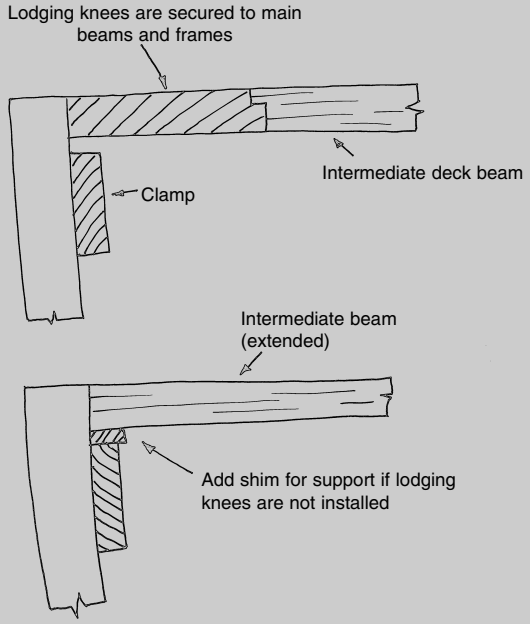
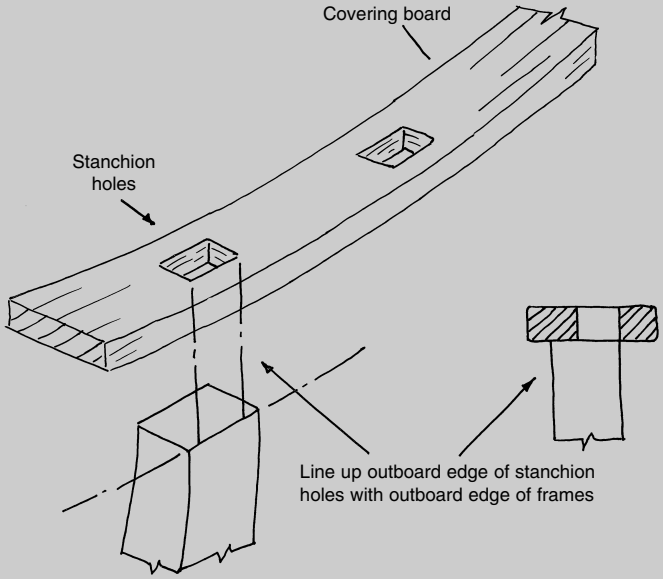
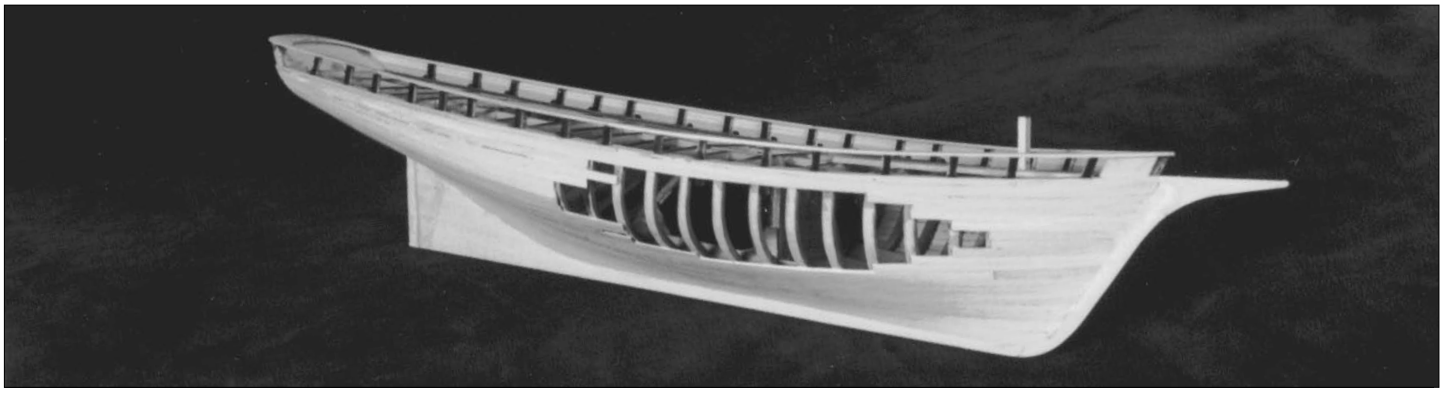


Fig 1-17 Covering Board Installation





STAGE 2

Planking the Hull

Before starting, it's a good idea to know some shipbuilding terms used in the planking process.

Plank: Single length of wood used to plank a hull or deck. A *strake* is a continuous line of planks from wherever it begins to where it ends.

Garboard: Planking strake adjacent to the keel.

Sheer strake: Upper line of planking on a hull.

Wale: Heavy layer of strakes below the sheer strake. *Emma C. Berry* has no wale.

Belts: Group of planks along the hull. Belts are laid out using battens (temporary strips of flexible wood). A *ribband* is also a batten. It holds frames in position during planking. Ribbands are removed as planking is completed.

Spiling: Process for marking and cutting a plank to a given shape.

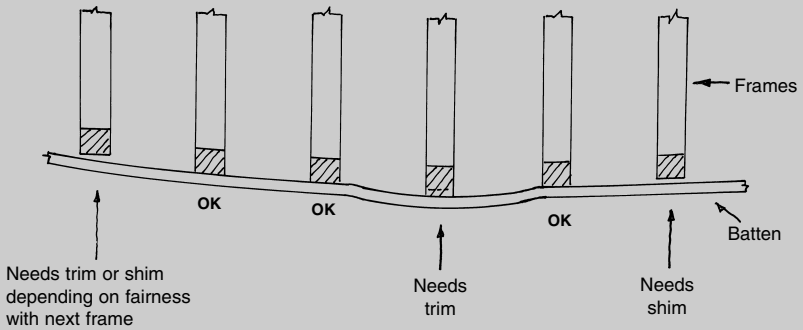
Edge-bending or *springing*: To bend a plank edgewise.

Fair: Refers to smooth, gradual curves when planking.

Nib or nibbing: Eliminates the tapered edge of one plank from running into another at a sharp angle by squaring off the pointed end and inserting it into a notch in the following plank. Nibbing generally applies to decks, but sometimes hull planks are nibbed. *Emma C. Berry* doesn't have nibbed deck planks, but her stern hull planks are nibbed.

Stealer: Plank inserted into another plank or between two adjacent planks to reduce their width. Or, when two planks taper toward a narrow end, both may have to be cut off and a wider plank substituted to leave enough wood for fastening. *Emma C. Berry* does not require stealers.

Fig 2-1 Checking Hull Fairness with Batten



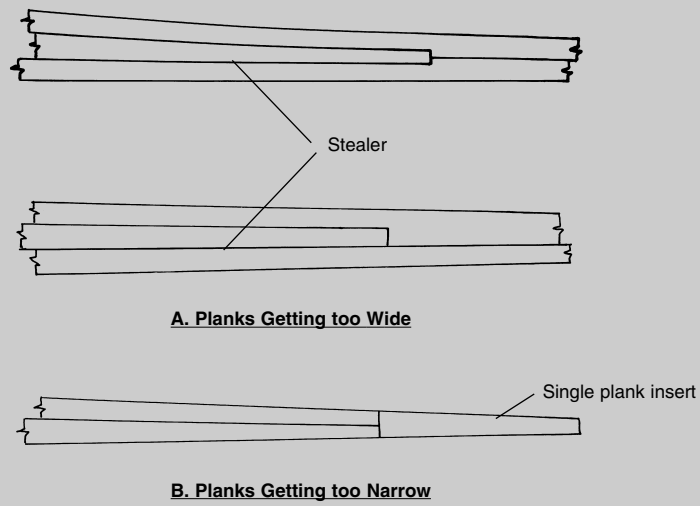
1. Getting Started

Planking, although tedious, is not as tough on a large scale model like *Emma C. Berry*. However, work slowly and think of each plank as a project unto itself. Since hull sides are identical, simultaneously cut one pair of port and starboard planks to shape. Fit the plank on one side, then the other. Don't rush. Speed results in frustration and a poor job.

Although possible to plank the hull in its building fixture, it is difficult, especially at the garboard. Consequently, remove the hull, invert it, place it back in the building fixture, and clamp it down.

Next, check if the hull is still fair by laying a stiff batten over the frames in several locations (Figure 2-1). If not, use a sanding block to eliminate humps. Hull lines must be smooth, so the planks will lie flush against the frames.

Fig 2-2 Planking Shown Using Stealer Inserts



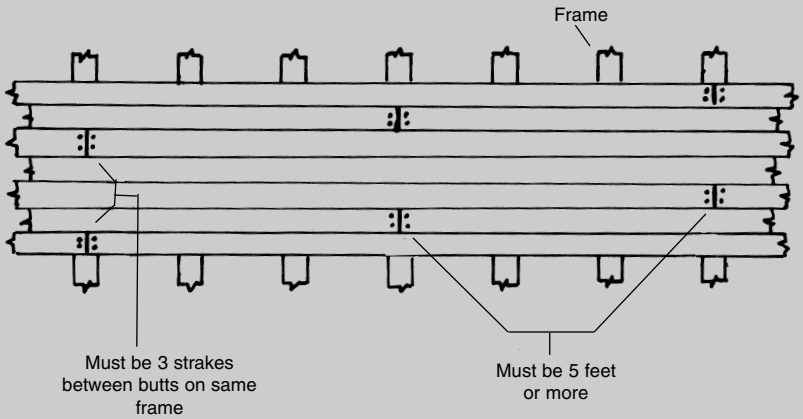
2. Planking Battens and Belts

Hulls are easier to plank when divided into belts. Each is designed to lay the planks against the frames without excessive edge bending. They gently sweep up at the ends like the deck sheer. Planks within a belt are usually evenly spaced, tapered, and fitted. Belts prevent errors from accumulating.

When selecting a belt width and the number of planks it contains, consider how the planks taper and lay against the frames. Taper too much and not enough stock is left for fastening. Then a larger plank must be substituted for two planks to increase the width. Planks too wide won't lay flat. In some areas, the distance between planks widens rather than tapers. If it becomes too wide, a stealer must be added. While these alterations are acceptable and employed on many ships, the best run of planking limits their number. (Figure 2-2 illustrates some inserts.) Luckily, none are required for this model.

Sheet 2 shows the planking layout. Fore and aft views plus a profile view provide a complete picture.

Fig 2-3 Staggering The Planking Butts



3. Planking Butts

Planking butts are another thing to consider before getting started. Few trees grow as tall as ships are long. Therefore, real planks were generally 20 or 30 feet in length. *Emma C. Berry* is a small boat and doesn't need more than perhaps one butt per planking strake.

To emulate shipwright practice, stagger hull and deck planking butts. Two or more planks per strake may be necessary to do this. Figure 2-3's pattern is similar to a real ship.

4. Spiling

Edge bending planks on real ships occurs on a limited basis. Wood is rigid, so many planks must be cut to shape. Spiling (Figure 2-4) is simply a matter of transferring curves to a straight plank, then sawing them out. To test if spiling is required, lay a tapered strake against the hull and see if it can be edge bent into position without excessive force. If not, then spile and cut the strake to shape. In most cases, basswood strips are flexible enough to edge bend in place.

5. Fastening the Planks

A commercial screw type plank clamp is available, but is more trouble than it is worth. It screws into frames, leaving a big hole to contend with when installing subsequent planks. Model Expo, however, sells a hull planking clamp that

relies on side clamps to hold planks in place. Or, use metal push pins to position planks, but be careful not to split the wood. If necessary, drill a pilot hole first. Smear a light film of white or woodworker's glue along the edge of the plank with your finger, then touch each frame with thin cyano to quickly affix the plank. Be careful not to glue your fingers to the model.

While glue alone will secure a plank, small brass brads or wooden treenails provide additional holding power and duplicate shipwright practice. If using fine, brass brads, cut off and discard the heads, then hammer in. Treenails are commercially available, but making your own is easy. Buy a package of long bamboo skewers, strip off short lengths, and pull through a drawplate to the desired diameter. Drill holes through the plank into the frame, dip the treenail in white or yellow glue, and drive in place.

Another alternative is to whittle flat toothpicks (round ones don't work as well) to a point. Place the entire toothpick in the hole, rap sharply with a 10-inch bastard file, and break off the remaining portion. A file works better than a hammer, because its serrated surface catches and firmly holds the head of the toothpick, permitting it to be driven in tightly. Exterior stubble is dressed and sanded smooth when treenailing is completed.

A new device to cut treenails mounts in a drill; expensive, but worthwhile.

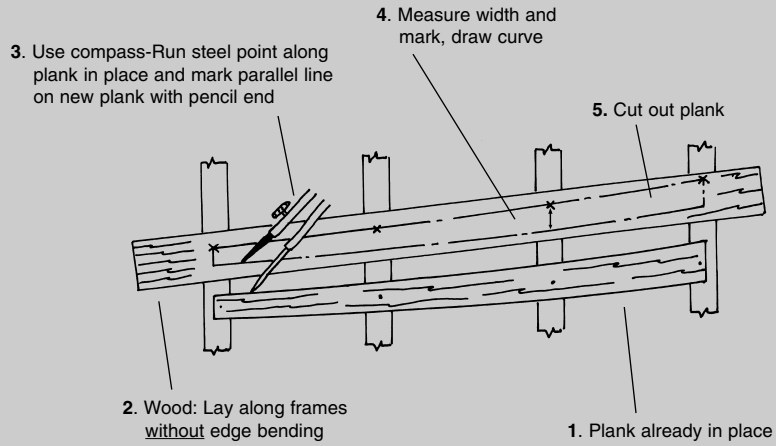
6. Planking the Outer Hull

Transom Intersection: Hull planks should extend beyond the transom. Cut them flush after the adhesive has dried.

Belt Layout: Taper planking forward and aft from the covering board to the keel rabbet. The area below the covering board is divided into **BELTS A** through **C**.

On Sheet 2, use a tick strip to mark belt seams on each frame or every third frame. Transfer these points in pencil to the model. Now temporarily tack two, 1/16" x 3/32" basswood battens along the port and starboard belt lines. Battens assure an accurate run of planks by correcting any errors in drafting, tick strip marking, or transferring.

Fig 2-4 Spiling The Planks When Edge Bending Cannot Be Accomplished



Once the two battens are in place, check their flow. Look at the model from the side and from the bow and stern. Do the battens have a pleasing, smooth curve? Are they symmetrical? If necessary, adjust the battens referring to the planking profile on Sheet 2. When everything is fair, make sure the belt seams are clearly visible. Re-mark those that aren't. Now, either remove the battens or leave them in place until they interfere with installing a plank.

Tapering Plank Edges: As planking proceeds, the edges of a particular plank may require tapering to butt flush against its neighbor. Properly machined planks have square edges. Butting them together on a hull may produce small gaps. Most are sealed with glue or wood filler, or caulked on a real ship.

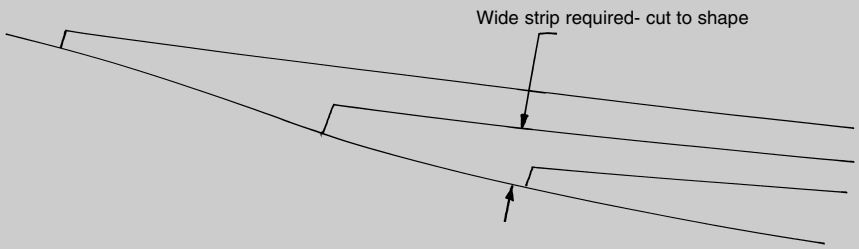
Procedure: With the model upside down, start planking at the keel, complete the lower belt, then continue toward the covering board.

*Laying the Planks in **Belt C***: **Belt C** has six 3/64" thick strakes. Next to the keel is the garboard strake. Its maximum width is about 1/4". The remaining strakes are about 3/16" wide amidships (6 inches on the real boat). As they near the stem, planks taper to about 1/8", except for the wider garboard. They also taper going aft, but instead of feathering out at the rabbet, lower planks are nibbed. Consequently, the next plank above must be a little wider to cover the nib (Figure 2-5). As an option, omit the nibs and run the plank directly into the rabbet.

Lift the plank widths from the hull planking layout with a tick strip. Mark these lines on the frames in pencil. If the batten for **Belt C** was altered, the plank marks may need adjusting, but not by much. **Belt C** is now completely marked.

The next step is to cut planks to fit between the marks. Starting with the garboard plank, taper the lower edge until it fits against the rabbet; use trial and error or spile the edge from the rabbet. Once this edge is fitted, mark the widths of the plank at the various frames, draw a line through the points, then cut this line. Cut an identical strake for the other side of the hull. Glue first one, then the other in position. Note: If butting the planking, the garboard strake may require two or three planks. It has quite a twist, so steam bend the wood.

Fig 2-5 Nibbed Hull Planks AFT



The tapered strake above the garboard must fit over its nibbed end. After cutting the aft end to accommodate the nibbing, spile the remaining portion of the strake. Repeat this procedure for every plank up to the belt line. Remove the batten when it interferes with progress.

Strakes have a simple taper at their forward ends. Forward butted planks will be simpler to install and may not require spiling. Basswood is flexible and easily edge bent. However, do not stress it. If edge bending feels stiff, spile and cut each plank.

Install the upper strake, being sure it extends beyond the transom. After the glue dries, cut it flush with the transom.

*Planking **Belts A** and **B***: Each belt has seven planks about 3/16" wide amidships, tapering to about 1/8" at the ends. Cut the tapered strake (or planks if butting them) with a sharp hobby blade or small block plane. Next, edge bend a tapered strake to test whether or not it should be spiled.

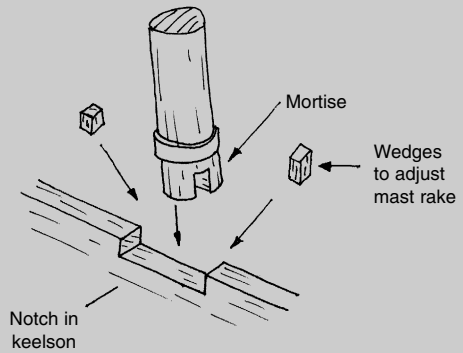
Install each strake until the belt line is reached. Remove the batten as the top of **Belt B** is approached. The covering board on top of **Belt A** serves as the batten. As planking progresses, the taper on a plank or two might have to be changed to wind up on the belt line. However, try to maintain the belts as they were laid out so as not to accumulate errors or disturb the smooth run of planks.

Now complete **Belt A** to finish the hull planking. Cut planks in **Belt A** and **B** flush with the transom.

Plank Variations within a Belt: Suppose a belt has seven planks the same width, but the eighth plank must be wider to complete the belt. Cause for worry? Certainly not. No planking job, even on real ships, is that precise. After all, these are hand-cut planks and slight variances will occur. The important thing is to keep their flow smooth.

Omitting Planks: When omitting planks to reveal interior detailing, follow the taper marks on the frames so it appears as though a plank fits in the opening. This is an attractive approach to displaying a model on the building ways. The boat looks natural, as if being built or repaired. See cover photograph.

Fig 2-6 Mast Step and Alignment



7. Planking the Deck

Coamings for Hatches, Wet Well Grating, and Cabin: Install these coamings before planking the deck. See Stage 4, Step 3.

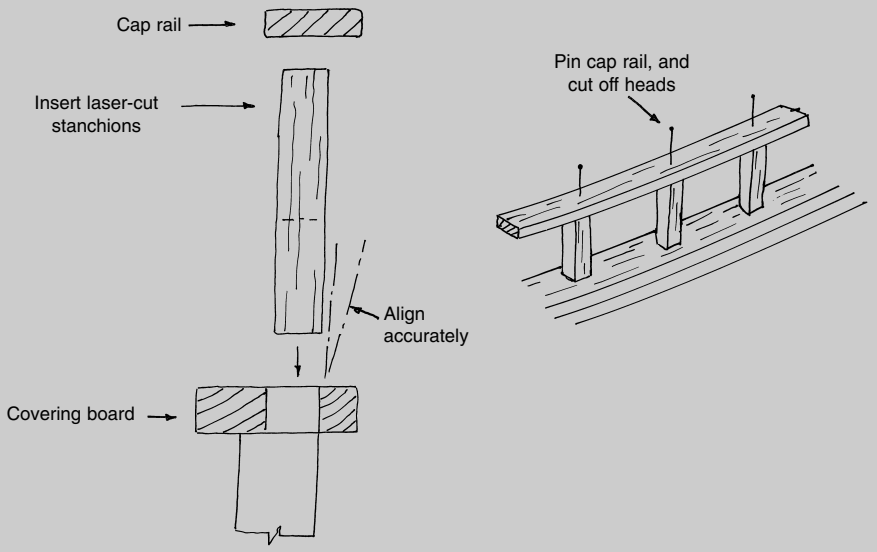
Deck planking is 1/16″ thick x 1/8″ wide except for the 3/32″ thick kingplank and 3/32″ thick rudder stock pad. The laser-cut kingplank has holes for the mast, bowsprit bitt, and windlass bitts. The laser-cut rudder stock pad has an opening for the stock.

Prepare the deck planks by painting one edge black or dark brown to simulate caulking. Be careful! Too much paint will penetrate too deeply with unsightly results. Do a test first. If it doesn't work, edge glue the planks with brown woodworker's glue. This adhesive dries dark enough to replicate caulking.

Procedure: First install the kingplank and rudder stock pad. Align them exactly on the centerline. Then insert the bowsprit pawl bitt through the hole and into the notch in stem deadwood.

Now is a good time to pre-fit the mast. Read ahead to Stage 5, Step 3 and at least make the lower mast. Its heel has a mortise that fits the keelson in way of the slot. Insert the mast through the hole in the kingplank. If necessary, enlarge the hole with a file. Temporarily step the mast at the proper rake and align it forward and aft. Make necessary corrections, then glue small wedges to either side of the mast heel (Figure 2-6). Remove the mast. Later, when the mast is permanently stepped, it will slide into its proper position.

Fig 2-7 Bulwark Construction



Add the 1/16″ deck planks. Begin to one side of the kingplank and progress outboard. Feather and glue the planks into the covering board. Ends are not nibbed. Scrape off excess glue after each plank is laid. Planking butts are an option. On the real boat, they don't show up as readily as deck seams. Butts can also be scribed in after planking is completed.

When omitting deck planking to reveal interior details, be sure to follow the run of planks.

Smooth the deck and covering board with a sanding block, then apply your chosen finish.

8. Constructing the Bulwarks

See Figure 2-7. Make the knightheads from stripwood and insert them into the covering board's pre-cut holes. Bulwark stanchions are laser cut. However, angle the bottoms of the forward ones where they encounter frames. Insert and glue the stanchions in their holes. Check the angles. Stanchions must run fair to receive the bulwark plank. (On the real boat, thin wedges hold the stanchions in the covering board. This makes them easier to remove.)

Pin and glue the laser-cut port and starboard cap rails to the stanchions. Position them to evenly overhang the stanchions and bulwark. Use a scrap piece of plank to judge the bulwark overhang. Add the laser-cut stern rail to the transom. Steam bend it to the camber if necessary.

Forward, on top of the cap rail, is a buffalo rail. Make it from stripwood. Check the rigging plan, then drill a hole in the port and starboard buffalo rails for the topmast staysail and jib downhaul lines.

Bulwark Planking: First install the scupper strake. It is thicker than the others. Lay the plank against the stanchions, mark the locations of these drain holes, and cut them out before gluing the plank. After it is installed, add the two upper planks. Clean up excess glue while still wet. It is difficult to remove when hardened.

A 1/32" thick doubler fits on top of the scupper strake at the bow. To make room for it, reduce the scupper strake to 1/32" thick, then fit the doubler. Drill hawse holes through the doubler, plank, and knighthead (Figure 2-8).

Sand the edge of the covering board flush with the adjacent hull plank and scupper strake.

*Mooring Chock*s: Fit the mooring chock doubler between the aft stanchions, then drill and shape the mooring chock hole (Figure 2-9). On the real boat, these iron chocks have lips. They can be carved from wood, or just have a hole.

Lashing Rails: Glue or pin the lashing rails to the inboard side of the stanchions per the plan.

Thoroughly examine the hull for starved glue joints. Fill these with wood glue or spackling compound, then smooth the hull with sandpaper.

Fig 2-8 Bulwark Details

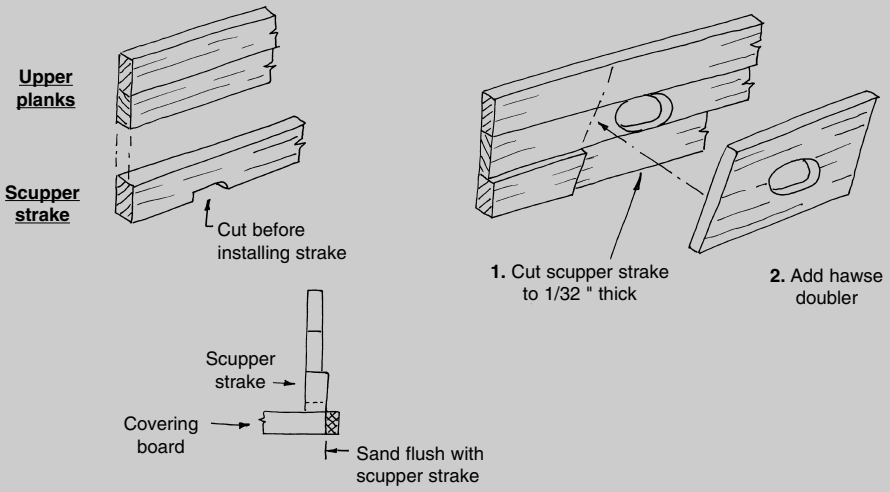
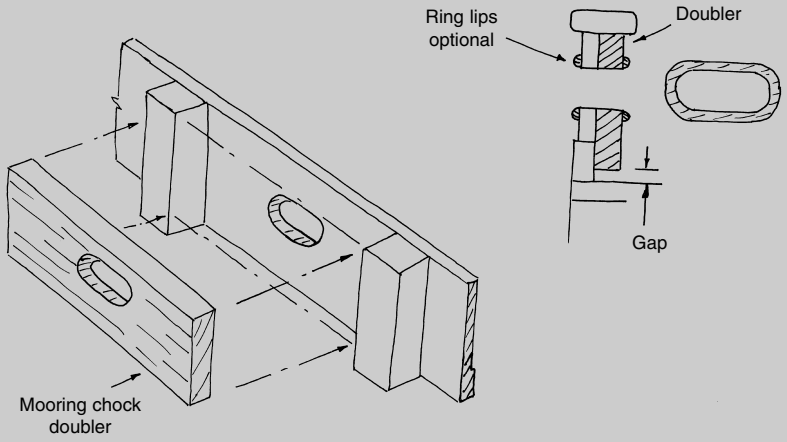


Fig 2-9 Mooring Chocks



STAGE 3

Mounting the Hull

Mount the hull as soon as basic framing and planking are completed to prevent damaging fittings when handling the model. Proper mounting is important, because future alignments will require a true waterline. This kit contains 1/4" square stripwood for making a building, or launching, ways (Figure 3-1). A second option is to purchase brass or wooden pedestals.

No baseboard is included. Pre-finished ones are commercially available, or make your own from woods such as basswood, cherry, walnut, bubinga, or rosewood. Round the top edges or cut a simple chamfer. Those with access to a router can cut mouldings along the edges. Paint or stain the baseboard.

Models should be cased to protect them from dirt and damage. Furthermore, most competitions require entries to be cased. A glass or plastic case is a cheap insurance policy. A case's outside diameter should be 4" longer than the model (2" fore and aft), 4" wider (2" port and starboard) and 2" higher. If casing the model, make the baseboard large enough to double as the display base.

When setting up the building ways or using pedestals, the model's waterline must be parallel to the base. The correct angle was used for the building fixture and is shown on the profile plan.

1. Building Ways

This model is best suited for display on a building ways (Figure 3-1), especially if planking and other details are omitted to give the illusion of a boat under construction. Building ways is also ideal for a model without sails. With a large enough baseboard, a builder can create a diorama based on a shipyard activity. The cover photograph illustrates such a diarama.

2. Baseboard with Two Pedestals

Purchase pedestals of different lengths to keep the waterline parallel to the baseboard (Figure 3-2). Mark the pedestals' locations, then drill pilot holes for their screws in the keel and board.

Fig 3-1 Building Ways Mounting

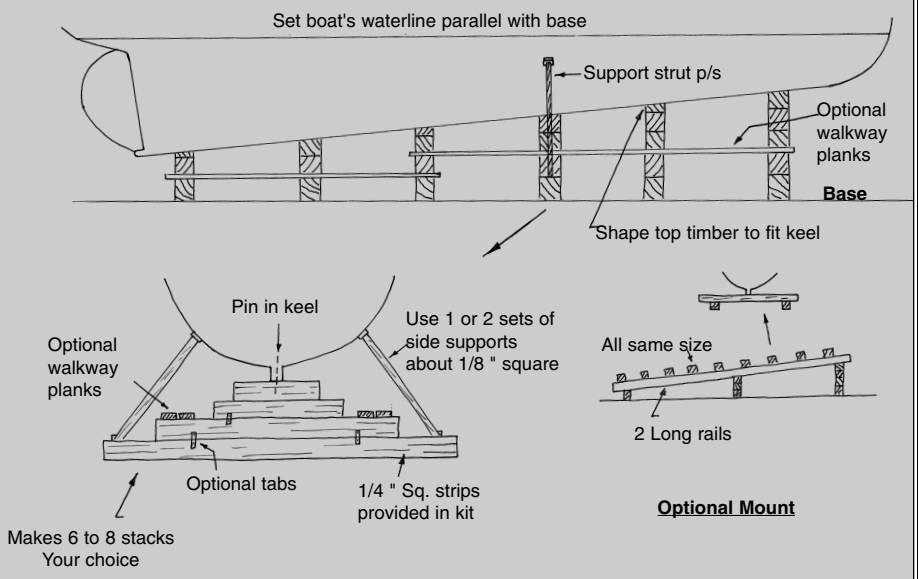
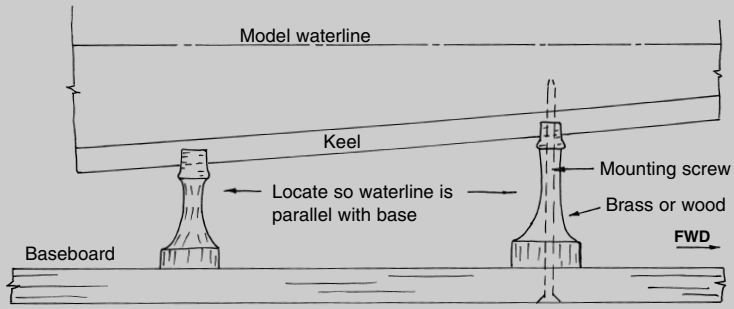


Fig 3-2 Pedestal Mounting



STAGE 4

Adding the Hull Details

1. Stern Mooring Bitts

Make the bitts from stripwood and glue at the locations shown on the plans (Figure 4-1). Mystic Seaport added bitts at the rail in 1988. These are secured with bolts. Prior to that, *Emma C. Berry* had deck bitts on each side of her tiller.

2. Main Sheet Horse

Make main sheet horse on the transom from brass wire (Figure 4-2). It may be easier to add the block on the horse now, because the ring can slip over the rod before it is mounted.

On the actual craft, the horse is bolted to the transom. For the model, just drill holes and secure the brass wire with cyano.

3. Hatches, and Wet Well Grating

Note: Hatch and wet well coamings were installed before laying the deck.

Between the two small hatches aft of the mast is a grating over the wet well. The coaming for the grating is low and tapered flush with the deck. When the grating is removed, fish can be swept easily over the coaming into the wet well.

Each hatch has a portable cover that fits into notches in the coaming (Figure 4-3). Ventilation gratings occasionally replace these covers on *Emma C. Berry*. They are only for museum use and not considered part of the original vessel.

The grating is two, laser-cut panels (Figure 4-4).

4. Cabin Trunk

The cabin coaming was installed before laying the deck.

Glue the laser-cut cabin beams into notches in the thick side plank. (This could be omitted if desired.) On top of the cabin is a companionway on the centerline. On its starboard forward side is a small scuttle with portable cover. A britannia stove pipe is on its port side. The cabin has no port lights or windows (Figure 4-5).

Fig 4-1 Stern Mooring Bitts

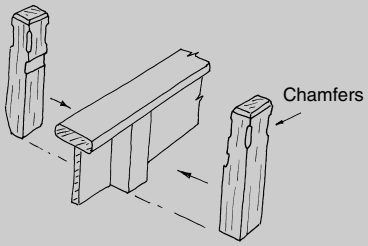


Fig 4-2 Main Sheet Horse

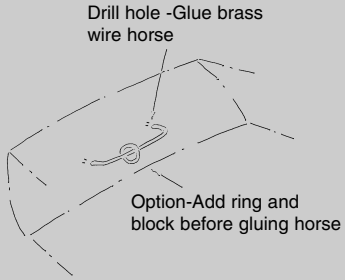


Fig 4-3 Hatch and Cover

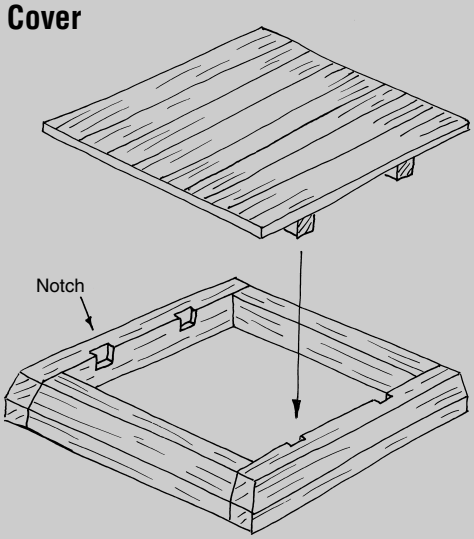
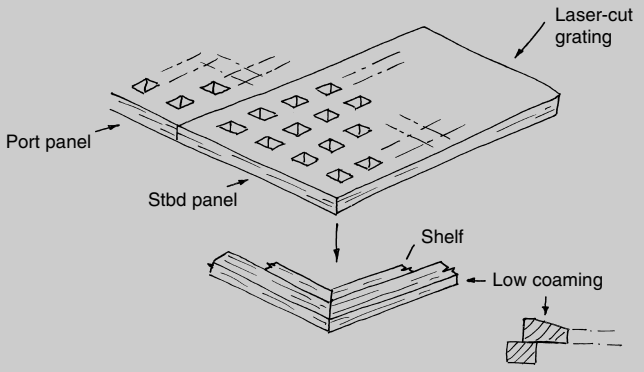


Fig 4-4 Wet Well Gratings



To make the stove pipe more realistic, drill out the flue and paint it black. For an even more realistic pipe, scratch build it from 1/8" brass tubing.

5. Rudder and Tiller

Taper the laser-cut rudder according to the plans. It mounts to the sternpost with a strap instead of pintles and gudgeons. The strap goes through round holes cut in the rudder.

Shape the laser-cut tiller per the plans (Figure 4-6). Don't round the edges. Keep the chamfer sharp.

The rudder stock passes through the stock box and mounts to the rudder. Insert the dowel, then connect it to the rudder. The slot in the dowel is for the tiller arm.

6. Stern and Bow Lettering

The transom and bow carry the boat's name. Below the name on the stern is the port, NOANK. The best way to add this detail is to buy dry transfer lettering (available at art and office supply stores. Or, look for Woodland Scenes lettering in model railroad shops). After applying, give the letters a coat of flat varnish. Woodland Scenes has gold lettering, but if it isn't available, paint over black ones.

Another method is to make your own decals using dry transfer lettering on a clear decal sheet.

7. Billet Head and Trailboards

The billet head (bow ornamentation) is shown in Figure 4-7. Either carve the billet head and scrollwork on the trailboards, or paint the trailboards to replicate the detail.

8. Chain Plates, Stem Plates, and Bowsprit Guy Eyebolts

Install these fittings. They are described in Stage 7 under Shrouds and Bobstay.

9. Deck and Spar Eyebolts

Eyebolt locations are shown on the plans. Drill a hole wherever one is required. Attach blocks to eyebolts requiring them. Using a toothpick or Microbrush, spread a thin film of cyanoacrylate on the bolt, then insert. Don't overdo the glue. When all are mounted, test the bond by tugging on each eyebolt.

Fig 4-5 Cabin Trunk Details

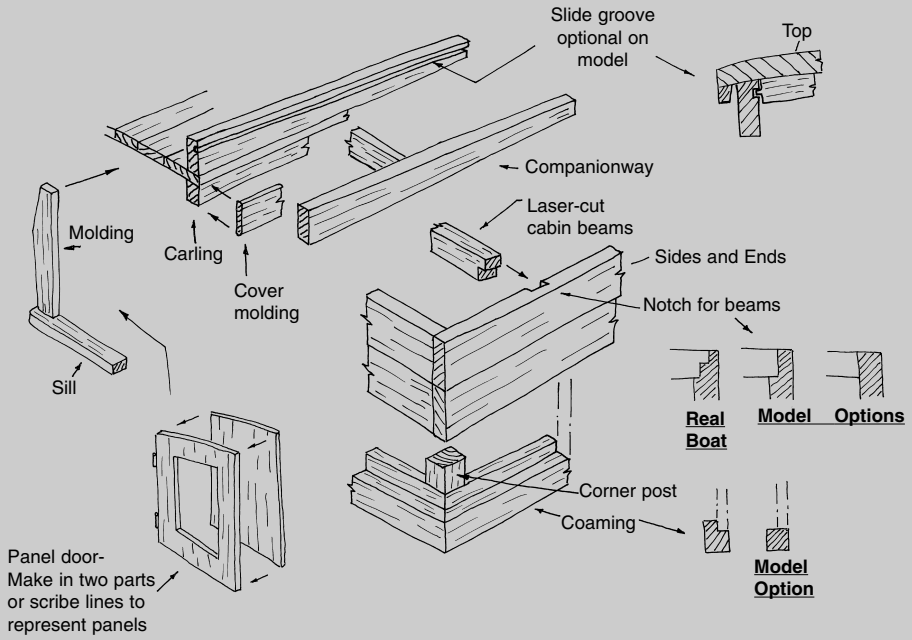


Fig 4-6 Tiller

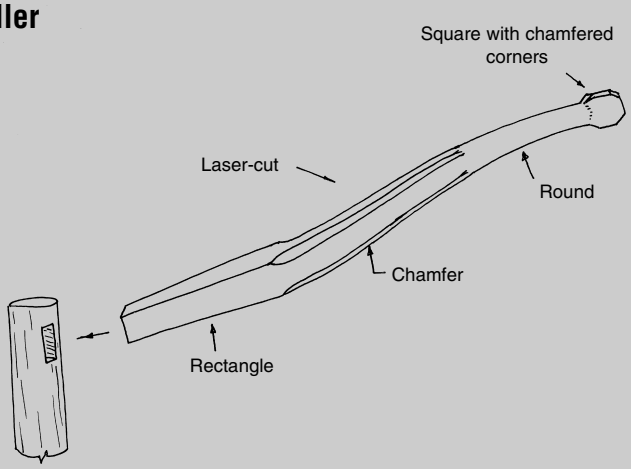
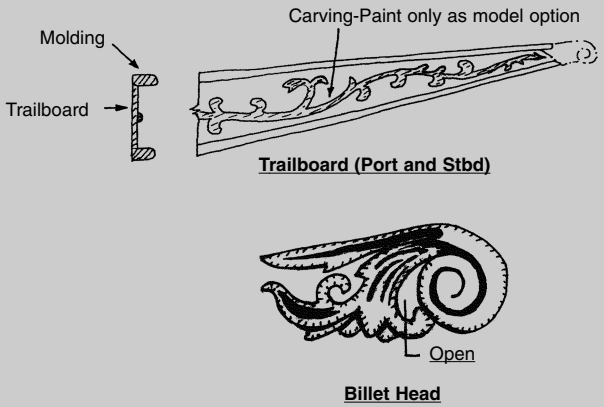


Fig 4-7 Billet Head and Trailboards



Eyebolts (kit supplied) are simply brass wire bent into a loop. To close the loop, touch with a little solder or epoxy. Figure 4-8 shows an easy way to produce scale eyebolts. The twisted wire shank traps glue and ensures a permanent bond.

10. Windlass

Windlass barrel, purchase arms, and rocker arm are Britannia. Knees, bitts, and whelps are laser-cut parts. Make links from wire. The kingplank has laser-cut holes to accept the bitts (Figure 4-9).

Carefully align the whelps to the barrel, then touch with cyano to attach them.

When assembling the barrel, make sure the slots at the centerline are facing in the proper direction to engage the pawl.

11. Anchor

The anchor shank is britannia, but make its triangular stock from stripwood. Position the anchor to starboard with one fluke on top of the rail just forward of the shrouds and the stock forward outboard. Tie the fluke and stock to the lashing rail (Figure 4-10). After passing the anchor cable around the windlass, coil it on deck.

If the model is displayed in a shipyard diorama, the anchor could be lying on the ground. Possibilities abound with such a presentation.

12. Bow Chocks

The open-skewed bow chocks are britannia. Although they can be glued directly to the buffalo rail, drilling holes in their ends and pegging with brass pins dripped in cyano is a better approach. Nip off the pin heads. Make sure the skews are facing forward.

Fig 4-8 Making Eyebolts

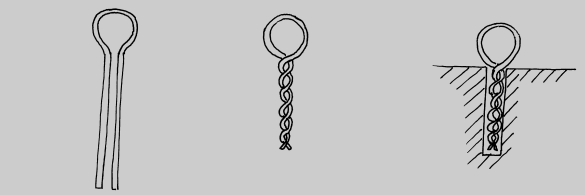


Fig 4-9 Windlass Assembly

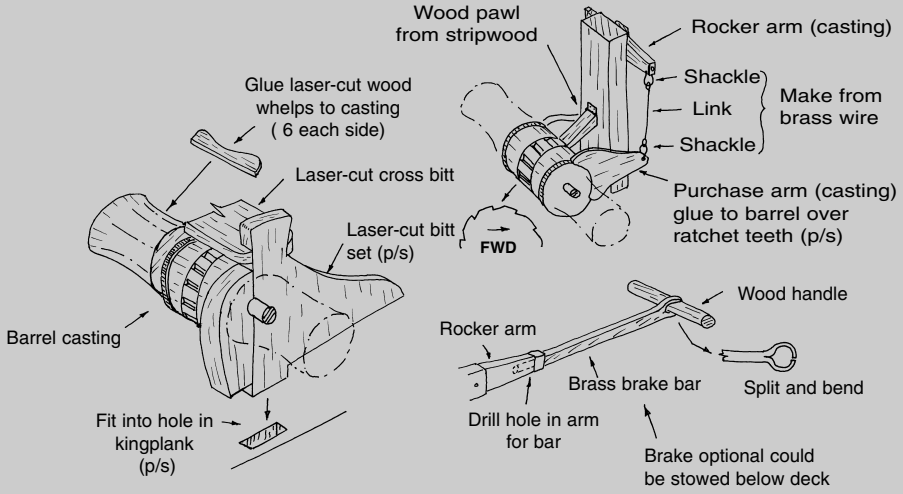
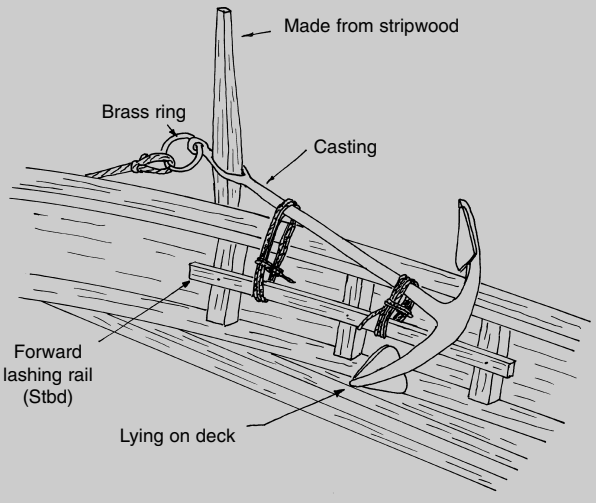


Fig 4-10 Anchor Stowage



STAGE 5

Mast and Spar Construction

Before jumping into the masts and spars, examine the hull, correct mistakes, and touch up paint blemishes. Go over the plans again. Was anything overlooked? When all is well, get ready for the masts and spars.

1. Iron Bands

All the spars have iron bands. These are made from brass strips, and it is tedious. To reduce fatigue, intersperse this ironwork with building the hull or spars.

The kit contains brass strips to simulate iron bands. See Figure 5-1 for ideas.

2. Shaping and Tapering Masts and Spars

Masts and spars are drawn to scale on Sheet 3. Dowels are provided (except for the square bowsprit), but require final tapering. A dowel, because it is round, is difficult to taper. The best approach is to taper the dowel from its maximum diameter to square at the ends, then eight-sided. Sand to achieve final rounding. This prevents a dowel from becoming an oval (Figure 5-2).

Although a little tricky, dowels can be tapered by chucking them into an electric drill or lathe. As the dowel turns, taper with sandpaper.

3. Building and Installing the Lower Mast and Topmast

The lower mast is almost straight, but tapers near its head. Its heel fits into the mortise with side strips on the keelson. After squaring the head, cut the tenon for the iron mast band. The topmast heel is flat on the side abutting the lower mast head.

Make the topmast spreader from stripwood. It bolts to a band. Assemble the mast and topmast (Figure 5-3). Attach the ball to the topmast truck.

Sand and stain the laser-cut boom rest and mast hoops. Slip 11 hoops onto the lower mast, then fit the boom rest. Slip seven hoops on the topmast. Be sure

Fig 5-1 Making Iron Bands

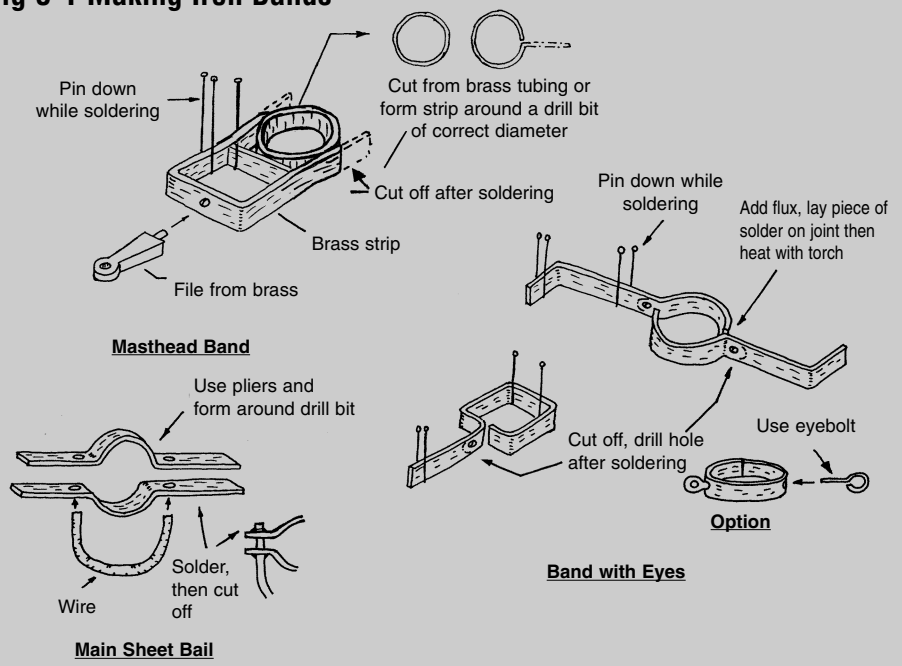


Fig 5-2 Shaping & Tapering the Masts & Spars

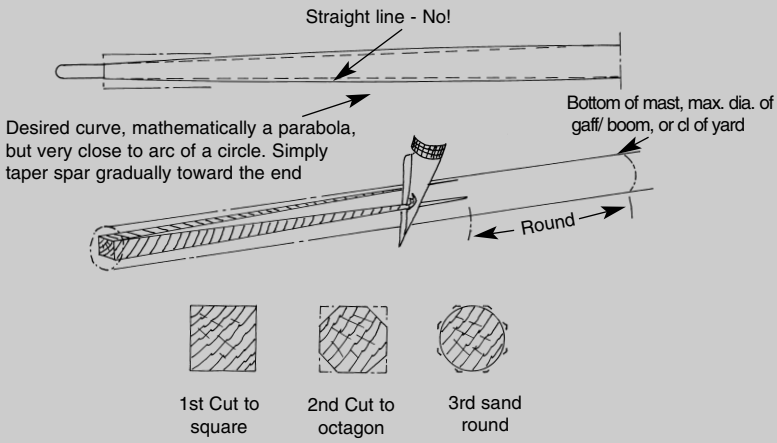


Fig 5-3 Assembled Masts

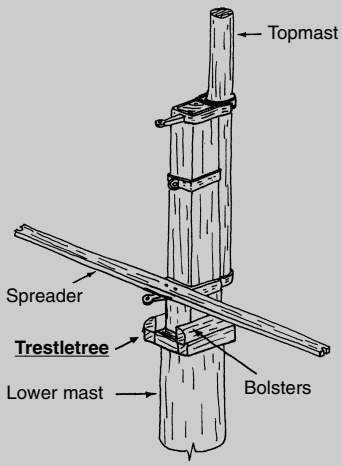
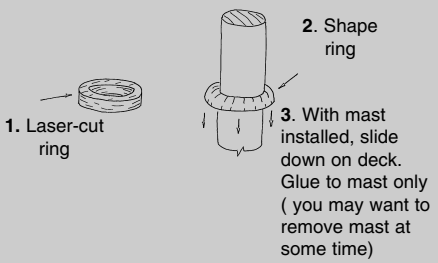


Fig 5-4 Installing the Mast Coat



these are in place before starting to rig. Make mast cleats from stripwood. Obtain their positions from the plans. Drill a hole through the cleat into the mast, then peg with a brass pin dipped in cyano. Glue alone will not do the trick. The cleat will probably fall off when a line is belayed.

Mast Coat and Mast Installation: A laser-cut ring represents mast wedges covered with a mast coat (canvas). Shape the ring and slip it on the mast. Then, insert the mast through the deck hole and step it. If necessary, add some shims to jam the mast in the hole. Check the alignment forward, aft, and athwartships. The angles must agree with the plans. Hopefully, this was done earlier when adding wedges to the keelson mortise. Finally, secure the mast coat ring to the mast with a touch of woodworker's glue (Figure 5-4).

4. Building and Installing the Bowsprit

The bowsprit is made from square stock. It is square as it passes through the hull, becomes eight sided, then 16 sided, and finally round except for the flat top. The tenon in the heel fits the mortise in the bowsprit pawl bitt (Figure 5-5).

Insert the bowsprit into the mortise in the bitt, and align it properly. Make sure the side angle lines up with the centerline. If necessary, modify the bow hole to correctly set the steeve (angle from the horizontal).

5. Building the Boom and Gaff

The maximum diameter of the gaff and boom is not at the center, but about one-third out from the forward end as shown on the plans.

The boom and gaff jaws are laser-cut, but make the clappers (Figure 5-6). Gaff jaws are shorter than boom jaws. String beads for the gaff and boom parrels, or use a bare line. Add parrels when installing these spars.

Add the chocks to the gaff for peak halliard block strops. Now attach the cheek block for the gaff topsail sheet. Complete the ironwork. The boom requires cheek blocks for reef pendants and a cleat for the topping lift (Figure 5-7).

Stain and paint the spars prior to installation. Also, much of the rigging can be attached beforehand.

Fig 5-5 Making the Bowsprit

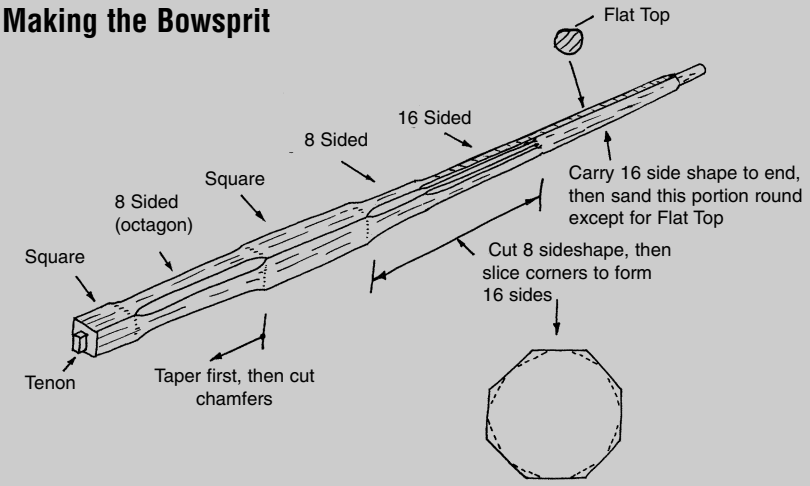


Fig 5-6 Boom and Gaff Jaws

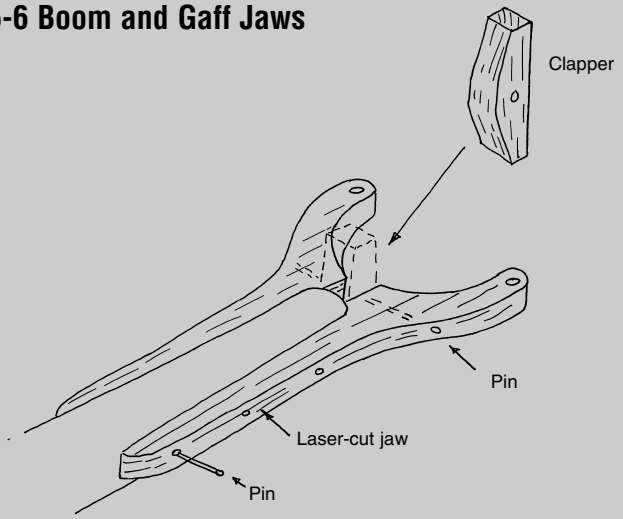
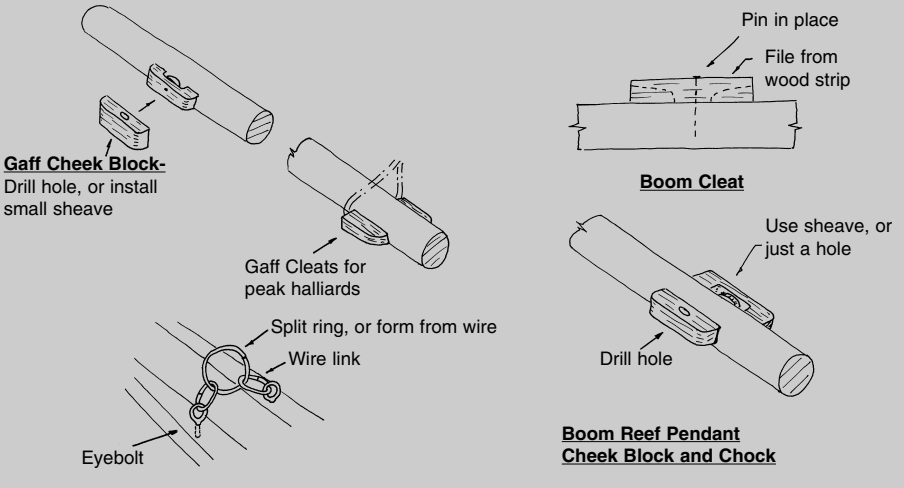


Fig 5-7 Boom and Gaff Details



STAGE 6

General Rigging and Sailmaking

Newcomers to the nautical world should learn the following rigging terms.

Each edge and corner of a sail has a name. On a fore-and-aft sail, the top is the *head*, bottom the *foot*, aft side the *leech*, and forward side the *luff*. The forward lower corner is the *tack*, aft lower corner the *clew*, forward upper corner the *throat*, and aft upper corner the *peak*. A triangular sail is similar, except the upper corner is called the *head*. It has no throat or peak.

Cringles, sewed into corners of sails or elsewhere, are metal thimbles to which lines are attached. They are named per their location; for example, clew cringle.

Grommets are either a buttonhole-stitched round hole in the sail or a brass grommet. They are used to pass a line through the sail. Sails are bent to their yard, stay, gaff, or boom.

Standing rigging: Fixed lines supporting masts and spars. Standing rigging is generally *wormed*, *parceled*, and *served* with a light line. It also is tarred; hence, its black or dark brown appearance.

Shrouds: Transverse lines supporting masts. *Deadeyes* are wood and have three holes for reeving the *lanyard*. Lanyards are lines used to tighten shrouds. On modern ships, metal turnbuckles have replaced *deadeyes*. A *bullseye* is similar to a deadeye, except it has one hole.

Chain plates: Iron bars or rods on the hull for holding deadeyes.

Stays: Fore and aft lines supporting the masts. *Backstays* provide side and aft support. They are generally angled slightly aft.

Bobstays: Support the bowsprit from upward loads. *Bowsprit shrouds* (called *guys* on *Emma C. Berry*) support the bowsprit from side loads.

Running rigging: Lines that move, reeve through blocks, or operate sails and spars.

Blocks: Wooden or metal shells with *sheaves* (pulleys) for handling lines. A *purchase (tackle)* consists of several blocks and a line to provide a mechanical advantage for handling sails and spars.

Halliards or halyards: Lines for raising and lowering a sail, yard, boom, gaff, or flag. For gaffs, the outer halliard is the *peak halliard*. At the gaff jaws is a *throat halliard*, named for the part of the sail it operates. *Downhauls, outhauls,* and *inhauls* drag a sail along a boom or up and down a stay.

Sheets: Hold the lower corners of a sail or boom. When not in use, sails are *furled* (bundled on the yard, boom, or mast).

Reef bands: Horizontal reinforcing bands on the sail. They have short lengths of rope called *reef points*. In heavy weather, sailors tie the reef points to a yard or boom to shorten the sail. *Emma C. Berry* has no reef bands, but does have reef points. They run through grommets.

Parrels or parrals: Lines or devices for holding yards, booms, and gaffs to their respective masts and spars.

Mast hoops: Wooden hoops securing fore-and-aft sails to the masts. *Hanks*, small wooden or metal rings, secure fore-and-aft sails to stays. *Lacing* secures the head and foot of a sail to its boom or gaff.

Topping lift: Line lifting the boom. A *gasket* (line) furls a sail to its spar.

For future reference, buy a marine

dictionary.

1. Rigging Options

Like the real ship, the model can be rigged four ways; with sails fully set, furled, some furled and others set or partially reefed, or without sails. The choice is yours.

Sheet 4 shows rigging for a full set of sails. *Emma C. Berry's* simple rig should cause little trouble.

2. Rigging Line Sizes

Because more line diameters are shown on the plans than provided in the kit, use the following guide:

Lines on plan	Lines in kit
Less than 0.012"	0.010"
0.016" to 0.023"	0.021"
0.028" to 0.031"	0.031"
0.039" to 0.049"	0.041"

Additional diameter lines are commercially available. Experienced builders probably have a stockpile of sizes from which to choose. Try to use every diameter to enhance the model's scalelike appearance.

3. Treating the Lines

Worming, Parceling, and Serving: Lines on ships were wormed, parceled, and served wherever chafing might occur. Shrouds are a prime example. Worming inserts thin pieces of line (worms) between the strands. Parceling winds canvas strips saturated with tar around the wormed part. Happily, this isn't necessary on the model, because *Emma C. Berry* has no worming. Only consider serving (binding the wormed and parceled area in the opposite direction with spun yarn). Use fine silk waxed polyester (available from Model Expo), or linen thread. Avoid cotton. It's too fuzzy.

Although serving is recommended, it's optional. The model will look good without it. Lines are easier to serve off the model. Figure 6-1 shows how.

Note: Per the plans, not all standing rigging is served. The jib stay is an example. This unusual stay has a core line wrapped with other lines, but no serving.

Seizings: Seize lines with cotton, nylon, or silk thread. Do not secure lines with knots. Knots are for shoelaces. Touch seizings with diluted white glue

Fig 6-1 Serving Line

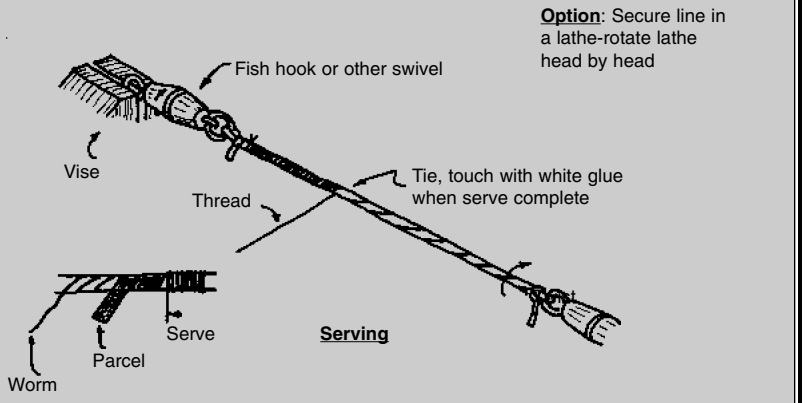
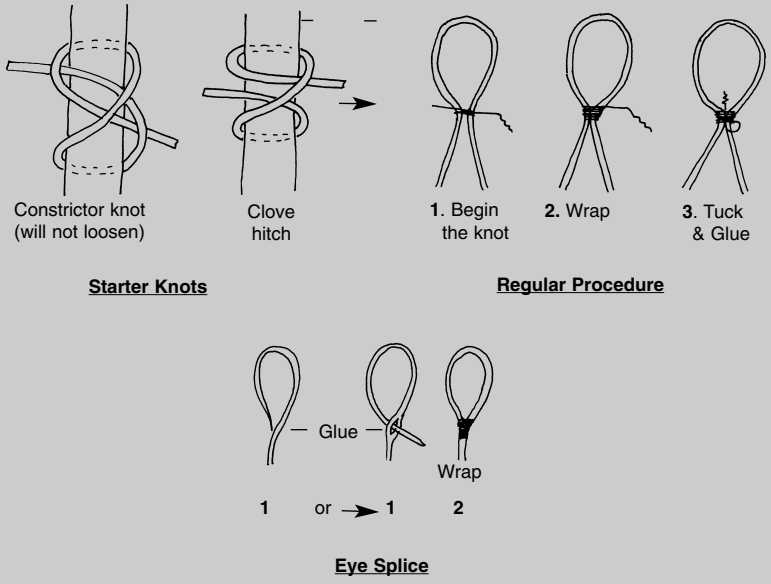


Fig 6-2 Seizing the Lines



(Figure 6-2).

Beeswax: Protects lines against moisture and lays down fuzz. To soften beeswax, hold it to a light bulb. Run the line across the beeswax, then through your fingers to soften and smooth it. Do this several times to thoroughly coat the line.

4. Blocks, Deadeyes, and Bullseyes

The plans list each block's, deadeye's, and bullseye's actual length or diameter. Because 7/32" blocks (7 inches full size) are unavailable, use 1/4" blocks. Sand them a bit to maintain scale.

The kit may substitute a deadeye for a bullseye. If so, ream its center to a single hole.

Sand the blocks and deadeyes and slightly ream their holes to better reeve the lines. Figure 6-3 shows an indispensable fixture for holding small blocks. A sewing needle threader is ideal for reeving lines through blocks and deadeyes.

Emma C. Berry has rope and iron stropped blocks. These are detailed on the plans. Stropping blocks at 3/8" scale is not difficult. However, modeling alternatives are shown in Figure 6-4 for those who opt not to do so.

5. Belaying

Emma C. Berry has one belaying pin in the boom's starboard jaw. Most lines belay to bitts, cleats, or to the port and starboard lashing rails. Sheet 4 shows where lines are belayed.

6. Rigging Tools

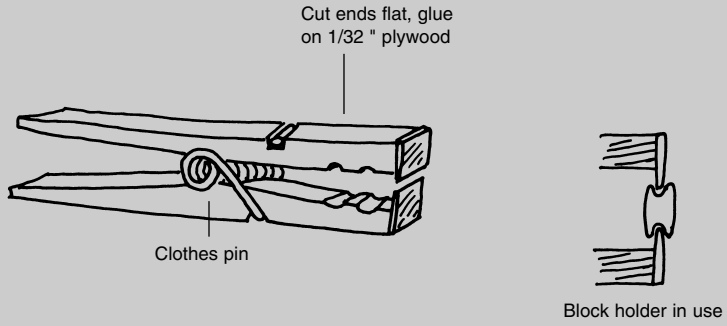
Some homemade tools are essential for the rigging process (Figure 6-5). Similar shapes are commercially available.

7. Sailmaking

The plans provide details of *Emma C. Berry's* sails. However, here are some shortcuts.

Choosing the proper material is critical. Sailcloth must be lightweight, yet fairly opaque. Tightly woven cotton is acceptable and available from Model Expo. (We will have several sizes in new catalog.) Although linen is ideal, most is

Fig 6-3 Block - Holding Jig



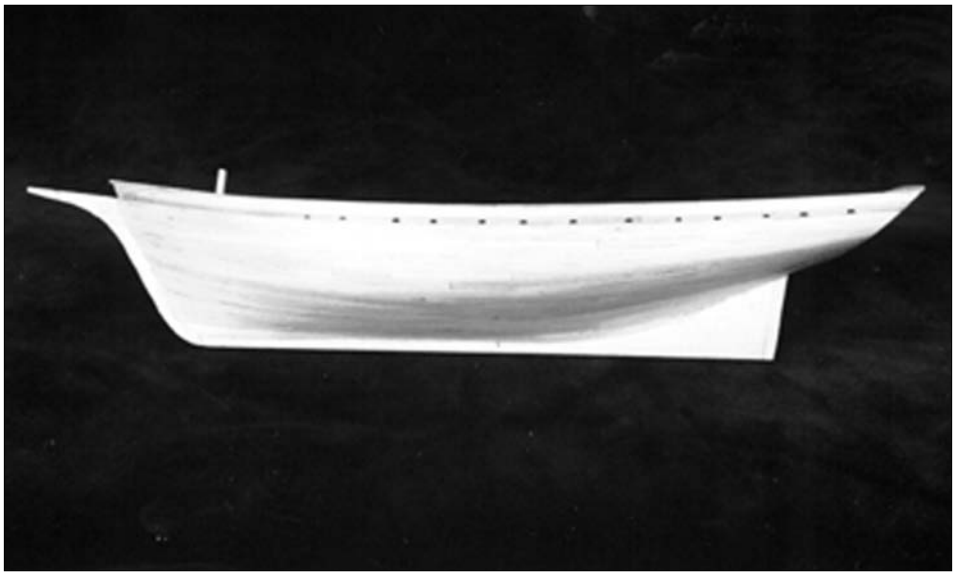
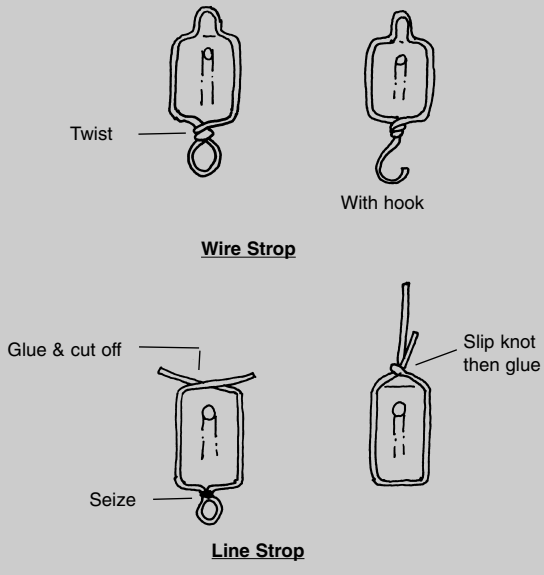


Fig 6-4 Stropping Model Blocks



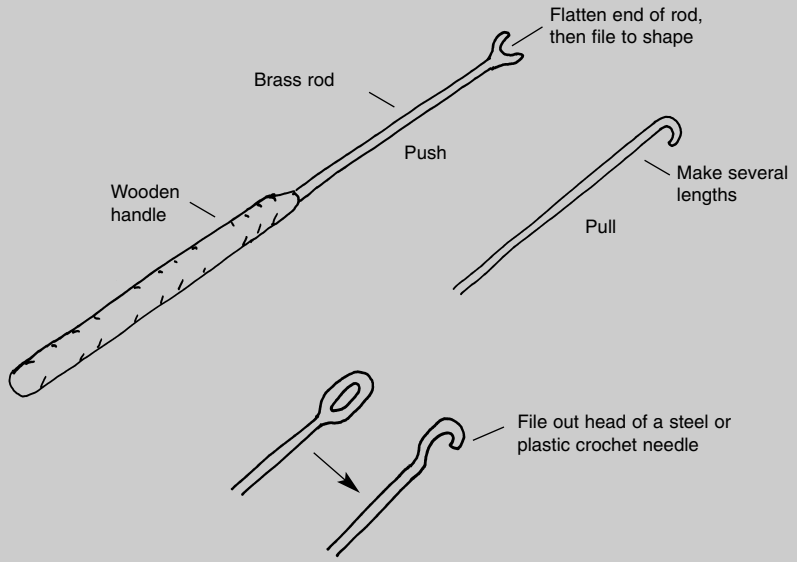
too heavy for models.

Wash sailcloth several times to pre-shrink it. When dry, iron the cloth, but be careful not to scorch it. Next, lightly draw the seams and hem (tabling) lines in pencil, then sew the seams using light tan cotton thread. A sewing machine makes fast work of the project. Practice on scrap cloth. Balance the needle thread tension so it doesn't pucker the material. No reinforcement patches are required. Instead, simply stitch lines to represent corner reinforcements, etc. If sewing a double seam, be sure the two lines are parallel. Those who lack the Betsy Ross touch can substitute a single seam. Figure 6-6 shows the mainsail layout.

When done, iron the sails. Be careful not to burn them. Next, cut the sail shape using Line A in Figure 6-6. Fold the hem, iron it flat, and sew as close to Line B as possible. Tuck the ends and hand stitch the corners. The sail is now ready for stretching.

Sewing Aids: Visit a fabric shop and purchase a bottle of *Fray-Chek.* Running or brushing it along the edge of the cloth prevents the material from unraveling when cut and produces a sharp edge. Apply it to the sail before rolling the hem.

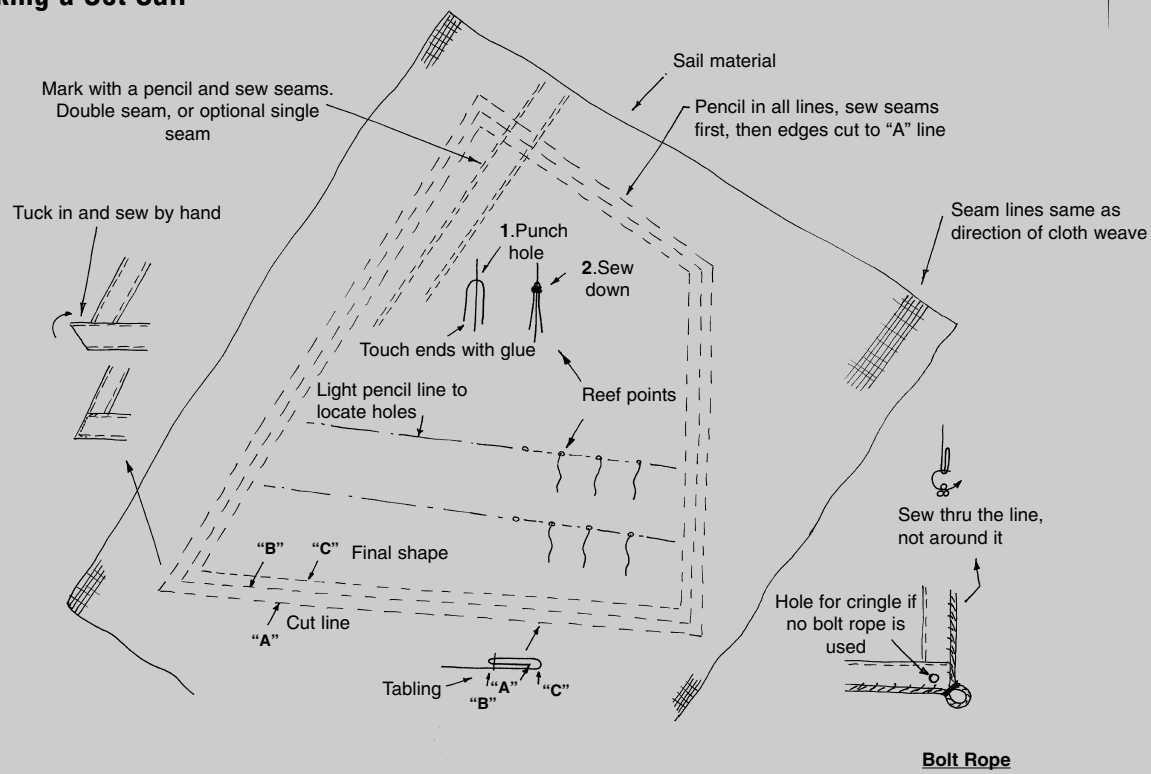
Fig 6-5 Homemade Rigging Tools



Stitch-Witchery and Wonder-Under are basically the same product. They are heat fusible bonding tapes. *Stitch-Witchery* comes in a roll and is bond sensitive on both sides. To join two pieces, simply place a strip between them and iron.

Wonder-Under comes in sheets with a thin, paper backing on one side. This material is useful for bonding letters and numbers to a scale sailboat's sail. First, buy the colored fabric for the

Fig 6-6 Making a Set Sail



numbers. Place the *Wonder-Under* sheet on the cloth with the paper backing up. Iron the sheet to bond it to the material. Next, cut out the letters, numbers, logo, or whatever with scissors or a sharp blade. Peel off the paper backing, position the letter on the sail, and iron. This technique also works for making flags from colored cloth.

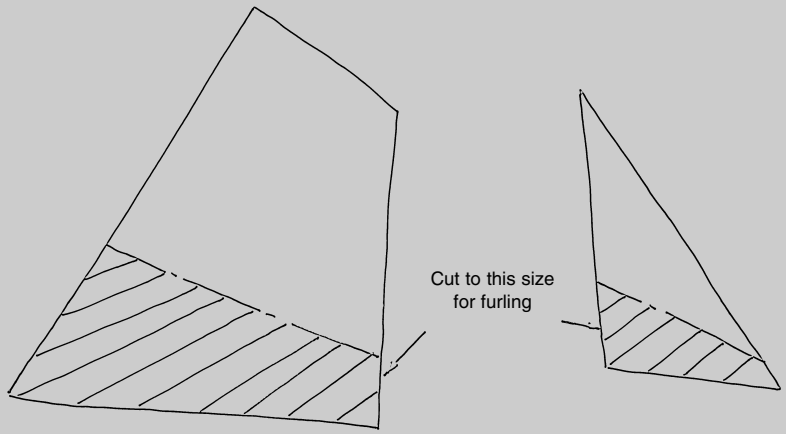
Emma C. Berry has no numbers. Use *Wonder-Under* for hemming the sail if sewing it is too difficult.

Stretching the Sails: This step assures the sail's proper shape, since sewing may have altered it. Using the original pattern, trace the sail's outline onto a piece of paper. Place the paper on a solid, but porous backing, such as a wood or cork board. Now wash the sail again and lay it over the outline. Stretch the wet material to the sail's outline, then secure with stick pins through its outer edges. When dry, the sail will have resumed its proper shape. Iron it one more time.

Boltropes and Reef Points: Although boltropes can be omitted, they add quite a bit to a model the size of *Emma C. Berry* (Figure 6-6). The sketch also shows how to install reef points.

Furled Sails: Don't furl sails made from sailcloth and cut to the original's scale size. The material is usually too heavy, resulting in a bulky furled sail. To solve this problem, either proportionally reduce the size of a sail by one-third when using sailcloth (Figure 6-7), or buy a lighter material such as Silkspan (model airplane covering tissue available from Model Expo). Depending on their size, even Silkspan sails may require being reduced by one-third. Test the percentage reduction to determine how much material is needed for a neat, tight furl.
Even furled sails need some seams and hems, as these details are visible.

Fig 6-7 Making Sails for Furling

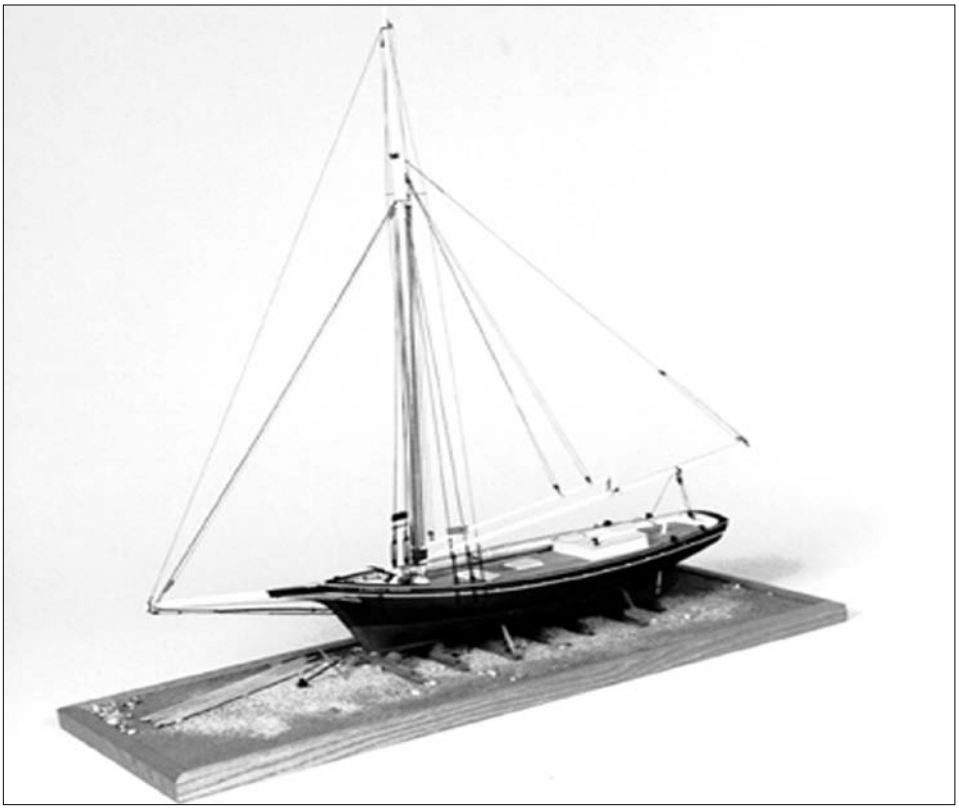


8. Rigging the Model Without Sails

Include most of the lines that remain when sails are removed. These are shackled together, tied off, or secured to some other stowage point. Sketches here and on the plans show some details.

If no mainsail is present, lower the gaff on top of the boom and stack mast hoops between them.

STAGE 7



Standing Rigging

Before starting, sort lines by size, coat with beeswax, and keep them handy. Use polyester, silk, or nylon sewing thread for seizings. Treat this with beeswax. Keep white glue at the ready for dabbing on a seizing if necessary. Usually sewing through the shroud followed by a half hitch will prevent a seizing from unraveling.

Serve lines before installing them. As previously stated, serving will enhance the model's appearance. Refer to the section on serving for procedures.

1. Shrouds

Note: Before rigging, make sure all hoops are placed on their masts.
Begin the standing rigging with the lower shrouds. Install the starboard pair first. Note: Double seize shrouds after wrapping them around the masthead.

Lower deadeyes have flat chain plates. Make them from brass strip. A cap rail fits over the chain plates (Figure 7-1). To set up the shrouds, make a temporary brass wire fixture to space the deadeyes as seizing progresses (Figure 7-2). The fixture should be longer than the final spacing of deadeyes. Reeving the lanyards will tighten the shrouds to their final proper spacing. Make a test shroud first to see how much it stretches.

Figure 7-2 also shows the sequence for reeving lanyards. When looking outboard at any deadeye, always start with a knot in the upper left-hand deadeye hole. Consequently, port deadeyes have the knot aft and starboard deadeyes have it forward. Keep an eye on the masts. Rigging the shrouds can pull them out of alignment.

The bitter ends of the shrouds set up inboard, not on the side. There are three seizings. Seize the wooden sheer pole above the top set of deadeyes.

2. Topmast Backstays

Topmast backstays are eye spliced over the masthead, run to the spreader, and down to a lanyard. The lanyard, between the shroud eye splice and shackle on the chain plate, is hitched to itself just below the backstay eye thimble (Figure 7-3). Tension it like the main shrouds and allow for stretching.

3. Jib Stay and Topmast Stay

Install the jib and topmast stays after the shrouds are completed. Start these lines by making an eye splice around the masts. Be careful not to pull them out of alignment when installing the stays. To keep things taut until the mainsail is bent, run a temporary line from the masthead to the stern (Figure 7-4).

The topmast stay is eye spliced to a shackle at the bowsprit. The forestay passes through a hole in the bowsprit, runs to a bullseye at the stem, then seizes to itself. Neither are parceled and served. *Emma C. Berry*'s jib stay has a core line wrapped in stranded lines. For the model, just use the line as is.

4. Bobstay and Bowsprit Guys

The chain bobstay fits to the stem. Part of the chain is parceled and served as shown on the plans. Prior to installing, wrap the chain with cloth and serve it with thread. Or, cover the chain with heat-shrink electrical tubing. The for-

Fig 7-1 Chain Plates and Shroud Seizing

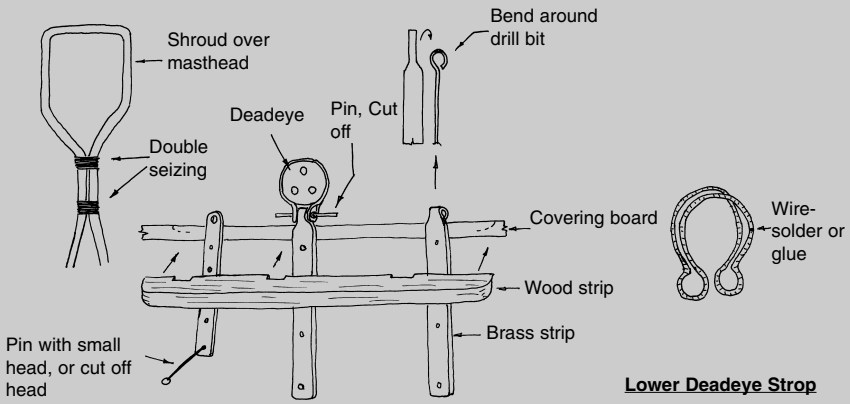


Fig 7-2 Setting Up Shroud Deadeyes

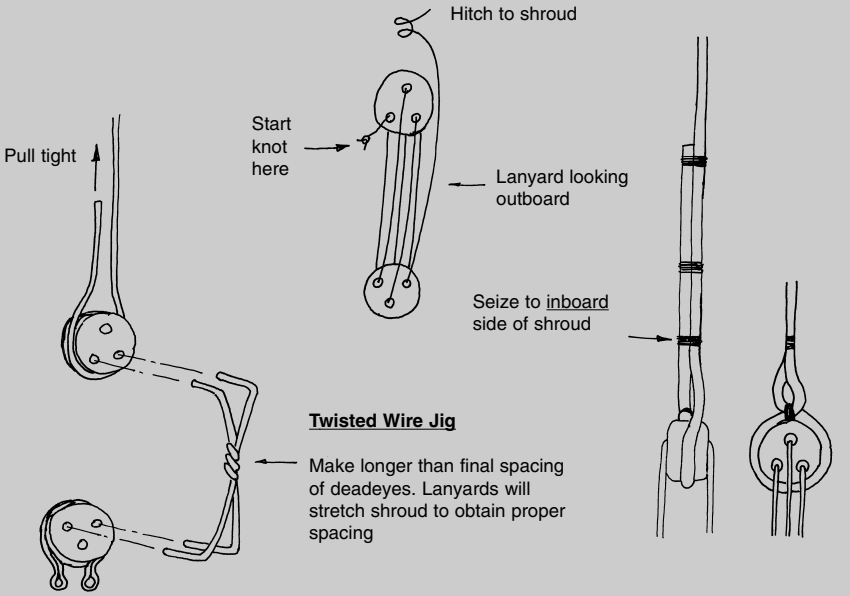
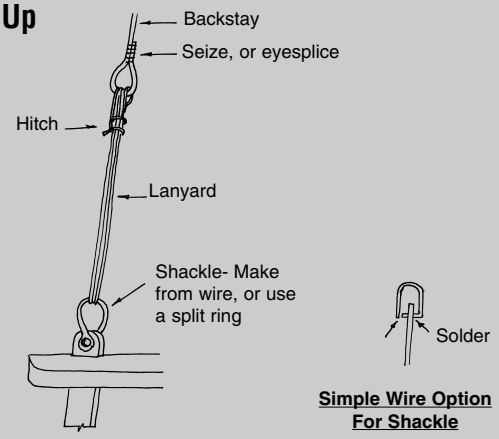


Fig 7-3 Topmast Backstay Set-Up



ward end of the bobstay sets to bullseyes and lanyard (Figure 7-5).

Bowsprit guys (also called bowsprit shrouds) are single, parceled, served lines (Figure 7-6).

5. Running Lights

Glue the britannia running lights to flat, wooden boards. Or, drill a hole in the side of each light, then peg to the board with a pin dipped in cyano. Paint the boards and running lights. Seize the boards to the shrouds

STAGE 8

(Figure 7-7). Remember, port is red and starboard is green.

Running Rigging

Decide whether to rig with or without sails or with a few furled. The following discusses the choices and how to rig them.

1. Mainsail

Lace the mainsail to the boom and gaff (Figure 8-1). Rig as much of the mainsail off the model as possible. Leave enough line for reeving, handling, and belaying. Don't be in a hurry to snip lines flush. They may need retensioning as rigging progresses.

Install the gaff, boom, and sail. Reeve the throat and peak halliards first, then the main sheet. Rig the topping lift last. Sew the mast hoops to the sail as shown on the plans (Figure 8-2).

If no sail is used, rig the topping lift first, then the boom sheet. Lower the gaff on top of the boom, and rig the throat and peak halliards. Hold the mast hoops together with a small line around the gaff and boom (Figure 8-3).

Belay the topping lift to the cleat on the port side of the boom. Belay halliards to cleats on the mast. The boom sheet runs through a double block on the horse, then belays to the stern rail bitts (Figure 8-4).

Reef pendants belay to the mainsail's tack with a simple hitch. If rigging without sails, don't add reef pendants. They are removed with the sail.

Fig 7-4 Setting Up Headstays

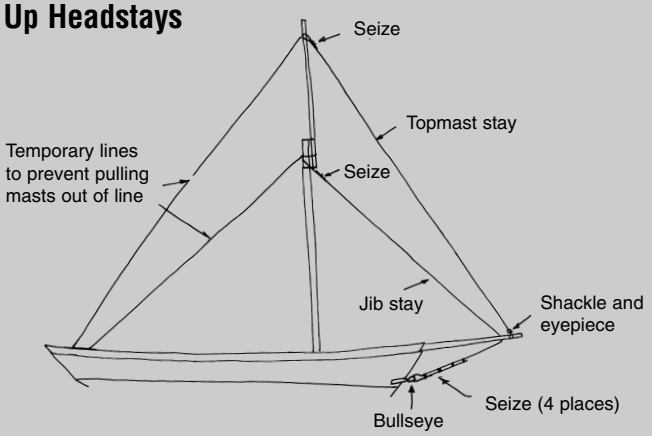


Fig 7-5 Rigging the Bobstay

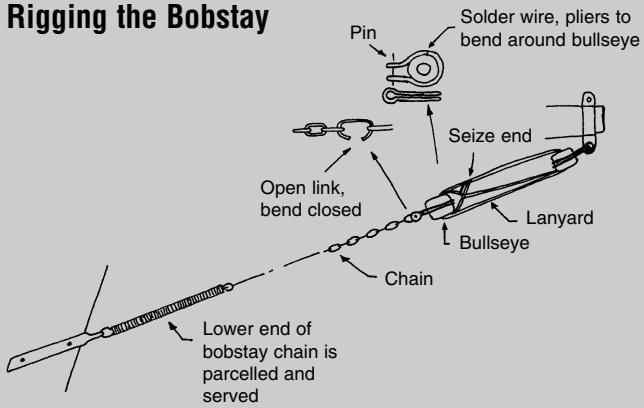


Fig 7-6 Bowsprit Guys

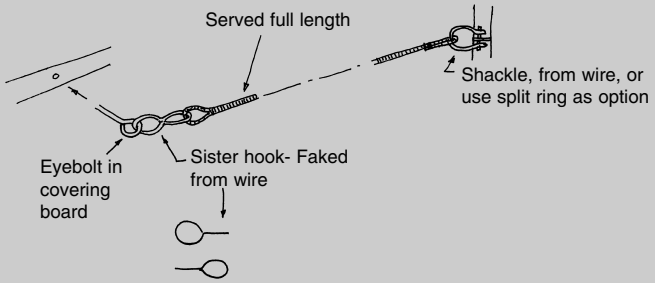
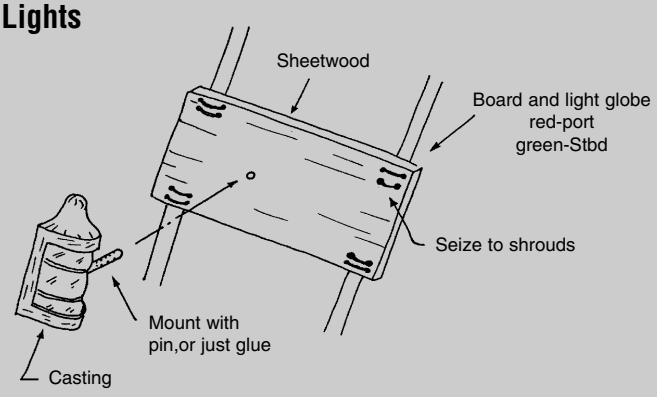


Fig 7-7 Running Lights



2. Gaff Topsail

The gaff topsail is generally set up on the starboard side of the gaff. Because there is only a single tack, the sail isn't constantly shifted from port to starboard and vise versa.

The sheet feeds through a block with a long pendant, then belays to the lone pin in the boom jaw. The tricing line (pulls sail in for furling) runs through a metal ring seized to the sail's luff (Figure 8-5).

As with the mainsail, sew the mast hoops to the luff. If no sail is bent, bunch hoops on the topmast.
With the sail removed, connect the sheet and halliard (Figure 8-6). If the sail is furled, make it a tight bundle (Figure 8-6). Notice the lack of ratlines on the shrouds. When a crewman went topside, he climbed along the mast hoops.

3. Jib

If rigging with sails, add their halliards, downhauls, and sheets before installing on the model. Leave enough extra line for belaying (Figure 8-7).

The real boat has steam-bent wooden hanks for bending the jib to the forestay, but the kit contains split brass rings (Figure 8-7).

Belay the halliard to a cleat on the mast. The downhaul feeds through a small cheek block on the bowsprit, passes through a hole in the starboard buffalo rail, then belays to the lashing rail. Lash the sheet's standing end to the after shroud chain plate. The running end goes through a block on deck and belays to the forward most stern rail bitts. This permits operation near the tiller.

If sails are not used, attach the halliard and sheet blocks to the downhaul, then bring it just forward of the mast. Another option is to eliminate the sheets, attach the downhaul and halliard, and bring the combined lines to the end of the bowsprit (Figure 8-8).

4. Topmast Staysail

The topmast staysail sheets lead directly to the aft lashing rails. This sail, like the others, is operated from the tiller. Note: The downhaul originates at the tack, not at the head like the jib. It runs through a block shackled at the end of the bowsprit,

Fig 8-1 Gaff and Boom Lacing

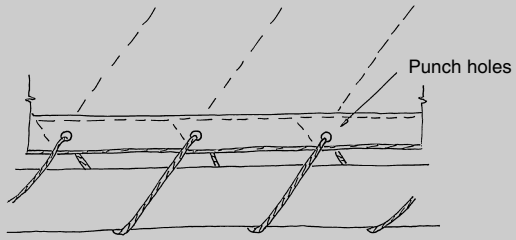


Fig 8-2 Sewing Mast Hoops

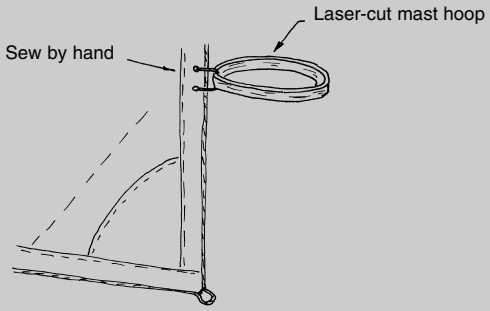


Fig 8-3 Gaff in Lowered Position

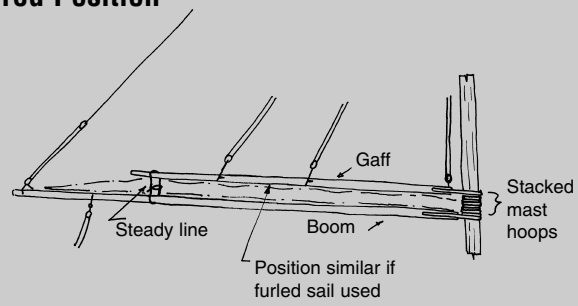
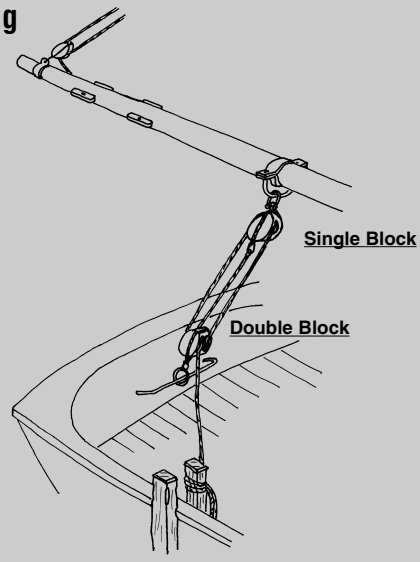


Fig 8-4 Main Sheet Rig



through a hole in the port buffalo rail, and belays to the lashing rail.

If the sail is not installed, the sheets are removed with it. They are attached with a bowline hitch and are not easily untied. Shackle the downhaul to the halliard similar to the jib.

5. Tiller and Boom Preventers

Port and starboard preventers run from the tiller and boom iron to the bitts. These lines, used only when the boat is in port, steady the boom and tiller.

6. Gaskets

Gaskets furl the sails on top of the bowsprit. These are simple, port and starboard lines with a knot at the jackstay. Use a touch of glue on their ends to prevent them from unraveling (Figure 8-9).

FINAL TOUCHES

When the model is rigged, recheck every line and make sure the seizings are sound. If necessary, add another touch of glue. Touch up shiny spots on standing rigging with black paint or black liquid shoe polish. Use a tan stain or brown liquid shoe polish for running rigging. Check if any painted wooden parts were fouled during the rigging process and make repairs.

CONGRATULATIONS

Emma C. Berry is finished! Take a moment to revel in your accomplishment. You've persevered when the going became rough and your effort has produced results. You've developed skills you never knew you had, increased your vocabulary, and become a time traveler. We hope you've enjoyed your voyage and look forward to sailing with you on your next shipmodeling project.

Fig 8-5 Gaff Topsail Rigging

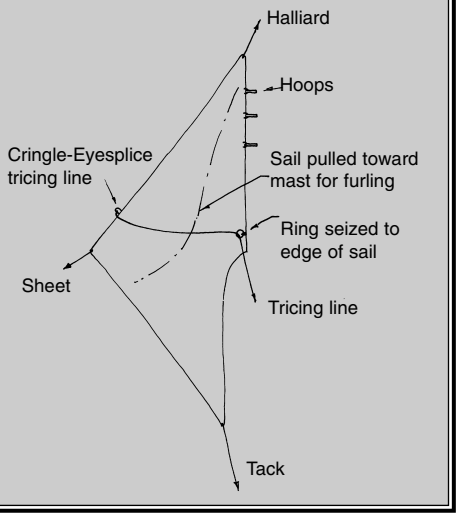


Fig 8-6 Furling the Gaff Topsail

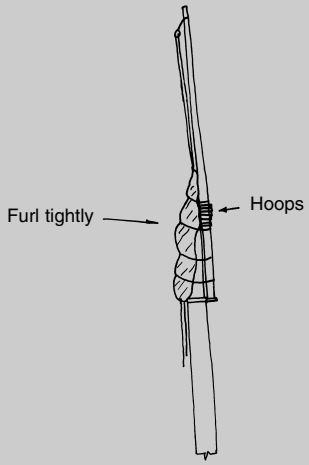


Fig 8-7 Jib Ready to Install

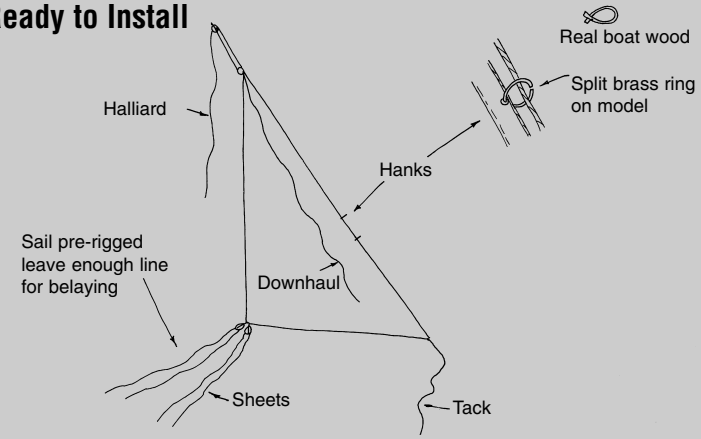


Fig 8-8 Jib Rig with No Sail

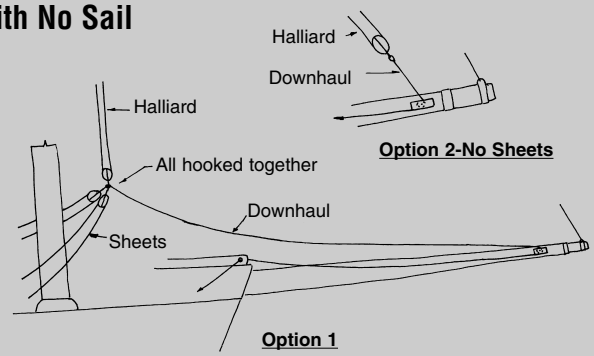
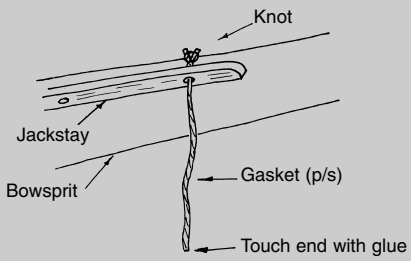


Fig 8-9 Bowsprit Gaskets



RIGGING LINE DIAMETERS

.10mm (.004")
.20mm (.008")
.25mm (.010")
.40mm (.016")
.50mm (.020")
.60mm (.024")
.75mm (.030")
.80mm (.032")
.90mm (.035")
.95mm (.037")
1.00mm (.039")
1.20mm (.047")
1.25mm (.049")
1.30mm (.051")
1.50mm (.059")
1.60mm (.063")
1.70mm (.067")
1.75mm (.069")
2.00mm (.079")
2.50mm (.098")

FORMULAS FOR CONVERTING MILLIMETERS AND INCHES

1 mm = .03937 of an inch

To find tenths of an inch:
.03937" x mms = tenths of an inch

To find mms from tenths of an inch:
Tenths of an inch ÷ .03937" = mms

Bibliography

1. *Restoration of the Smack Emma C. Berry* at Mystic Seaport 1969-1971, by Willits D. Ansel. Mystic: Marine Historical Association.

Reference for framing the *Emma C. Berry* kit. This edition also contains plans of the craft, but do not reflect its current deck layout. The book was updated in 1993 to reflect the ongoing restoration and changes made after 1971. However, it has been out of print since 1995.

2. *Mystic Seaport Museum Watercraft*, by Maynard Bray. Mystic: Mystic Seaport Museum, 1986.

Description of *Emma C. Berry* (shows 1971 version) and other craft at Mystic.

3. *Boatbuilding Manua*l, by Robert M. Steward. Camden: International Marine Publishing, 1994.

Good text on boatbuilding practices.

4. *Boatbuilding*, by Howard I. Chapelle. New York: W. W. Norton & Co., 1941.

An old standby with excellent descriptions of boatbuilding practices from that period.

5. *The Classic Boat*, by Time-Life Editors. New York: Time-Life Publishing, 1978.

Wonderful book with photos and drawings of boat construction. Has a lot about sloops.

6. *Building the Blackfis*h, by Dana Story. Gloucester: Ten Pound Island Books.

Shows a larger boat, but excellent photos of planking and framing.

SCALE CONVERSION TABLE

R I G G I N G

Diameters for Lifesize Vessel	Diameters in Tenths of an Inch	Diameters Converted to 3/8" Scale
		1/32 x Inches in Tenths
3/8"	.375"	.012" (.30mm)
1/2"	.50"	.016" (.40mm)
5/8"	.625"	.020" (.50mm)
3/4"	.75"	.023" (.60mm)
1"	1.0"	.031" (.79mm)
1-1/4"	1.25"	.039" (.99mm)
1-1/2"	1.5"	.047" (1.19mm)
1-3/4"	1.75"	.055" (1.39mm)
2"	2.0"	.063" (1.59mm)

B L O C K S

Lengths for Lifesize Vessel	Lengths Converted to 3/8" Scale
4"	0.125" (3.18mm or 1/8")
5"	0.156" (3.97mm or 5/32")
6"	0.188" (4.76mm or 3/16")
7"	0.219" (5.56mm or 7/32")
8"	0.25" (6.35mm or 1/4")
10"	0.313" (7.94mm or 5/16")
12"	0.375" (9.53mm or 3/8")

MODELER'S LOG

Date	Time	Notes

MODELER'S LOG

Date	Time	Notes

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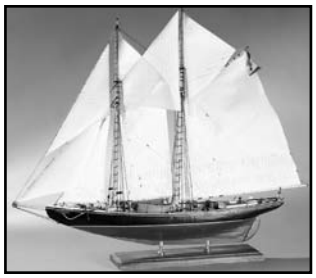

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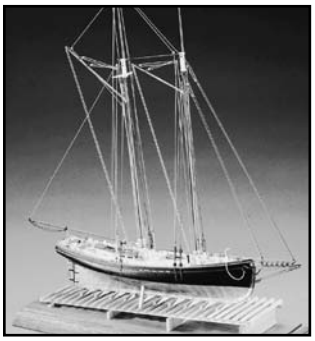

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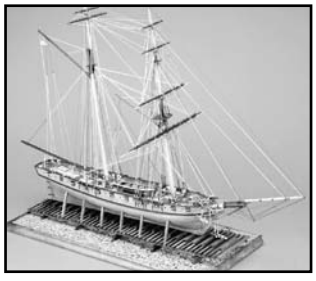

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