INSTRUCTION MANUAL

Niagara

U.S. BRIG, 1813

TECHNICAL CHARACTERISTICS

SCALE: 3/16" = 1' (1:64)
Overall length: 43"
Overall height: 27"
Overall width: 11"

MODEL SHIPWAYS
• QUALITY KITS SINCE 1946 •

Model Shipways Kit No. MS2240

HISTORY

The original *Niagara* was Commodore Oliver Hazard Perry's second flagship during the Battle of Lake Erie on September 10, 1813. His victory over the British secured the Northwest Territory, opened supply lines, and lifted the nation's morale.

Six ships in Perry's fleet of nine, including *Niagara*, were built in Erie, Pennsylvania. To accomplish the task, shipwrights, block makers, caulkers, boatbuilders, and laborers were recruited from Pittsburgh, Philadelphia, and elsewhere. Material was brought in from all over the country.

The Navy assigned ship master Daniel Dobbins of Erie to direct construction until experienced builders arrived. In February 1813, Noah Brown, a New York shipbuilder, was hired to complete the construction. He also designed two of the four schooners and the brigs, *Niagara* and *Lawrence*.

On March 27, 1813, Commodore Perry took command of the American naval forces at Lake Erie. When the famous battle began six months later, Perry was aboard *Lawrence*, his flagship. He was soon engaged in a tremendous battle with the main strength of the British line. However, for more than two hours Commander Jessie Elliott kept *Niagara* well removed from the action, content to lob shots at his adversary with two 12-pound long guns. After two-and-three-quarter hours of murderous gunfire, *Lawrence* was "one confused heap of horrid ruins." Perry gave up his flagship and was rowed to *Niagara* where he continued to attack. Two-and-a-half hours later, Perry returned to the shattered *Lawrence*, went to his cabin, and penned a quick message to General Harrison: "We have met the enemy and they are ours — Two Ships, two Brigs, one Schooner and one Sloop."

After the War of 1812, *Niagara* served as a station ship in Erie until 1820. Then she was scuttled in Misery Bay. For the centennial of the battle, Erie citizens raised the hulk and rebuilt the ship. Another restoration began in 1931, but the Depression slowed progress. The hull was completed in 1943 and masts installed in 1963. By 1988, *Niagara* was again deteriorating. The Pennsylvania Historical and Museum Commission hired Melbourne Smith, a world-famous naval architect, to redesign the entire ship and direct construction. *Niagara* was relaunched on the battle's 175th anniversary. Only a few original timbers remain in the hull, and these are used in non-structural locations. The reconstruction was completed in 1990.

The new *Niagara* hull length is 123 feet with a 32 foot beam. Draft at the stern is 10 feet 3 inches, and she displaces 297 tons. The tons burthen (old measure) is 492 60/95 tons. In 1813, the ship carried 155 officers and men, and was armed with eighteen 32-pounder carronades and two long 12-pounders. Today, 40 professionals and volunteers man *Niagara* and four replica carronades comprise her ordnance.

Niagara is operated by the Pennsylvania Historical and Museum Commission, with the assistance of the Flagship *Niagara* League, a non-profit associate group. The ship sails daily and serves as the Commonwealth's goodwill ambassador. She is the centerpiece of a new maritime museum in Erie, Pennsylvania.

For more history on *Niagara* and the War of 1812, refer to the bibliography.

TABLE OF CONTENTS

Instruction Manual

U.S. Brig
Niagara
1813 –1990

Plans and Instructions
by Ben Lankford

Model by William Hitchcock

Model Shipways developed the *Niagara* kit in 1996. Plans are based on the 1990 reconstruction drawings, research sketches, and specifications prepared and supplied by the designer, naval architect Melbourne Smith, International Historical Watercraft Society, Annapolis, Maryland. Many as-built features deviating from the plans are incorporated. These are based on visits to the brig and photographs. In addition to providing invaluable design information, Smith reviewed Model Shipways' plans for accuracy.

Modern features, such as engines and a housing over the exhaust system, are not included to maintain *Niagara's* 1813 configuration.

Photo Courtesy
of Melbourne Smith

Before You Begin

Niagara is a beautiful, interesting ship and makes a splendid model. Assembling the plank-on-bulkhead hull develops an understanding of how real ships are built, while laser-cut parts assure an accurate shape. The kit contains more than 150 laser-cut wood parts.

Although britannia, brass, and wood fittings facilitate construction, many require final finishing prior to installation. This is especially true for the britannia castings and is discussed later.

Take your time building this model. It has a fair amount of detail and small parts. Furthermore, the rigging is fairly complicated. Complete one stage before moving to the next. When things go awry, consider doing them 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
1. Set of needle files

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
Small woodcarving set, or individual gouges and chisels for carving keel rabbets, bow and stern filler blocks, ship's boats, and tapering the stem and rudder.

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" wide masking tape
10. Wire cutters (for cutting fine wire and strip metal)

H. Sandpaper
1. Fine and medium grit garnet or #100 to #200 aluminum oxide
2. #400 wet-or-dry sandpaper

I. Sail cloth
Light weave cotton or linen cloth for sails. Model Expo sells a suitable cotton cloth.

J. Finishing
1. Paintbrushes
   a. Fine 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 Kroxx, Jet, 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 bulkheads to the keel or planking to the bulkheads.


BELFRY AT BOW

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 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

Six sheets are provided:

1. Laser-Cut Wood Patterns
2. Plank-on-Bulkhead Hull Construction
3. Hull Plan and Profiles
4. Hull and Spar Details
5. Rigging Profile
6. Rigging Sections and Details

Sketches throughout the manual illustrate various construction techniques.

The *Niagara* kit is manufactured to a scale of 3/16" = 1'0" (1:64). 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.

A 3/16" architect's or 1:64 metric scale is a handy tool. Measuring and cutting parts using the scale gives a better feel for real sizes. Because these are modelbuilders' plans, actual measurements were converted to the nearest 1/64". For example, a 7/64" block is 7" on the real ship.

Measurements on the plans are in inches, but Sheet 3 contains a conversion table giving equivalent real ship sizes in decimals and millimeters.

2. Making Allowances Along the Way

Try to be exact when following the plans, but use common sense. Adjustments may be necessary to compensate for small differences in how your model is shaping up; perhaps one mast has too much *rake* (angle to the deck). Lines should not drape over fittings or conflict with other lines when *belayed* (secured). If necessary, move a belaying point or fairlead. Put yourself on the ship, imagine performing the task, and use logic.

3. Understanding Hull Lines

Beginners may not be familiar with hull lines. *Buttock* lines are vertical longitudinal planes cut through the hull. *Waterlines* are horizontal planes, and *sections* are transverse vertical planes. *Diagonals* are diagonal planes cut through the hull. These lines define the hull's shape and are used by the draftsman to *fair* it (create even curves).

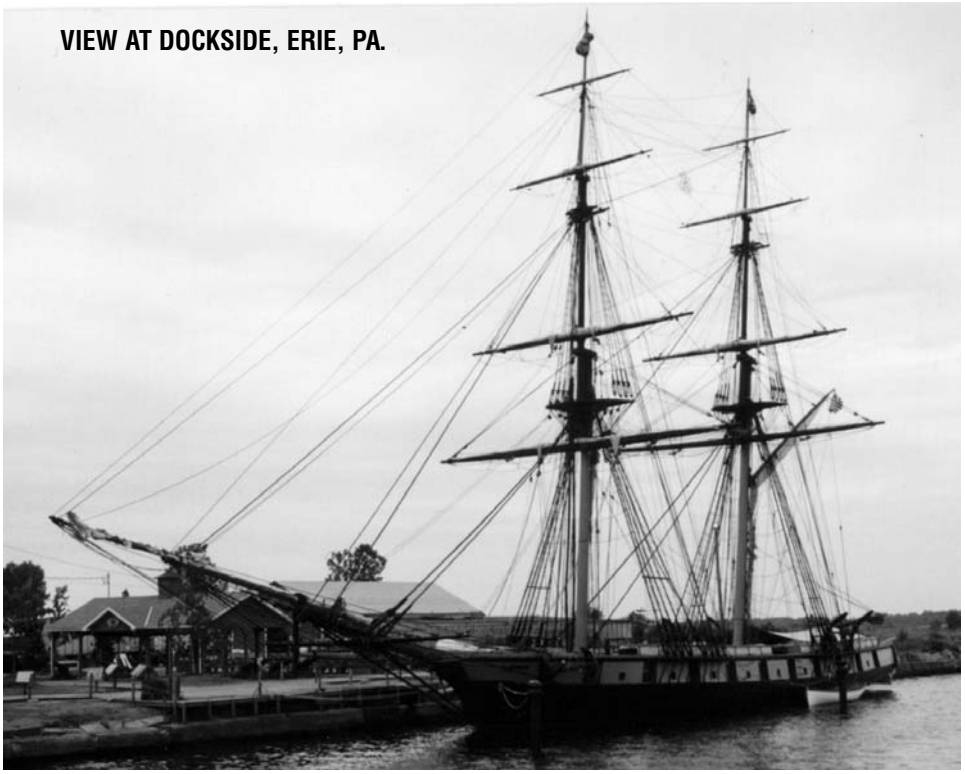
A complete set of hull lines is not needed for this model, because laser-cut bulkheads and center keel define the hull. Sheet 2 shows the bulkheads. They are similar to a ship's *body plan* or sections, and illustrate how the hull curves from top to bottom.

4. Using Basswood Lumber

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 *Niagara's* 3/16" = 1'0" scale, 1/64" equals 1" on the real ship, 1/32" is to 2", 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.

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



VIEW AT DOCKSIDE, ERIE, PA.

How To Work With Plans And Parts

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.

5. Britannia Metal Fittings

Although most parts are wood, the kit contains a small number of britannia fittings. Before painting them, remove any mold joint flash with a #11 hobby blade, then file smooth or sand 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.

6. Soldering and Working with Brass

Niagara doesn't require a great deal of soldering. However, here are a few tips:

Cut brass sheet and strips with a small pair of tin snips or heavy scissors. Heavier brass requires 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. The brass will become hot, so clamp the pieces to the drill press table or hold them down with a wooden stick. Use a speed reducer to keep rpms under 2,000; otherwise, excessive heat buildup will break a small bit.

LOOKING FORWARD

Solder: 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).

Flux: Purchase pure solder and buy flux separately for additional control. Paste fluxes apply more precisely than liquids, which run to all the wrong places.

Soldering: 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.

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 glob of fillet. 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.

CAPSTAN AND SKYLIGHTS

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, gently dust the hull with a soft brush and clean, soft rag or tack rag. Use a hobby 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; Model Shipways' Historic Marine Paint, Floquil lacquers or Polly-S and Polly Scale acrylics, Tamiya, Testor's Model Master, and Humbrol. Jo Sonja artists' paints (used by bird carvers) or Holbein Acryla Gouache are also acceptable. Unlike pure acrylics, which have a little sheen, the gouache in these paints make them flat.

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.

Floquil's reducer works in an unusual way. Spraying on a single coat blends colors and subdues 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.

BOW AREA

Painting And Staining 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: A high quality inexpensive airbrush is available at www.modelexpo-online.com, 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 spray solvent through them.

Paints are either water (acrylic) or solvent based. We recommend Model Shipways' Historic Marine Paints with kit (No. MS2240MS) specifically matched for the Niagara Model. Paint should be thinned down for proper spraying. This paint is acrylic and allows for easy wash-up and cleaning of tools.

If 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 spray on several extremely light coats 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.


QUARTER DAVITS

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.

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. 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. *Niagara's* Color Scheme

The color scheme is shown on the plans. Sheet 3 matches it to equivalent Floquil marine colors. Some are straight out of the bottle, others a mix. (Model Shipways sells a *Niagara* paint set.) If another manufacturer's paints are used, match them to Floquil's color chart. Without this chart, follow the description on the plan. The colors may not match exactly, but should be close enough.

STAGE 1

Framing the Plank-on-Bulkhead Hull

1. Bending Wood

Building a P-O-B 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 take care 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 was 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.

Model Expo sells an electric plank bender (MS7205). It is designed for controlled heat and can be purchased at www.modelexpo-online.com.

Fig 1-1 Assembling the Center Keel

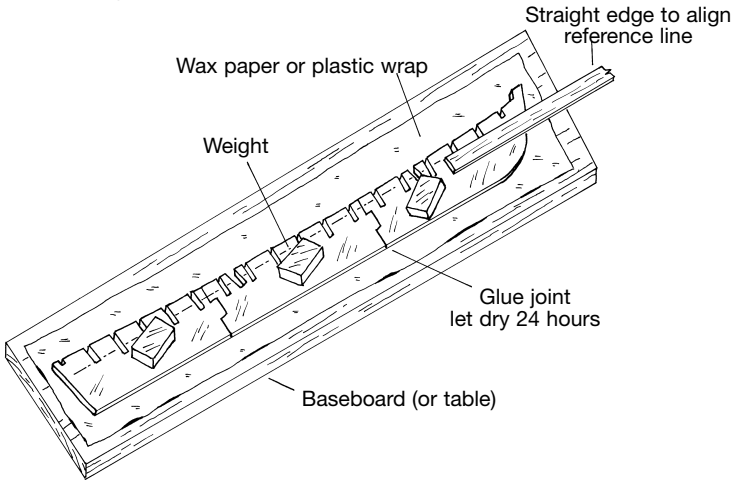
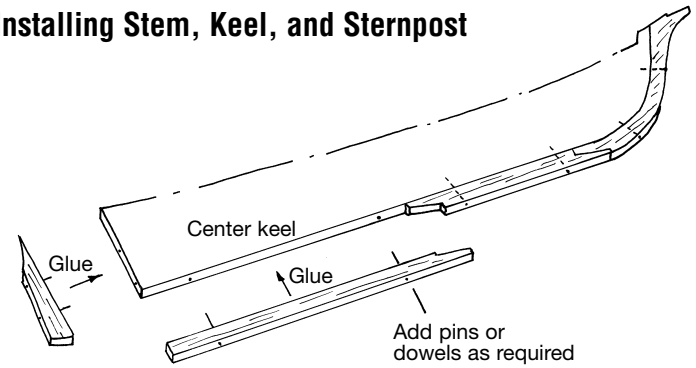


Fig 1-2 Installing Stem, Keel, and Sternpost



2. Center Keel Assembly

The first step in constructing the hull is to assemble the three laser-cut center keel pieces. With a sharp pencil, mark the reference line and bulkhead stations on both sides of the center keel. Be critical and measure from several points on the plans when marking the reference line. It is a key to proper alignment and locates Bulkheads **A** through **Q**.

Lay a sheet of waxed paper or plastic wrap over a flat building board or table, and place the center keel pieces on top. Affix the joints with white or woodworker's glue. Use a steel or aluminum straightedge to align the reference line. If necessary, add weights to hold down the parts. Let the adhesive dry at least overnight, preferably 24 hours (Figure 1-1).

3. Installing the Keel, Stem, and Sternpost

Add the keel, stem, and sternpost. Before installing, taper the stem as shown on the plans. Align and hold the pieces with dowels (Figure 1-2).

4. Cutting the Rabbet

The *rabbet* is the glue line separating the keel, stem, and sternpost from the center keel. The *bearding line* is the intersection of the center keel with the inside of hull planks. Measure the bearding line's location from the P-O-B plans, then mark it on both sides of the center keel. At the stern and bow, cut a 1/16" deep rabbet with a #11 hobby knife. Cut on or slightly above the glue joint. Next, start the rabbet cut at the bearding line. Use a 1/8" wide chisel and cut toward the rabbet. The 1/16" thick hull planking must lie flush against this cut area. To judge the angle of the rabbet, position a scrap piece of plank against the keel as you cut. The angle changes near amidships (Figure 1-3).

5. Installing the Bulkheads

The laser-cut bulkheads include timberheads. These extend above the deck to form bulwark stanchions. Compare the bulkheads with the patterns on Sheet 1, determine which is which, and label them **A** through **Q**. Test each to make sure it slides into the correct center keel slot. If the fit is too tight, sand the slot. Bulkheads should fit snugly with a little tolerance for glue.

Using a pencil, mark the reference line on each bulkhead. It must align with the reference line mark on the center keel. This assures an accurate hull, because each bulkhead is correctly related to the others.

Next, use a tick strip to transfer the bevels from the plans to the bulkheads. Mark them in pencil. Cut the bevels with a #11 hobby blade (Figure 1-4). Note: Cut bevels on the inboard side of timberheads. Deck bevels and side bevels near amidships are diminutive. Barely perceptible ones are sanded in after the bulkheads are installed.

Glue the bulkheads in place. Make sure each bulkhead's reference line matches the one on the center keel. Use a small machinist square to set each bulkhead perpendicular to the center keel, then tack or tape a temporary strip to the top of the bulkhead to hold it in place while the glue dries (Figure 1-5).

Model Expo sells the Fair-A-Frame Building Slip. It holds the center keel steady and bulkheads perpendicular to it. Purchase it separately.

Once the bulkheads are installed, tack or tape a temporary batten to each side of the hull just below the deck (Figure 1-6). This is a critical step. Measure the spacing between each port and starboard bulkhead and retack the battens until the hull is aligned. Although the center keel was assembled flat, it could warp and produce a banana-shaped hull. When it looks correct, check it again.

After the hull is aligned, add permanent struts between each bulkhead close to the exterior, then remove the battens. Now examine the bottom of each bulkhead. It should feather out and lie precisely on the bearding line. If not, trim until it does. Also check that the top of each bulkhead at the centerline is flush with the top of the center keel. Since alignment is based on the reference marks, slight errors can occur. Sand or add shims until the bulkheads and center keel surfaces are flush (Figure 1-7).

Next, sand in the bevels that were not precut. Check the hull's fairness by laying a 1/8" square basswood batten against the bulkhead edges at various locations (Figure 1-8). Correct bumps and dips by sanding or adding shims. This is an important check. Hull planks must lie flat against the bulkheads. With *Niagara's* numerous bulkheads, it's possible for manufacturing or assembly errors to occur.

Fig 1-3 Cutting the Rabbet in Center Keel

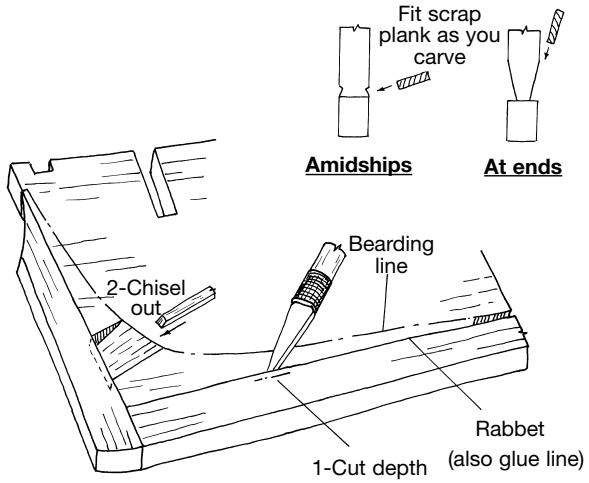


Fig 1-4 Cutting Bulkhead Bevels

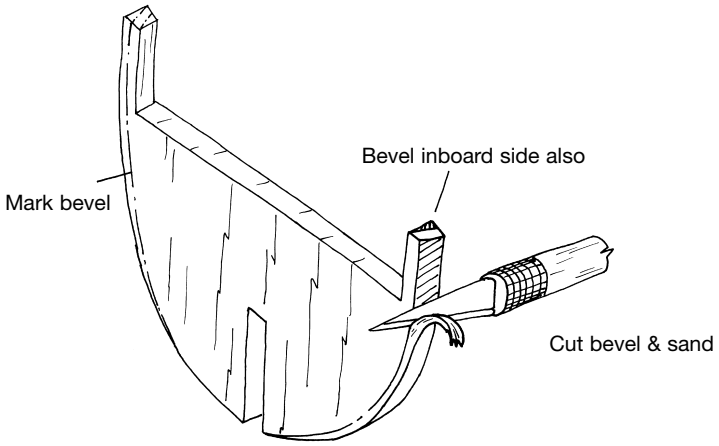
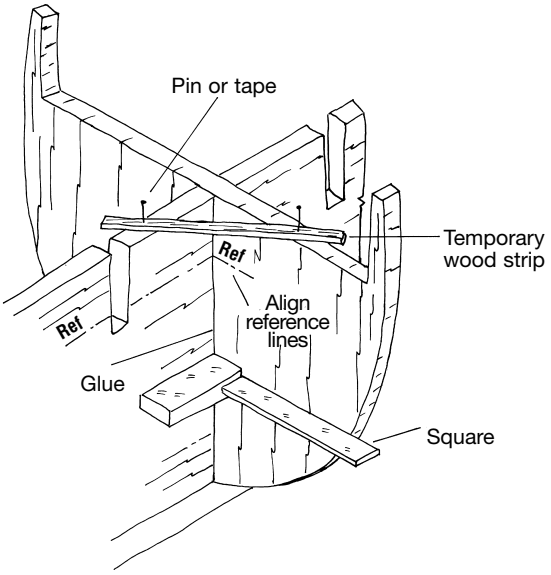


Fig 1-5 Gluing Bulkheads to Center Keel



6. Installing the Stern Blocks and Transom Framing

Refer to Sheet 2. Port and starboard filler and corner filler blocks butt into **Bulkhead Q** and the center keel. They provide more area on which to glue hull planking. Some waterlines are included to aid in carving these blocks to the correct hull form.

Mount the stern filler block, then install the laser-cut stern timbers. Add the corner filler blocks. Glue the two horn timbers to the sides of the center keel. Inner and outer timbers fit into a slot in **Bulkhead Q**. Glue quarter stanchions to the corner filler block. To form the hole for the rudder stock, install the laser-cut filler piece between the horn timbers.

Timbers have stiffeners between them, while some gunports have filler pieces for support. A deck beam fits into the slot in the top of the stern timbers. Figure 1-9 shows the stern framing assembly. See the plans for pictorial views.

7. Installing the Bow Filler Blocks

After carving the bow filler blocks to shape, add them forward of **Bulkhead A**. They provide a solid base for timberheads and knightheads, and additional support for the hull planking. Planks will still need steam bending at the bow; but, with the blocks in place, are not as likely to break as they curve around the last bulkhead.

8. Covering the Mast Slots

Cut the pieces shown on Sheet 2 from scrap wood, then glue to both sides of the two mast slots in the center keel. Make sure they are securely fastened, because access to them is impossible once the deck is laid.

9. Installing the Waterway and Plankshеer

Apply glue to the scarf joints of the three-piece waterway. When dry, shape it to fit per the plans. Most shaping occurs toward the bow. Now install it against the timberheads.

Add the three-piece, laser-cut plankshеer on top of the waterway. It also requires some shaping, especially at the bow.

The plankshеer has built in gunport sills, carronade carriage-pin holes, and timberhead slots. The latter requires precisely spaced bulkheads. If this is not

Fig 1-6 Temporary Battens for Hull Alignment

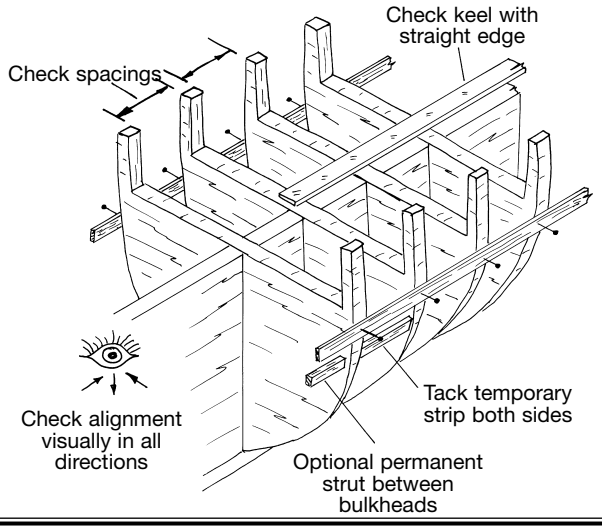


Fig 1-7 Correcting Bulkheads at Bearding Line

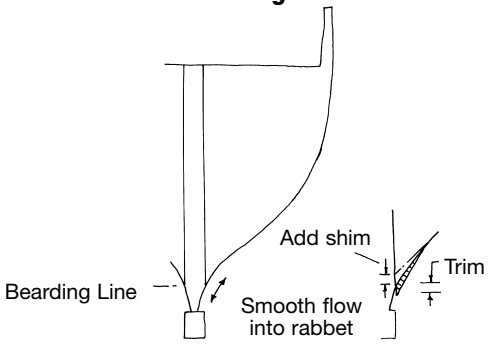


Fig 1-8 Checking Hull Fairness with a Batten

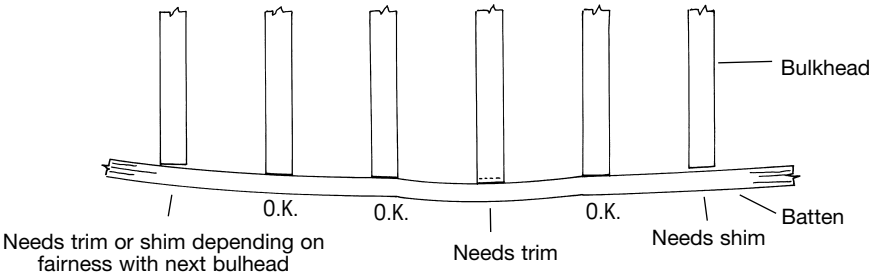
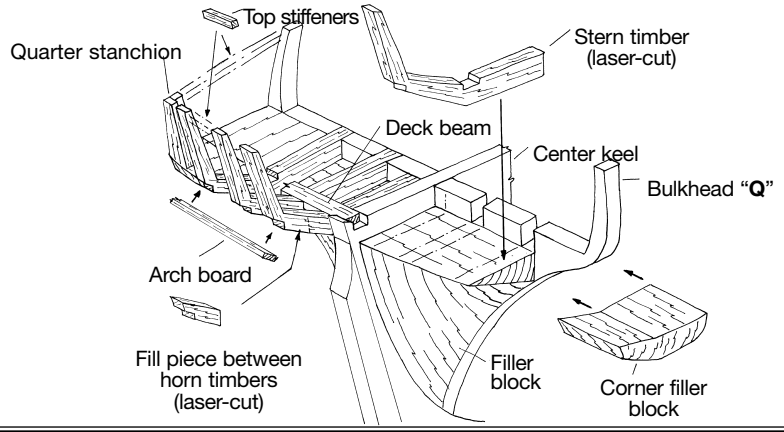


Fig 1-9 Stern Framing



the case, enlarge the slots to accept the planksheer. Once installed, fill any gaps with wood filler (Figure 1-10).

10. Installing the Knightheads and Forward Timberheads

Make the knightheads and bow timberheads, then glue them into the filler blocks' precut notches. Add the laser-cut stiffener at the top. It requires shaping to match the hull (Figure 1-11).

11. Installing the Main Rail and Chock Rail

The laser-cut main rail comes in sections with scarf joints along the side, but the stern rail is one piece. Use pins or dowels to align and hold them in place (Figure 1-12). Their locations are critical. They must evenly overhang the hull planking and ceiling planking.

A laser-cut chock rail covers the main rail at the bow. Taper it per the plan, then drill rigging line holes and cut out the section for the catheads (Figure 1-13).

12. Framing Around the Gunports and Sweep Ports

Timberheads taper from 1/8" at the deck to 3/32" at the rail. Frame around the gunports and sweep ports with 1/8" square strips. However, switch to 3/16" square pieces where the bulwarks begin to curve at the bow, then sand the outboard and inboard sides of the hull flush with the timberheads. Bulwark planking and ceiling must lie flat against this framing (Figure 1-14).

To check your work, take a strip of planking and lay it outboard on the hull, inboard against the bulwarks, and along the deck to make sure it will go on smoothly. You do not want any surprises when planking begins.

Fig 1-10 Installing the Waterway and Planksheer

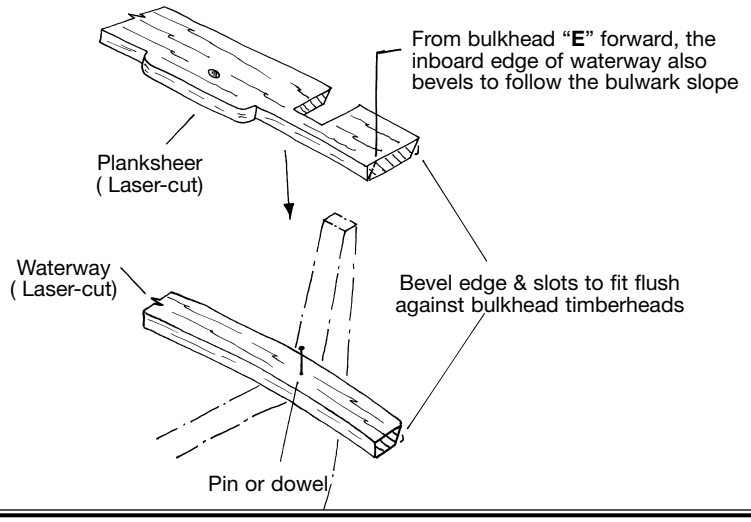


Fig 1-11 Installing Knightheads and Timberheads at Bow

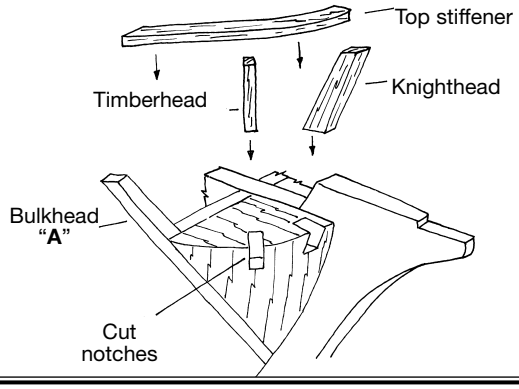


Fig 1-12 Installing the Main Rail

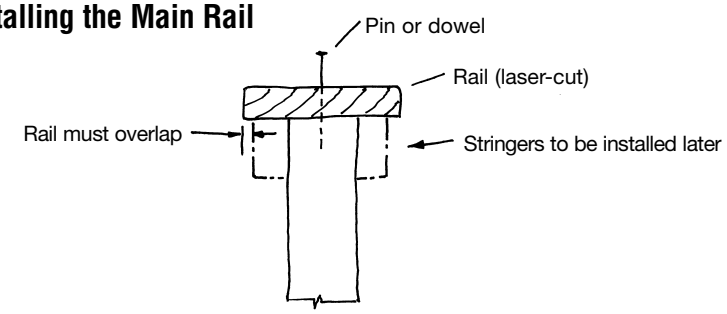


Fig 1-13 Installing the Chock Rail

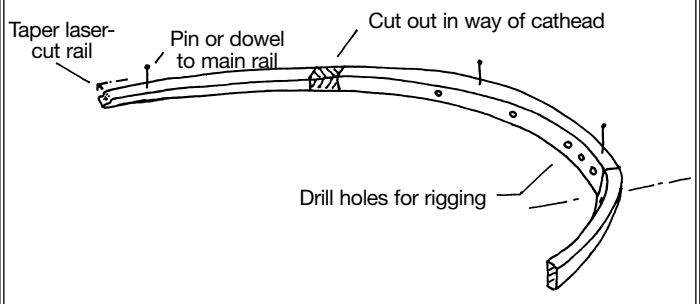
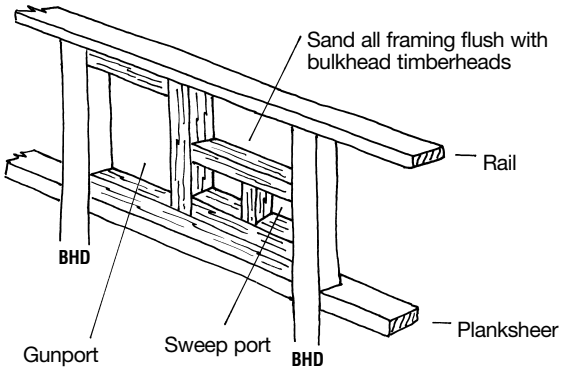


Fig 1-14 Framing Around Gun and Sweep Ports



STAGE 2

Planking the Plank- on- Bulkhead 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. *Niagara* 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 progresses.

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: Running one plank into a notch in another to eliminate a feathered edge. Nibbing generally applies to decks, but sometimes hull planks are nibbed.

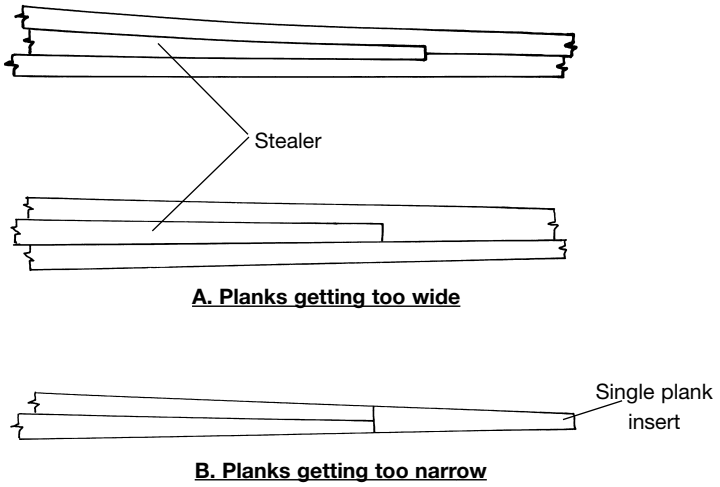
Stealer: Plank inserted into another plank or between two adjacent planks to reduce their width. Or, when two planks taper toward a narrow end, both may have to be cut off and a wider plank substituted to leave enough wood for fastening.

Counter: Underside of the overhanging portion of a ship's stern.

1. Getting Started

Most modelers find planking tedious. 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.

Fig 2-1 Planking Shown Using Stealer Inserts



Before starting, secure the hull upside down in a vise or cradle. Something portable that rotates is ideal. Model Expo sells a planking vise for this purpose.

2. Planking Battens and Belts

Hulls are easier to plank when divided into belts. Each is designed to lay the planks against the bulkheads 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 bulkheads. 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 2-1 illustrates some inserts.)

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

STERN VIEW

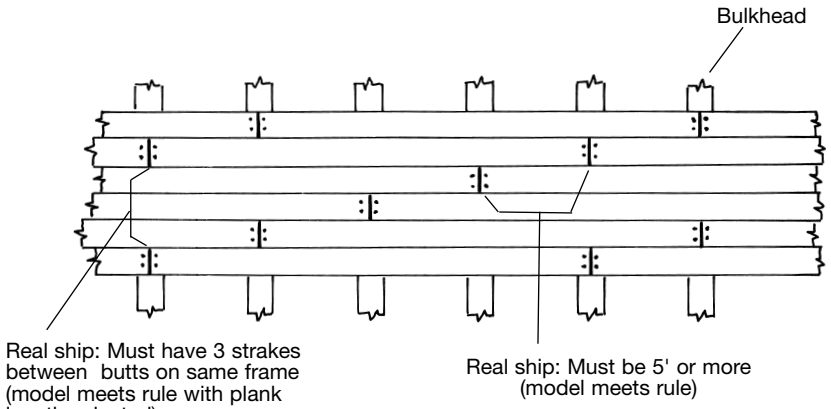
3. Planking Butts

Few trees grow as tall as ships are long. Consequently, real planks were generally 20 or 30 feet in length. Some builders think a plank as long as the model is easier to use. They scribe in fake butts or omit them. Although this can be done, working with shorter planks has its advantages. For example, tapers mark quicker and only one hand is needed to hold and fasten the plank. Should a mistake happen, just a small piece is affected. So, the following is based on scale-length planks.

Because this is a plank-on-bulkhead model, butts must occur on bulkheads and won't simulate shipwright practice. Use a 5" to 6" long plank (26 to 32 scale feet) to cover four bulkhead spaces. However, to avoid stubby pieces at the bow and stern, a longer or shorter plank may be necessary to complete the run.

To emulate shipwright practice, stagger the butts (Figure 2-2). This also applies to deck planking. Covering four bulkhead spaces follows the rule; i.e., three full plank widths between butts on a single frame. One plank covering three bulkhead spaces won't work, because that leaves only two full planks between butts.

Fig 2-2 Staggering the Planking Butts

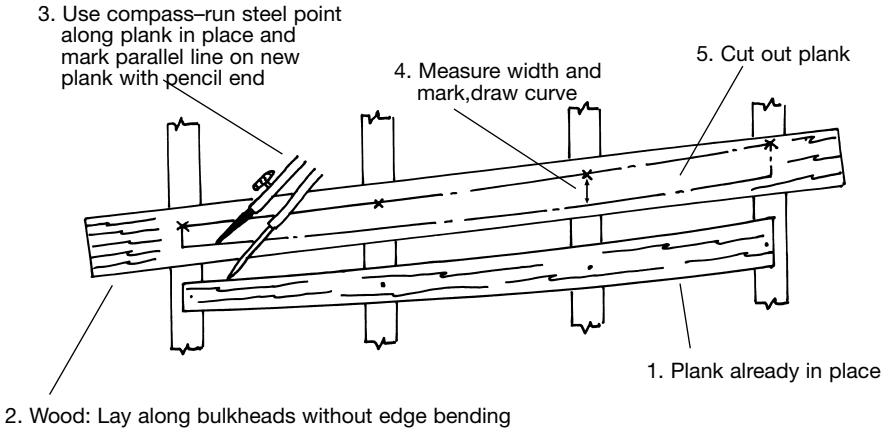


4. Spiling

Edge bending planks on real ships occurs on a limited basis. Wood is rigid, so many planks must be cut to shape. Spiling (Figure 2-3) is simply a matter of transferring curves to a straight plank, then sawing them out. In most cases, basswood strips are flexible enough to edge bend in place.

Stealers for *Niagara* are shown on the planking layout at the stern.

Fig 2-3 Spiling the Planks When Edge Bending Cannot be Accomplished



5. Fastening the Planks

A screw-type commercial plank clamp is available, but is more trouble than it is worth. It screws into bulkheads, leaving a big hole to contend with when installing subsequent planks. Model Expo, however, sells a hull planking clamp that holds planks in place with side clamps. Or, use aluminum-head 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 bulkhead with thin cyano to quickly affix the plank. Be careful not to glue your fingers to the model.

Another approach is to apply cyano to the edge of a plank already in place and on the bulkheads above it. Spray or brush the cyano's accelerator on the plank to be installed, then hold it in place. The glue sets instantly and no clamps are necessary. However, be sure to position the plank correctly the first time, because there isn't a second chance.

While glue alone will secure a plank, small brass brads or wooden treenails provide additional holding power and duplicate shipwright practice. They are essential on *bright* (unpainted) models and should be added where each frame is located on the real ship. If using brads, cut off and discard the heads, then hammer in.

Treenails are commercially available, but making them 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, dip the treenail in white or yellow glue, and drive in place. Nip the dowel flush with the planking. You can also buy a treenail cutter. This expensive accessory mounts in a handpiece.

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.

6. Outer Hull Planking

Belt Layout: Planking widths are fairly equal from the main rail to about 1/4" below the gunport sills. From there on down, planks taper fore and aft. Consequently, the hull below this point is divided into **Belts A** through **D**.

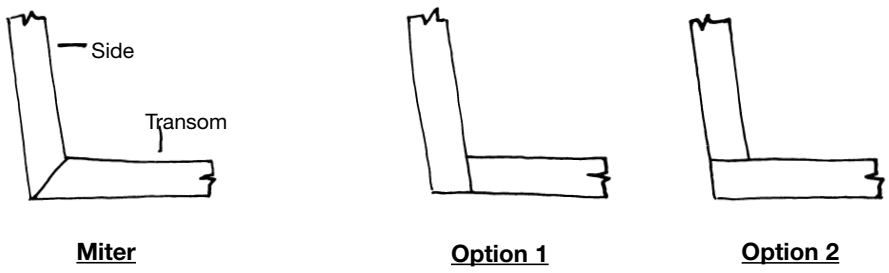
On Sheet 2, use a tick strip to mark the belt seams along each bulkhead. Transfer these points in pencil to the model. Now temporarily tack four, 1/16" x 3/32" basswood battens along the port and starboard belt lines. Battens assure an accurate run of planks by correcting any errors in drafting, tick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

Once the eight 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 lower battens referring to the planking profile on Sheet 2. When everything is fair, make sure the belt seams are clearly visible. Remark 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. Plank edges are often deliberately sloped to ensure they butt against each other, while providing a sufficient gap for caulking. To create a perfectly smooth hull without gaps, trim each plank edge as it is fit. The decision to taper or rely on filler is yours.

Planking the Counter and Transom: Cover the counter and transom with 1/32" planks. Normally, counter/transom planks and hull planks intersect in a miter. However, other options are available (Figure 2-4).

Fig 2-4 Transom / Side Plank Intersection



Gunport and Sweep Port Butt Strips: A 1/32" square, vertical strip covers the hull planking's end grain at the gunports and sweep ports. These are red on the real ship (Sheet 3) and provide a reference line for painting the model. However, those who paint only the inside of the gunports red may wish to leave the covering strips yellow like the rest of the hull planking.

Upper Hull Planking: The first plank beneath the rail is 3/64" thick. The rest are 1/32" thick except the two 3/64" thick strakes below the gunport sill. Widths are fairly uniform from bow to stern. Gunports break up most strakes, so planking butts are not an issue. For the longer strakes above and below the ports, use the following procedure:

*Laying the Planks in **Belt A***: Planks below the upper hull planking are 1/16" thick. Belts are done separately, so planking can start with any one. However, it's logical to begin at the top and work down. **Belt A** has eight, 1/16" thick strakes. The maximum plank width, at **Bulkhead H**, is roughly 3/32" on the model (6" on the real ship). Planks taper forward and aft to about 1/16". Use 1/8" or 3/32" wide strips for the midship area and 3/32" strips aft.

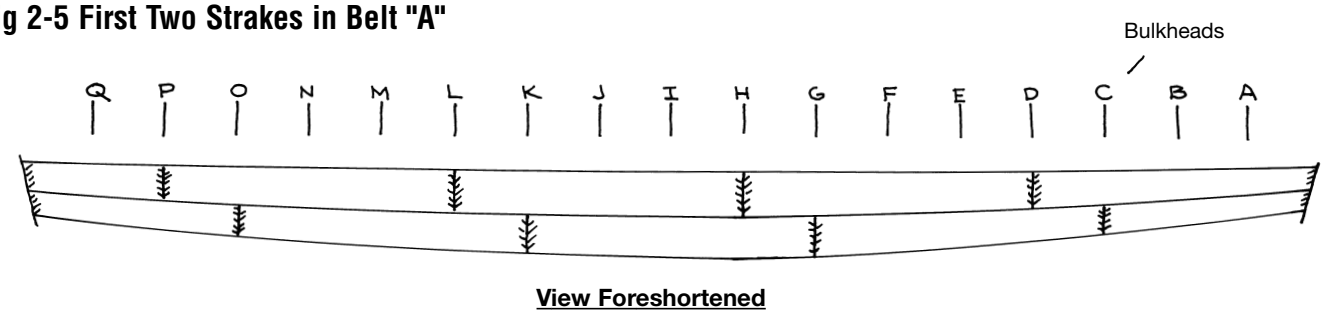
Lift the plank widths from the hull planking layout with a tick strip. If any batten locations were changed, divide the space on each bulkhead into eight equal plank widths. To do this, set the slide on your proportional dividers to the number of planks in **Belt A**. Span the width of **Belt A** with the long legs. The distance between the points on the short legs is the width of each plank in the belt. Mark these lines on the bulkheads in pencil. **Belt A** is now marked.

The next step is to cut planks to fit between the marks. **Belt A** doesn't require spiling, so make straight tapered planks. Start at **Bulkhead H**. Use a plank to cover:

1) **Bulkhead H**	to	**Bulkhead L**
2) **Bulkhead L**	to	**Bulkhead P**
3) **Bulkhead P**	to	the stern
4) **Bulkhead H**	to	**Bulkhead D**
5) **Bulkhead D**	to	the stem

First, lay a piece of planking stock over the bulkheads. In pencil, mark their overall length on the plank, then the position of each bulkhead. Next, using a set of dividers or tick strip, lift the plank widths from the marks on the bulkheads and transfer to the stock. Draw a line through the points and cut the plank. Trace this tapered plank to obtain another for the other side of the hull. Repeat for the remaining planks in this strake.

Fig 2-5 First Two Strakes in Belt "A"



Install the planks. Repeat the process for the next strake, but stagger the butts. Install a plank from:

1)	**Bulkhead G**	to	**Bulkhead C**
2)	**Bulkhead C**	to	the stem
3)	**Bulkhead G**	to	**Bulkhead K**
4)	**Bulkhead K**	to	**Bulkhead O**
5)	**Bulkhead O**	to	the stern

The hull now has two strakes of five planks each running from bow to stern (Figure 2-5).

Moving to the next planking strake, stagger the butts starting at **Bulkhead F**. Continue until the other strakes in **Belt A** are completed. Steam bend planks where required.

*Laying the Planking in **Belt B** and **Belt C***: These belts have eight strakes a little wider than those in **Belt A** . If the temporary batten is still in place, remove it. Lay the planks for **Belt B** and **Belt C**, but remember to stagger the butts.

Note: **Belt C** has some stealers, since the planking is widening.

*Laying the Planking in **Belt D**: T*his belt contains the garboard strake (next to the keel) and has only five strakes.

Note: Near the stern are two stealers. Fit them per the plans.

Sheet 2 shows a complete planking profile. Follow it to determine plank widths in **Belt D** aft. The hull planking layout doesn't show all the planks aft, so the profile view is necessary.

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.

Counter - Rabbet Intersection:
Hull planking first encounters the rabbet at the sternpost, then butts into the counter. This intersection creates a sharp point, so cut the hull plank flush with the counter planking. This was done on the real ship.

Fig 2-6 Fashion Pieces at Stern

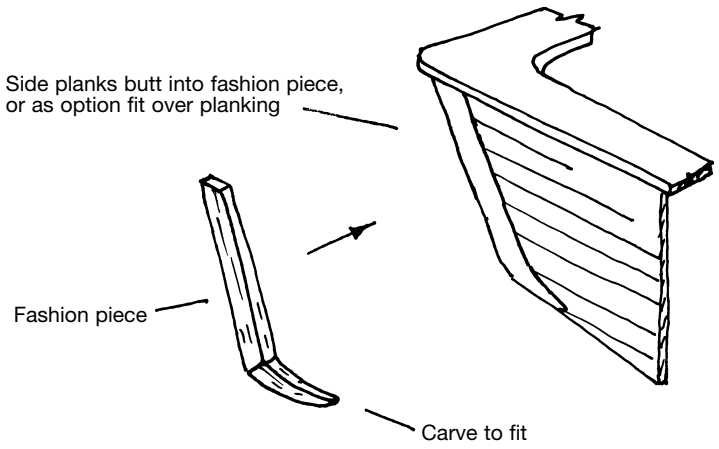
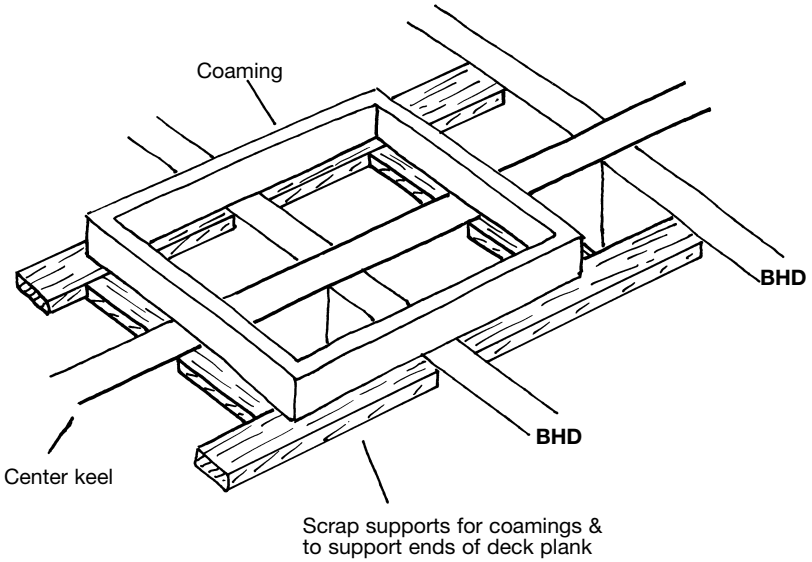


Fig 2-7 Coaming and Deck Plank Supports



Fashion Pieces: Some modelers install the fashion pieces on the port and starboard quarter stanchions, then butt the hull planking into them. However, in shipwright practice, fashion pieces fitted over the planks (Figure 2-6) to seal their end grain.

7. Ceiling (Inboard) Planking

Ceil the transom with a 3/64" thick plank at the rail and deck, and 1/32" planks between them. Bulwarks are ceiled with one 1/16" thick stringer under the rail and 3/64" wide planking down to the deck.

Note: Glue 1/32" square, vertical strips around the gunports and sweep ports to cover the end grain of the ceiling planks. Refer to Step 6.

8. Deck Planking

Coamings: Before planking the deck, decide how to treat the hatch, skylight, and companionway coamings. The recommended approach (follows shipwright practice) is to glue the coamings to their appropriate bulkheads, then plank around them. Be sure to glue and pin 1/8" thick scrap wood underneath each coaming's free sides prior to installation. This takes the place of deck beams and provides a permanent landing for the planks (Figure 2-7).

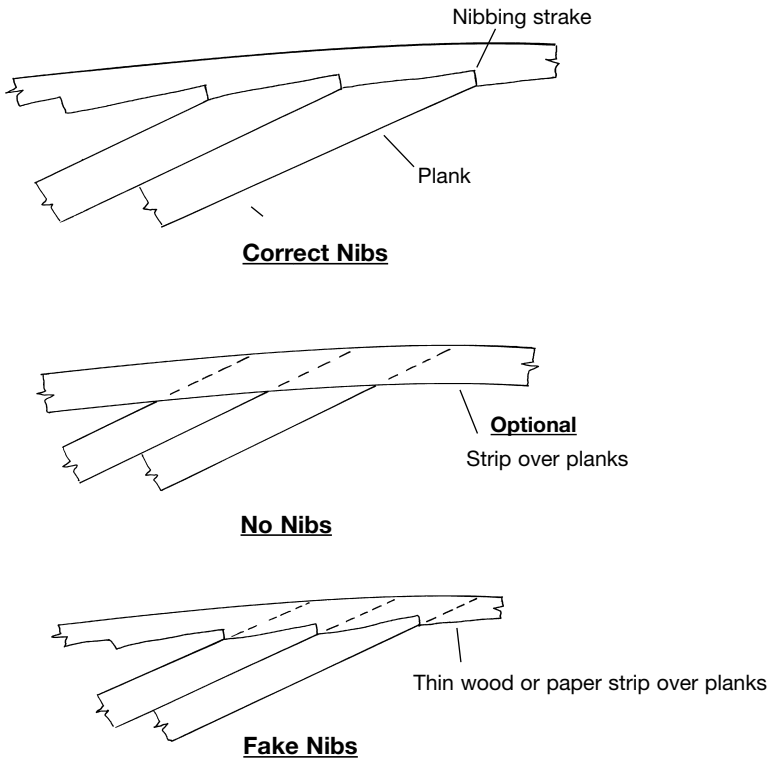
The alternative approach is to install the coamings, hatches, and deck structures on top of the deck, but remember to reduce their height by 1/16".

Deck Planks: Deck planks are 1/16" thick. Those forward and aft near the centerline run parallel to it. Away from the centerline, planks taper from midship aft and parallel the waterway. To omit this detail, install planks parallel to the centerline without tapering. While not accurate, it will still look presentable.

Prepare the strip 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: Start deck planking at the centerline and work outboard. Scrape off any glue that squeezes out before adding the next plank. Butts can be included or omitted. On the real ship, they don't show up as readily as the seams. Butts can also be scribed after the plank is laid. If desired, fasten planks with brads or treenails (see Step 5).

Fig 2-8 Nibbing Ideas



Nibbing Strake: The nibbing strake lies next to the waterway. Installation is a little tedious, so either do it correctly or take a shortcut (Figure 2-8).

Doublers: These timbers reinforce the deck beneath the capstan. See the plans.

STAGE 3

Completing the Basic Hull Structure

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

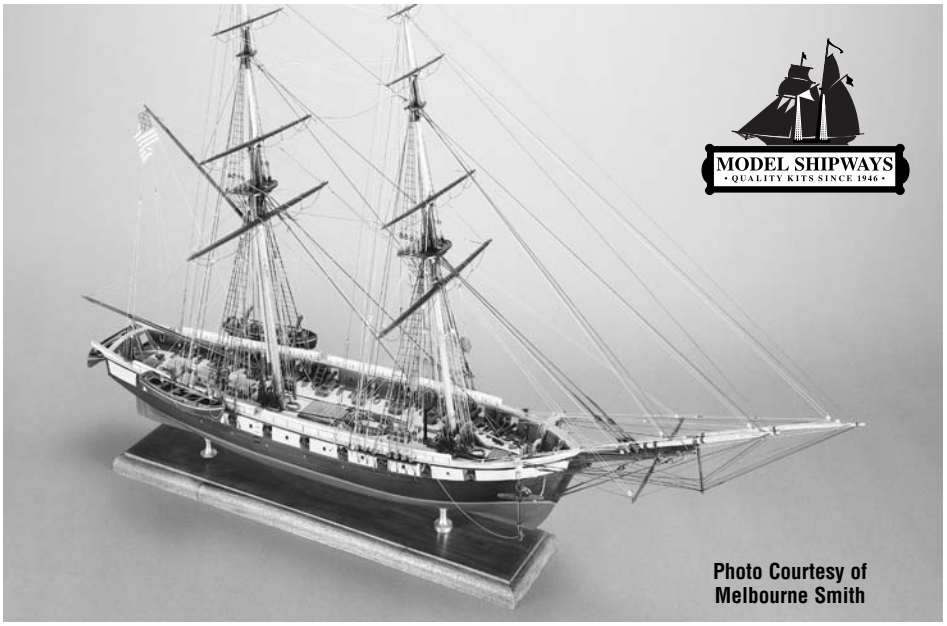
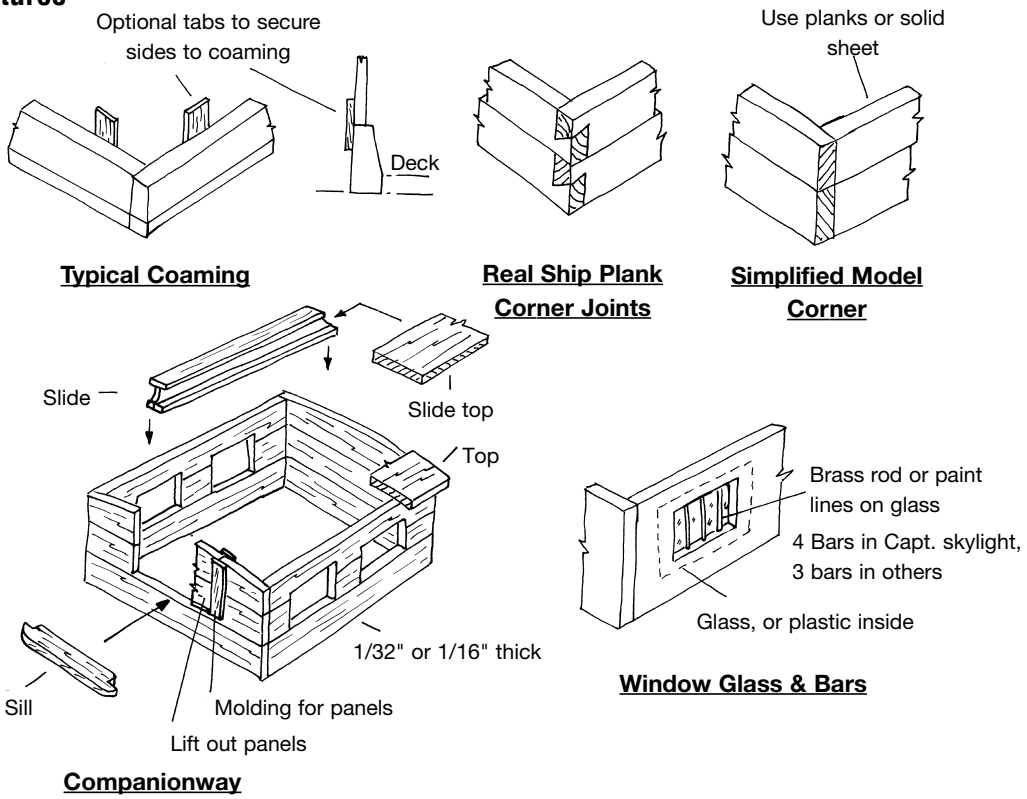


Photo Courtesy of Melbourne Smith

Fig 5-1 Deck Structures



STAGE 4

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. Two brass pedestals and a baseboard are supplied. Another approach to displaying the model is on a launching ways. Scratch build the platform or purchase the kit. Model Expo sells them.

Models should be cased to protect them from dirt and damage. Furthermore, most competitions require entries to be cased. A case is a cheap insurance policy. However, the kit's baseboard may be too small to serve as the base for the case. 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 the baseboard doesn't measure 47" long by 15" wide, make a new one to accept a case.

1. Mounting Board with Two Pedestals

Round the top edges of the baseboard or cut a simple chamfer. Those with access to a router can cut mouldings along the edges. Paint or stain the baseboard. Alternatives: Prefinished baseboards are available or make your own from basswood or more exotic woods like cherry, walnut, bubinga, and rosewood.

Mount the model with the waterline parallel to the baseboard. Because *Niagara* has a slight drag to her keel, the forward pedestal must be a little taller than the aft one. Therefore, shim the forward pedestal; or, better yet, modify its top. Drill pilot holes in the keel and baseboard for the pedestal screws. If something goes awry and the balance is off, add a brass shim under one pedestal to correct it.

2. Launching Ways

Models without sails display best on a launching ways. They are easy to assemble and fasten to a baseboard. With a large enough baseboard, a builder can create a diorama based on a shipyard activity. Drill holes in the keel for the anchoring rods, then follow the directions to achieve the proper waterline level.

Note: Stain or paint the baseboard or launching ways before mounting the hull.

STAGE 5

Adding the Hull Details

1. Locating Deck Fittings and Structures

If hatch and companionway coamings were not installed when planking the deck, locate them along with the fife rails, pin rails, boat davits, galley stack, bowsprit bitts, stern bitts, capstan, and catheads. To locate items, measure from a known bench mark such as the centerline or center of a mast. Lightly mark their positions in pencil on the deck.

Although installing eyebolts and cleats can wait, doing it now means they'll be ready when rigging commences. Once they're mounted, clean and varnish the deck.

2. Deck Structures

These consist of a companionway and two skylights (Figure 5-1). Build them from 1/32" or 1/16" basswood sheets or as planked structures. Another alternative is to make them from basswood blocks (not provided). Use microscope slides or clear acrylic for window panes, and paint their undersides light blue. Cut window bars from brass wire; or, fake it and paint them on.

A fancy, interlocking corner joint joined the sides of deck structures (see plans). However, this detail can be omitted.

3. Hatches, and Grating

Laser-cut grating material eliminates a lot of work. Grating strips can be assembled two ways (Figure 5-2). Edge-to-edge gluing creates thinner, more realistic gratings. They also fit in the hatch better and ledges need not be so deep.

For variety, display some hatches with gratings and others covered. Gratings were used in fair weather to admit air and light.

4. Boarding Ladders

Make boarding ladders from stripwood. Use the fixture shown in Figure 5-3 to align the parts for gluing.

5. Galley Stack

The britannia galley stack has a pad at its base. Three flat bars elevated the top of the real stack so smoke could escape. Model Shipways' casting doesn't have these openings, so drill holes in the top to make it more authentic.

6. Capstan

Assemble the capstan from laser-cut parts and a center dowel (Figure 5-4). Stow the capstan bars on the stern bulwarks.

7. Fife Rails and Riding Bitts

Make the fife rail bitts and crosspieces from stripwood. However, the foremast riding bitts have laser-cut knees (Figure 5-5).

8. Pin Rails

Pin rails are mounted on the bulwarks and at the bow. Make them from 3/64" thick stripwood, then drill holes to accept the brass belaying pins.

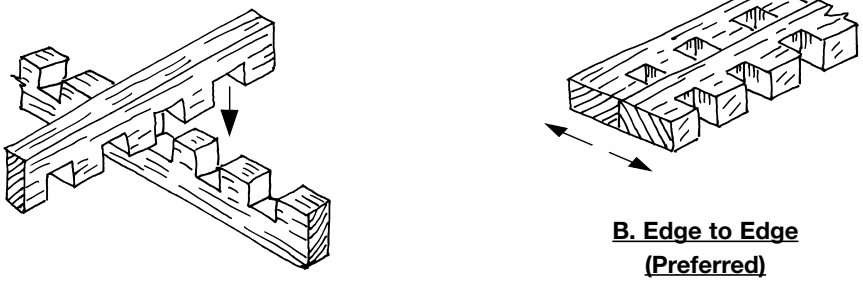
9. Bilge Pumps

Bilge pumps are simple boxes. Make them from stripwood. A few wire parts are required, but handles are wood (Figure 5-6).

10. Scuppers

The plans show five scuppers. These 1/32" diameter pipes are so small, they could be omitted; or, simulated by drilling holes.

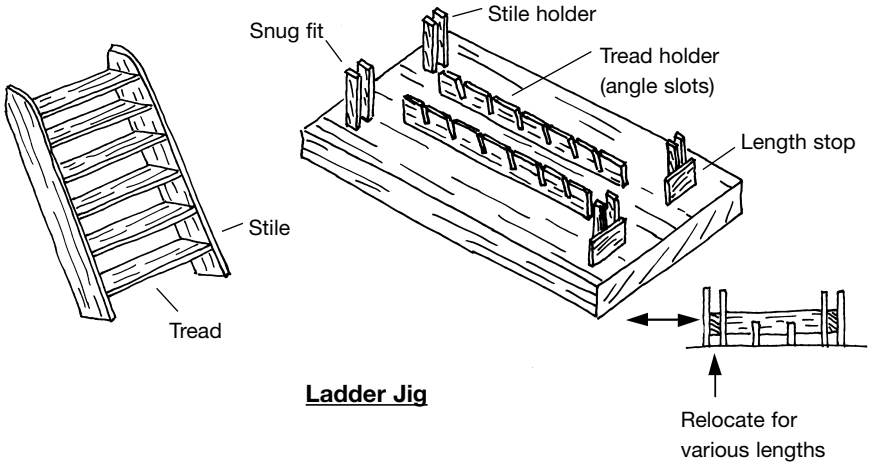
Fig 5-2 Assembly of Grating Strips



A. Egg Crate Fashion

B. Edge to Edge (Preferred)

Fig 5-3 Building Ladders



Ladder Jig

Fig 5-4 Capstan Assembly

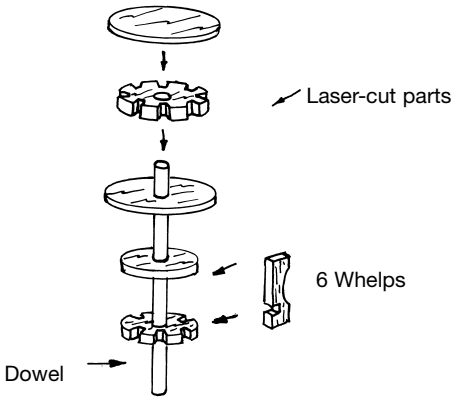
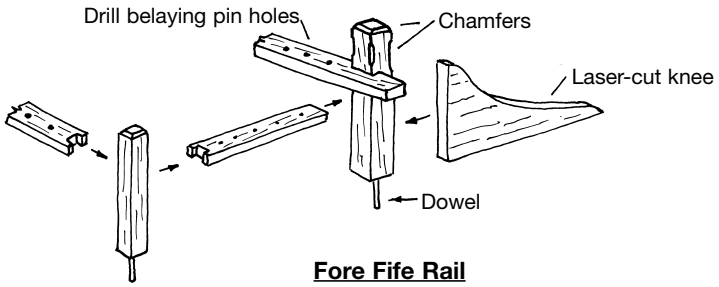


Fig 5-5 Building a Fife Rail



Fore Fife Rail

11. Catheads and Anchors

Cut notches in the laser-cut catheads so they'll fit around the rails, then drill sheave holes for the rigging (Figure 5-7).

Bower anchors are britannia castings. Wood can be substituted for the metal stock. Stow anchors on the bulwarks per the plans.

Niagara also carried the anchors listed on the plans. However, they are not included in the kit.

12. Mooring Cleats

Install the six, laser-cut mooring cleats on the plankshеer below the sweep ports as shown on the plans.

13. Hawse Pipes

Anchor chain ran through the hawse pipes (8" diameter iron castings in the bow). Drill angled, 1/8" holes to simulate them, then add the chafing pieces (Figure 5-8).

14. Eyebolts and Cleats

Eyebolt locations are shown on Sheets 3 and 6. Drill a hole wherever one is required. Attach blocks to those eyebolts requiring them. Using a toothpick or Microbrush, spread a thin film of cyano-acrylate on the bolt, then insert. Don't overdo the glue. When all are mounted, test the bond by tugging on each eyebolt.

Eyebolts are simply brass wire bent into a loop. To close the loop, touch with a little solder or epoxy. Figure 5-9 shows an easy way to produce scale eyebolts. Clamp the brass rod in a vise, then grasp the wire with pliers, pull back slightly, and twist. A spiral shank traps glue and ensures a permanent bond.

Make cleats from stripwood. When installing, pin and glue each one, so tensioning the rigging won't pull it out.

15. Cannons

The kit contains 18 carronades and two long guns. Carriages are laser cut, but barrels and carronade trucks are britannia castings (Figures 5-10 and 5-11). Gun tackle is shown on the plans. Keep it to scale or the mass of lines will detract from the model.

Fig 5-6 Bilge Pump

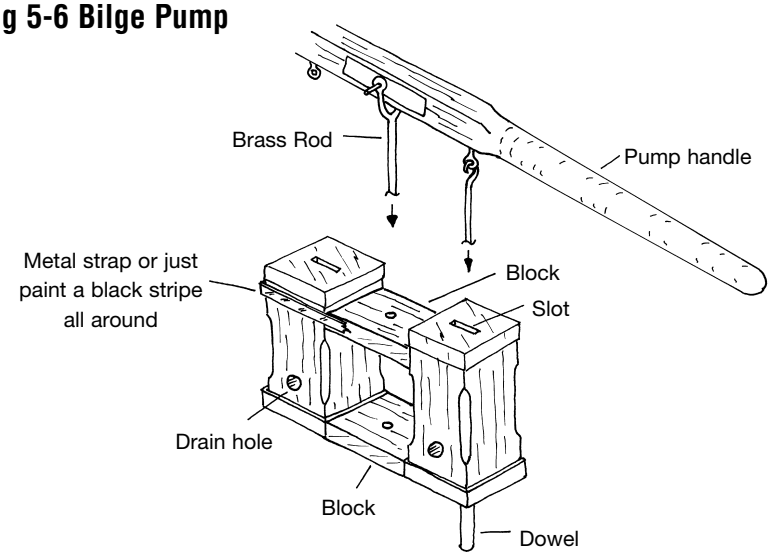


Fig 5-7 Cathead

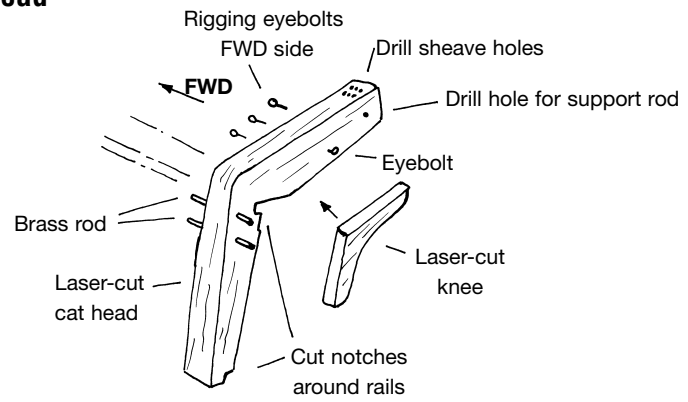


Fig 5-8 Hawse Pipe

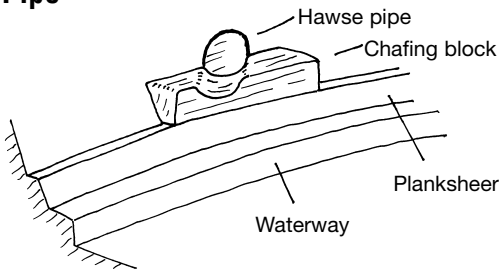
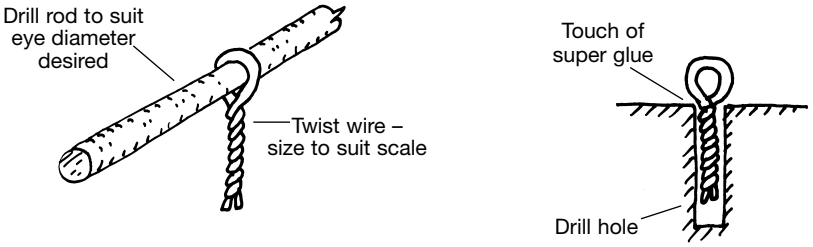


Fig 5-9 Easy Eyebolts



16. Rudder and Tiller

Shape the laser-cut rudder per the plans. Fashion pintles and gudgeons from brass or paper strips (Figure 5-12). Attach the preventer chain to the rudder, then install it. Now secure the preventer chain to eyebolts in the counter.

Shape the laser-cut tiller and insert it into the mortise in the rudder stock. Note the supporting steel rod from the stock to the tiller.

17. Boat Davits and Slides

Davits are laser cut. Make the slides for the cutters from stripwood (Figure 5-13).

18. Ship's Boats

Niagara carried two cutters and a yawl. Instead of britannia castings or solid blocks for these boats, Model Shipways supplies laser-cut lifts for bread-and-butter hull construction (Figure 5-14). When hollowing, the challenge is to carve the hulls as thin as possible without breaking through the wood.

End tabs on each lift facilitate alignment. The wide tab is the stern, the narrow one the bow. Each lift from tab end to tab end is the same length. When assembling, keep the tabs in line. Use only a thin coat of white or woodworker's glue or cyano. Too thick a layer will affect the hull's overall height.

Hollow the boat with chisels and sandpaper. Carve or sand the inside corners to the intersection of two lifts. When all is smooth, the shape should be correct. Next, cut off the tabs and carve or sand the exterior hull to its correct profile. Be careful; the hull is becoming thin. Make templates from the body lines to fine tune the hull's shape. Adding the keel completes the basic hull.

Note: The rudder is part of the keel. To be more realistic, cut through the joint to separate the rudder or scribe a line at the junction.

Carving a small boat hull is difficult. One way to check its thickness is shown in Figure 5-15. This is a homemade double-ended caliper. Commercial metal ones are also available.

Option: Temporarily omitting the bottom lift might make hollowing the hull easier. Carve the inside close to what is required, then glue on the bottom lift and complete the carving.

Fig 5-10 Long Gun Carriage

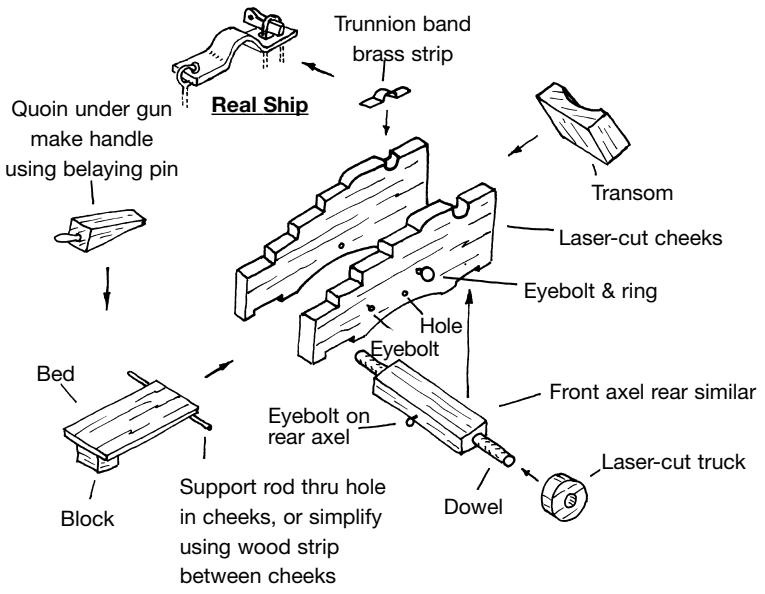


Fig 5-11 Carronade Carriage

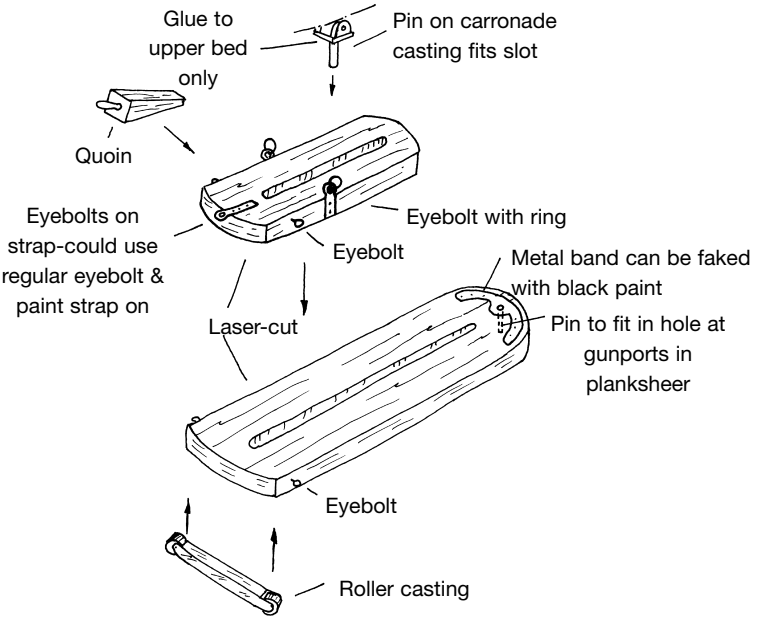
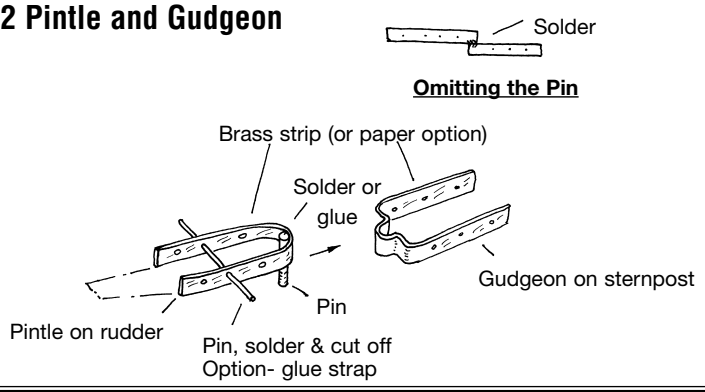


Fig 5-12 Pintle and Gudgeon



How much detailing to include is an individual choice. Frames, floor boards, thwart knees, moulding, and other items shown on the plan add to the model, but might be a little difficult to make. Don't be afraid to try. Just keep the scale in mind.

Boat Stowage on Davits: The plans show the boats on davits with gripes holding them in place. As an option, omit the gripes and suspend the boats from the davit tackle.

Colors: See the plans.

19. Ship's Name

The ship's name was carved into the transom and bow, then painted. The best way to add this detail is to buy dry transfer letters (available at art and office supply stores or model railroad shops). After applying, give the letters a coat of flat varnish. Or, make decals by using dry transfer lettering on clear decal sheets.

20. Hammock Rails and Stanchions

Make the U-shaped stanchions from 1/64" x 1/32" brass bar. Glue on the wood rails and lines (Figure 5-16). Stuff a roll of white cloth between the rails to fake the hammocks' canvas covers. For a more uniform bag, cover a basswood strip with cloth and insert it.

Today, hammock bags house life preservers and cover the running lights when *Niagara* is on exhibit.

21. Channels

Cut channels from stripwood and install; or, wait until it's time to make the chain plates. Consult Stage 8 for chain plates and channel details.

22. Sweeps

Niagara's 20 sweeps were usually not carried on board. If they were, they were stowed along the aft bulwarks. A typical sweep is shown on the plans.

Only masting and rigging remains. Before continuing, recheck everything, correct mistakes, and touch up paint blemishes. Go over the plans again.
Was anything missed?

Fig 5-13 Quarter Davits

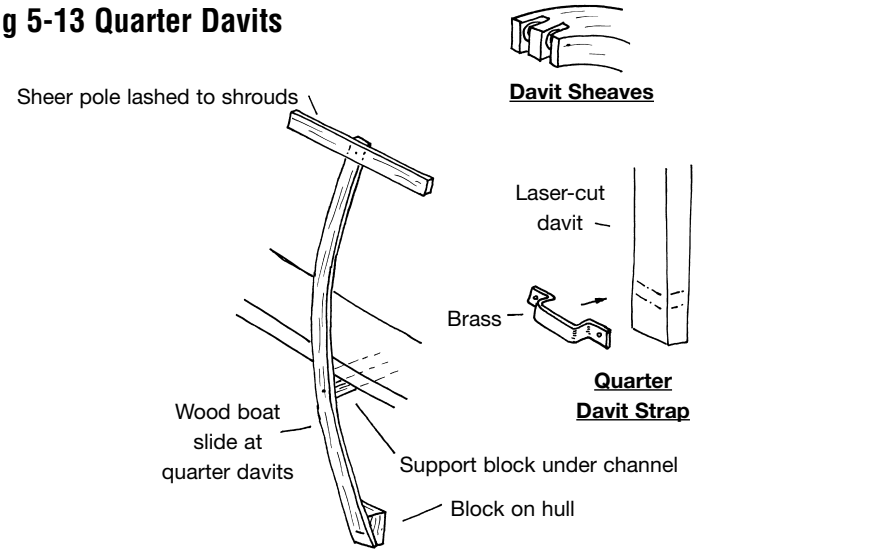


Fig 5-14 Building Ship's Boats

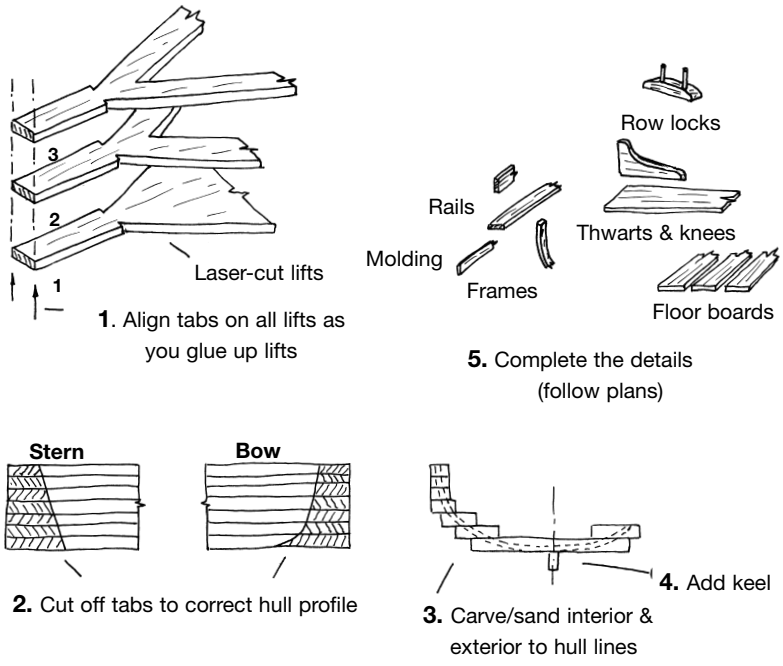
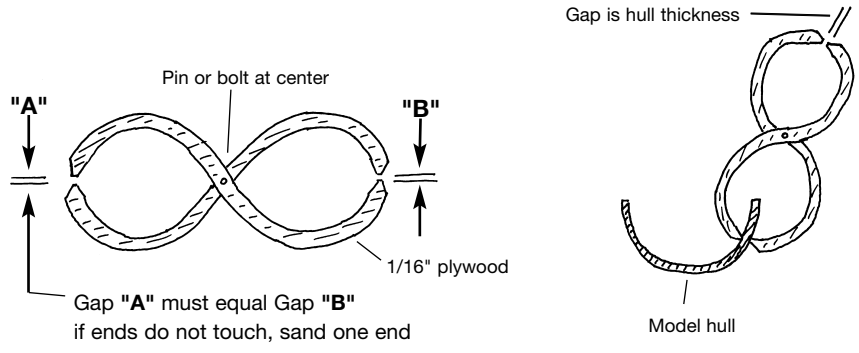


Fig 5-15 Homemade Double–Ended Caliper



STAGE 6

Mast and Spar Construction

1. Shaping and Tapering Masts and Spars

Dowels are provided for the masts and spars, but require shaping and tapering. Spars with square or octagon sections are sized to their corners across the square or octagon. After cutting the dowel square or octagon, file or sand the rest of it round.

Since *Niagara's* lower masts and yards have octagon sections, this is an ideal place to start. Sand or file the entire spar eight-sided, mark the octagon portion, make the remainder of the mast or yard 16-sided, then sand round (Figure 6-1). This is how spars on real ships were shaped. Although the process may sound difficult, it's much easier than tapering a dowel.

Those electing not to include square and octagon sections can use the oversized dowel as is or sand it down a bit.

Sheet 4 shows the masts and spars to scale with critical dimensions given at maximum diameter and at the ends.

Experienced modelers make masts and spars from square stock. Doing so allows them to select and cut their own wood, and marking octagons and tapers is easier. Applewood is excellent for masts and spars, because its dense, twisted grain resists splitting and breaking.

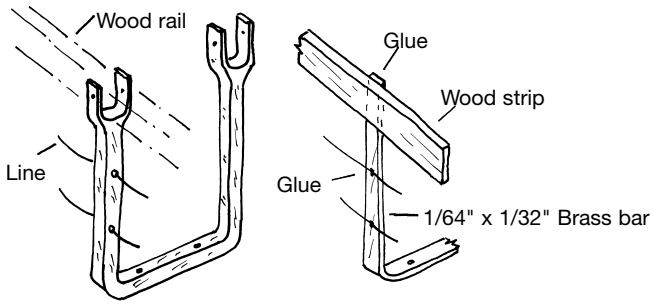
2. Building and Installing the Masts

Fore and Mainmasts: Both lower masts are octagon at the deck, round above, then square at the doubling. After squaring the heads to their proper widths, cut the tenon for the mast cap. Heads have chamfers on each corner (Figure 6-2).

Topmasts are square at the heel, then octagon, round, octagon near the head, and square at the head. The heel has a rectangular slot for a *fid*] (iron bar preventing the topmast sliding through the top). Drill a hole and shape it with a file (Figure 6-3). The fid should be a press-fit.

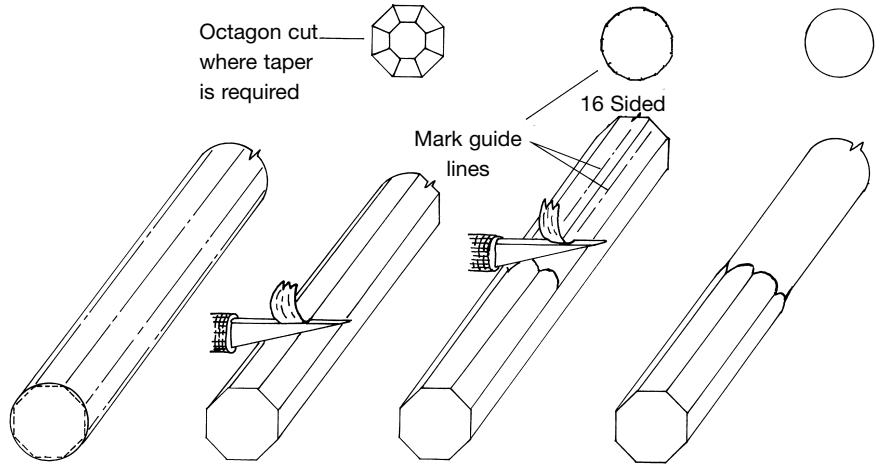
Topgallant/royal masts are similar in shape to the topmasts.

Fig 5-16 Hammock Rail and Stanchions



Metal Stanchion Real Ship **Model Simplification**

Fig 6-1 Shaping a Mast or Spar



1. Mark 8 equally spaced lines around dowel **2.** Cut octagon **3.** Cut corners of octagon at start of round section to form 16 sided shape **4.** Sand round

Fig 6-2 Lower Mast Head

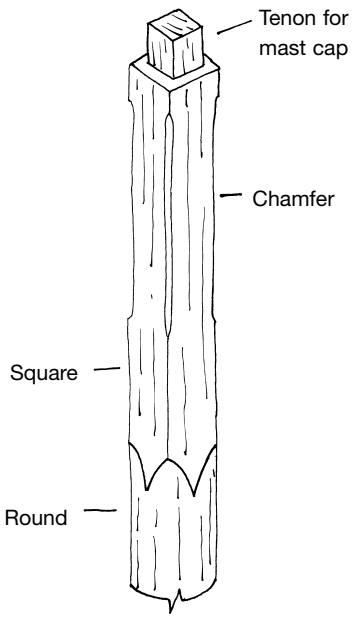
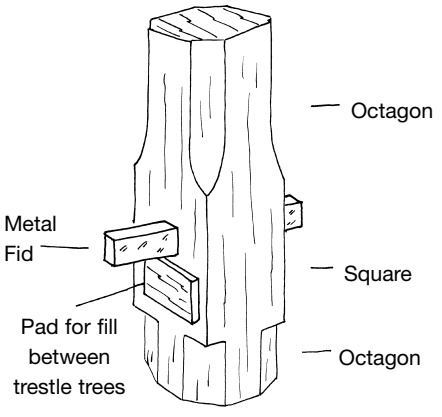


Fig 6-3 Topmast Heel



After completing the basic masts, drill the required sheave holes. Since the yard halliard tye covers the sheave, don't install real ones. Add all cleats, eyebolts, and the spanker boom rest.

Spanker Mast: The spanker mast has no taper, but is square with chamfers at the deck. It also has a seat at the head and at deck level. Caution! Before installing, slip on the laser-cut mast hoops.

Mast Caps, Tops, Trestle Trees, and Crosstrees: Tops are simple and fun to make. The kit contains laser-cut mast caps, basic fore and main tops, top molding pieces, cheeks, trestle trees, and topmast crosstrees. Make other parts from stripwood (Figure 6-4).

Assembly: With all parts made and pre-fitted, be sure the lower masts, topmasts, and topgallant/royal masts align. Check port and starboard views and fore and aft. Adjust the upper mast heel holes if necessary. Now glue tops, caps, crosstrees, and trestle trees onto the lowermasts, topmasts, and topgallant/royal masts.

Option: Some modelers prefer to build mast assemblies as they rig. Step lower masts, attach shrouds and lower stays, then add the topmasts. Be sure to constantly check alignment.

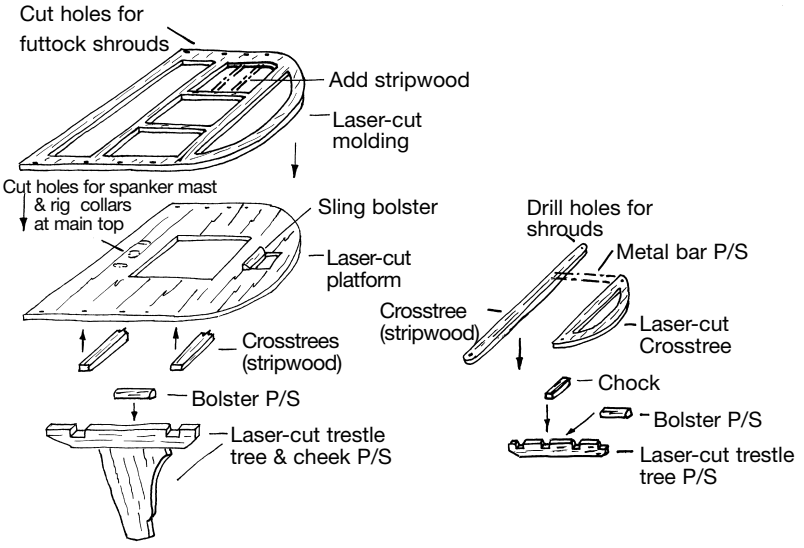
Mast Wedges and Mast Installation: Laser-cut, octagon rings represent mast wedges (Figure 6-5). To shape this fitting, file the edge and angle the hole to each mast's rake. Slip it on the mast, then insert the mast through the deck hole. Check the alignment forward, aft, and athwartships. Masts must rake at the angles shown on the plans. If they don't, file the offending deck hole to its correct slant, then wedge the mast in place with wood slivers. Finally, secure the mast wedge pieces to the deck with woodworker's glue.

3. Building and Installing the Bowsprit, Jibboom, Flying Jibboom, Spritsail Yard, and Dolphin Striker

Bowsprit, Jibboom, and Flying Jibboom: Fashion the bowsprit from square stripwood (Figure 6-6). Taper it while square, then file or sand the octagon sections. Sand the remainder round and cut the tenon for the cap. Enlarge and angle the holes on the laser-cut cap, then taper its top and bottom edges.

Make the iron band for the lower bobstay from brass strip. Cyano it in place, then add the bees and eyebolts.

Fig 6-4 Building the Tops



Fore & Main Top **Fore & Main Topmast Crosstrees**

Fig 6-5 Mast Wedges

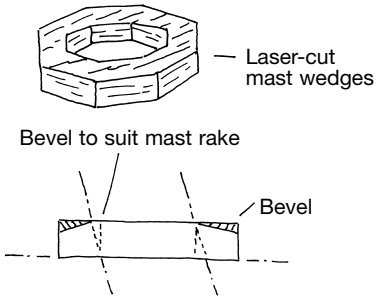


Fig 6-6 Bowsprit

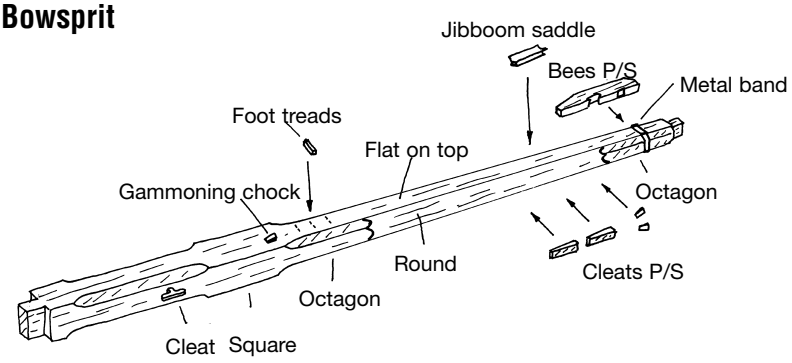
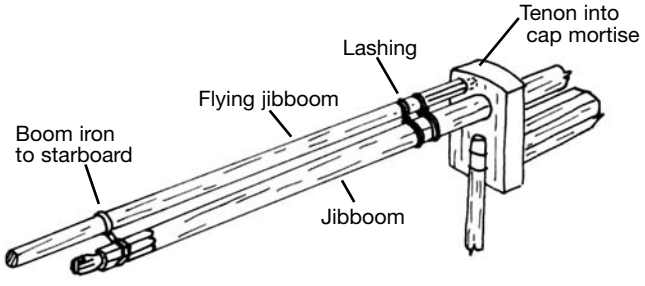


Fig 6-7 Installing the Flying Jibboom



The jibboom begins as an octagon, becomes round, then returns to an octagon. Drill the required sheave holes. The jibboom passes through a hole in the cap and lashes to a saddle on the bowsprit. The flying jibboom is mostly round with a short octagon section at the end. Mount it starboard of the bowsprit so the stays can pass around the end of the jibboom. An iron at the end of the jibboom secures the flying jibboom, while a tenon in its heel fits a mortise in the bowsprit cap (Figure 6-7).

Dolphin Striker: Staple the dolphin striker to the bowsprit cap. Mount the chocks and drill holes for rigging lines.

Spritsail Yard: Glue and pin the chocks, then secure this round spar to a sling under the bowsprit (Figure 6-8).

Pass the bowsprit assembly through the bow opening and insert its tenon between the bowsprit bitts. Carefully check its alignment.

4. Building the Yards

Some rigging is included, because it's easier to do with yards in hand. Footropes are best added at this stage. They are shown with spar details on Sheet 4. Jackstays are lines rove through eyebolts. Course and topsail yards have an octagon center, but topgallant and royal yards are round (Figure 6-9).

Tops of yards are straight, but the bottom, fore, and aft sides are tapered. When sails were added, the combined weight bent the yard so it looked tapered on all sides.

Note: Topsail and topgallant yards have a wooden batten or yoke and parrels with ribs and trucks. However, a rope parrel is more appropriate for an 1813 ship. Consequently, one is shown as an option (Figure 6-10).

Reminder: Paint and detail yards before setting them aside. Once rigging commences, they must be ready to mount.

5. Building the Spanker Gaff and Boom

Like the yards, these spars have one straight side, except it is on the bottom. The sail bends it in the middle to produce the uniform taper.

Complete these spars in hand as much as possible. They will be installed later.

The spanker boom and gaff have laser-cut jaws (Figure 6-11). Drill sheave holes, then glue and pin the chocks.

Fig 6-8 Spritsail Yard

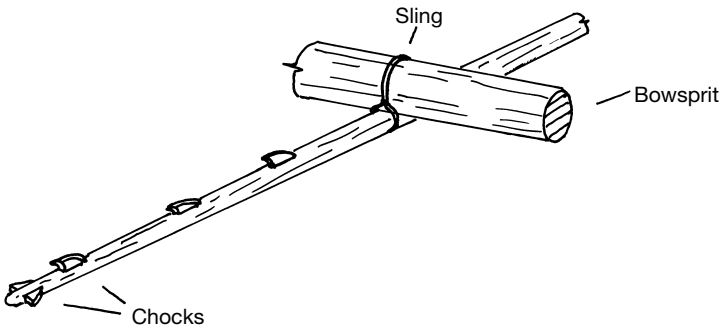


Fig 6-9 Course Yard

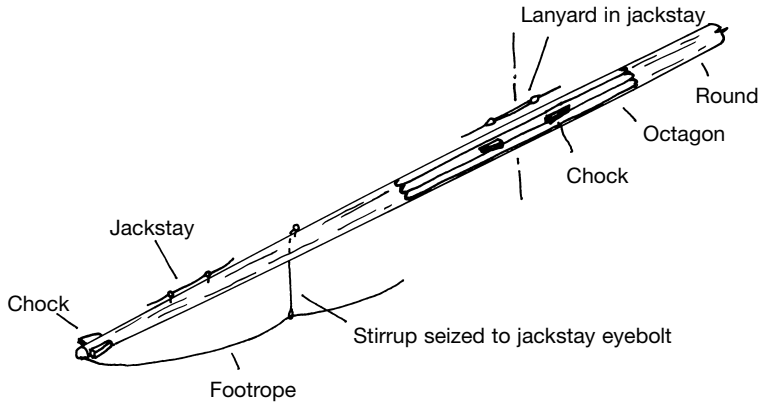


Fig 6-10 Topsail and Topgallant Yard Parrel

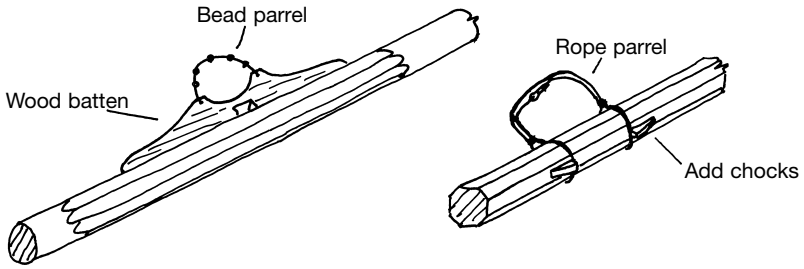
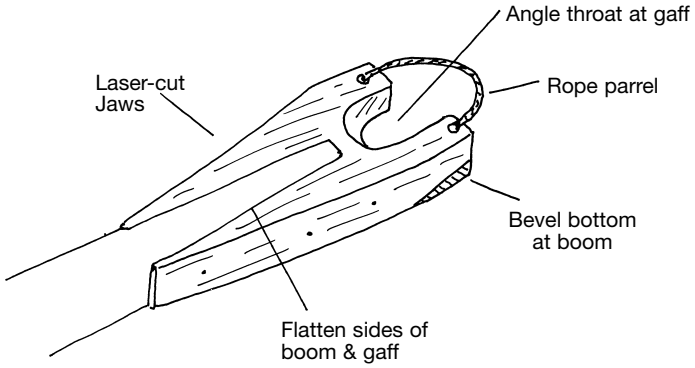


Fig 6-11 Spanker Boom and Gaff Jaws



STAGE 7

General Rigging and Sailmaking

Newcomers to the nautical world should learn the following rigging terms. Old salts can skip this part and grab a mug of grog.

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

Standing rigging: Fixed rigging supporting masts and spars. Standing rigging is generally tarred; hence, it is black or dark brown.

Shrouds: Transverse lines supporting masts. *Deadeyes* are wood and have three holes for reeving the *lanyard. Lanyards* tighten shrouds, stays, and other lines. Metal turnbuckles replace deadeyes on modern ships. A *heart* or *bullseye i*s similar to a deadeye, except it has one large hole. They are used on more permanent installations.

Chain plates: Iron bars or rods holding the deadeyes. Topmast shrouds have no chain plates. Instead, rods or lines run from the deadeye or bullseye to the mast band. These are called *futtock shroud*s. If they go just to the lower shrouds, they generally tie to a wooden or metal rod called a *futtock stave*. *Catharpins* are short lines fastened to each shroud to take up the slack and brace the yards more sharply. They are generally located at the intersections of the futtock staves.

Footropes and manropes: Lines on yards, booms, and bowsprits where seamen stand while working and furling sails. *Stirrups* hold the footropes, which are sometimes called *horses*. *Cranelines*, footropes running athwartships from the lower fore and mainmast shrouds, are used to furl the main staysails or spanker. They are a recent development and were not rigged on early ships. *Ratlines* are footropes on shrouds. A *sheer pole* is a round or rectangular iron or wood bar seized to the shrouds just above the deadeyes. It maintains shroud spacing and can serve as a belaying point.

UPPER RIGGING

Stays and Backstays: Lines supporting the masts from fore and aft forces. A *running backstay* has a movable tackle on deck.

Bobstays: Support the bowsprit from upward loads. *Guys* support the jibboom and bowsprit from side forces. Bowsprit guys are sometimes called *bowsprit shrouds*. Bowsprits occasionally have a vertical strut below the jibboom cap to increase the stays' downward pulling force back to the hull. This strut is the *martingale* or *dolphin striker*. Head stays reeve through the jibboom, down to the dolphin striker, and back to the bow. *Martingale stays* are separate and start at the jibboom rather than continuing from the head stays. *Backropes* continue from stays back to the hull after the stays pass the dolphin striker.

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

Blocks: Wooden or metal shells with sheaves (pulleys) for handling lines. The oval *clump* block is used for staysail sheets, because it won't tear a sail if it rubs against it. 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. The part of a halliard attached to a yard is called a tye. 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.

BOWSPRIT

Sheets: Lines holding the lower corners of a sail or boom. When not in use, sails are *furled* (bundled on the yards, booms, or masts). *Clew lines* pull up the corners of a square sail, *leechlines* pull up the sides, and *buntlines* pull up the belly for furling the sail. *Brails* are like buntlines, except they pull loose-footed fore and aft sails toward the mast for furling. *Bowlines*, attached to the sides of a square sail, pull it forward. These are used primarily on 18th century and older ships.

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.

Parrels or parrals: Lines or ribs and trucks for holding yards, booms, and gaffs to their respective masts and spars. A *truss, jeer*, and *sling* are similar to a parrel. These are lines or iron fittings holding a yard up and against the mast. They are most common on stationary lower yards.

Braces: Lines attached to yardarms for directing a yard's angle and holding it taut. *Lifts* are standing or running lines for holding yards when lowering or tilting them. A t*opping lift* is a line holding up the end of a boom when the gaff is down or absent. *Vangs*, port and starboard lines, prevent a gaff from swinging sideways.

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.

Full set including fore and aft and square sails: Not many modelers go to this extreme, because the mass of sails obscures most deck and spar details. Sails are the first item to deteriorate on a model. They look better on a ship at sea.

Sails furled, yards lowered on their lifts: Here is a pleasing compromise. Reality is maintained without sacrificing detail.

Sails furled and hoisted: This creates the illusion of a ship in port with some sails still drying after a day's run. Mix furled sails with open ones or sails half up. Possibilities abound, so look for a pleasing effect. Study marine paintings for ideas. John Stobart's work is an ideal reference.

No sails, gaffs lowered on the booms: Now the ship is in port with her sails removed for repairs. Most modelers choose this approach, and beginners should definitely opt for it.

2. Rigging Plans

Sheets 5 and 6 show the masts and spars with attendant rigging. They are drawn so every line is clear and its belaying point known. Sheet 5 shows standing and running rigging for fore and aft sails. Sheet 6 shows the rig for square sails. Study the plans and have a complete picture of each rig before starting. Do this and everything will proceed smoothly.

3. Rigging Line and Block 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 0.016"	0.010"
0.016" to 0.021"	0.021"
0.022" to 0.031"	0.031"
Greater than 0.031"	0.041"

Use every available diameter to enhance the model's scalelike appearance. Additional diameter lines are commercially available. Some modelers substitute the kit's nylon cordage with linen or cotton lines.

Block are in scale inches, but not all are commercially available. Follow this guide:

Blocks Sizes	Blocks in Kit
3/64" to 3/32"	3/32"
7/64" and 1/8"	1/8"
9/64" and 5/32"	5/32"
11/64" and 3/16"	3/16"

Options: Sand a block to more closely match the plan size or scratch build them.

Deadeyes and Bullseyes	In Kit
1/16" to 7/64"	3/32"
1/8" to 9/64"	1/8"

4. Treating the Lines

Worming, Parceling, & 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. Then the wormed and parceled area is *served* (bound in the opposite direction with spun yarn). Serving is the only procedure recommended for the model. However, most modelers prefer to use cordage as is after applying a heavy coat of beeswax. Those striving for authenticity should serve only the largest shrouds and stays with fine silk, polyester or linen thread. Avoid cotton. It's too fuzzy.

Seizings: Seize lines with linen, polyester, nylon, or silk thread. Do not secure lines with knots. Knots are for shoelaces. Touch seizings with diluted white glue or thin cyano (Figure 7-1).

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.

5. Belaying Pins, Cleats and Their Lines

Sheet 6 includes a complete belaying pin plan. Each belaying point and its appropriate line have the same number. Some lines reeve through fairleads before they belay. Sketches on the plans show which lines have fairleads.

As rigging progresses, belaying points may open up and expose more accessible pins or cleats. This happens when only a few sails are installed. Because every ship's captain had his own idea how lines should belay, no set rules exist. Therefore, it's permissible to alter the plan's belaying points provided sound judgment is applied.

6. Rigging Tools

Some homemade tools are essential for the rigging process (Figure 7-2). Similar shapes are commercially available.

7. Blocks, Hearts, Bullseyes, and Deadeyes

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

The largest hearts are laser-cut. Cut or file the stropping groove around the heart, then round the inside hole a bit.

Only the anchor cat block isn't rope stropped. Stropping blocks at 3/16" scale is difficult, so some alternatives are shown in Figure 7-3.

8. Sailmaking

Choosing the proper material is critical. Sailcloth must be lightweight, yet fairly opaque. Tightly woven cotton is acceptable and available from Model Expo. Although linen is ideal, most is too heavy for 3/16" scale models.

Wash sailcloth several times to preshrink it. When dry, iron the cloth, but be careful not to scorch it. Lightly draw seam 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 two lines to represent reef bands (Figure 7-4).

When done, iron the sails. Be careful not to burn them. Next, cut the sail shape

Fig 7-1 Seizing Methods

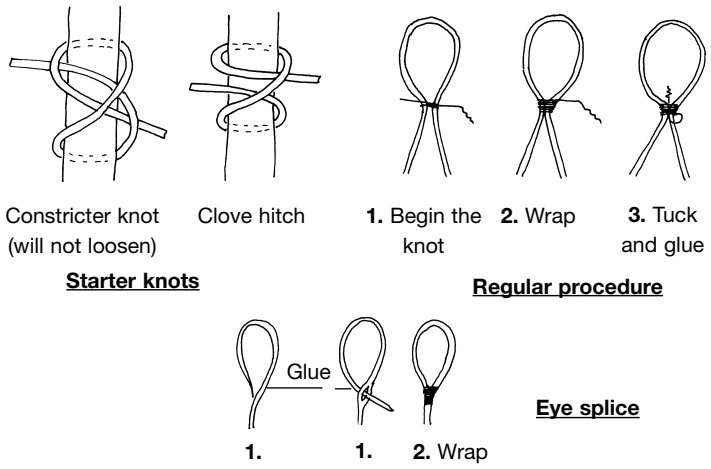


Fig 7-2 Homemade Rigging Tools

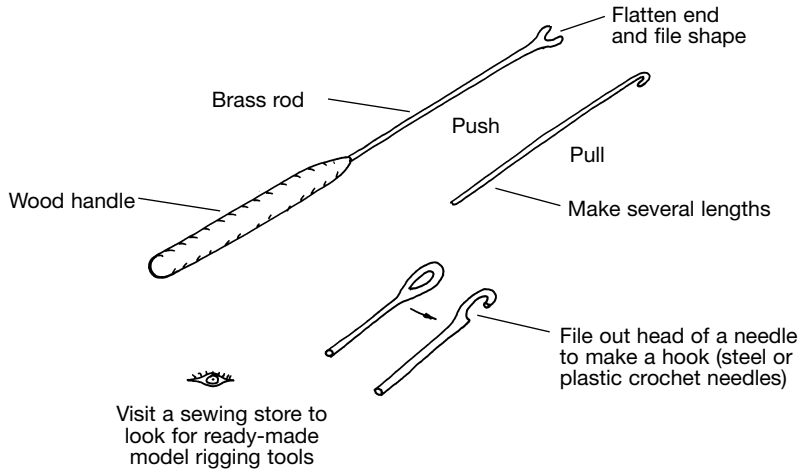
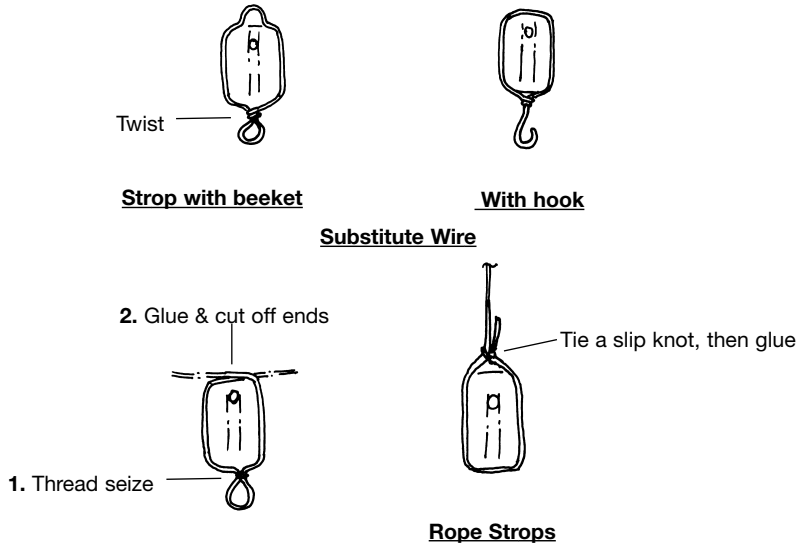


Fig 7-3 Stropping the Blocks



using Line A in Figure 7-4. 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 ready for stretching.

Stretching Sails: This assures the sail's proper shape, since sewing may alter 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 the model. Figure 7-5 also shows how to install reef points.

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.

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 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.

Niagara has no numbers, but Wonder-Under could be used as a substitute for sewing the hem.

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 7-6), 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

Fig 7-4 Sailmaking

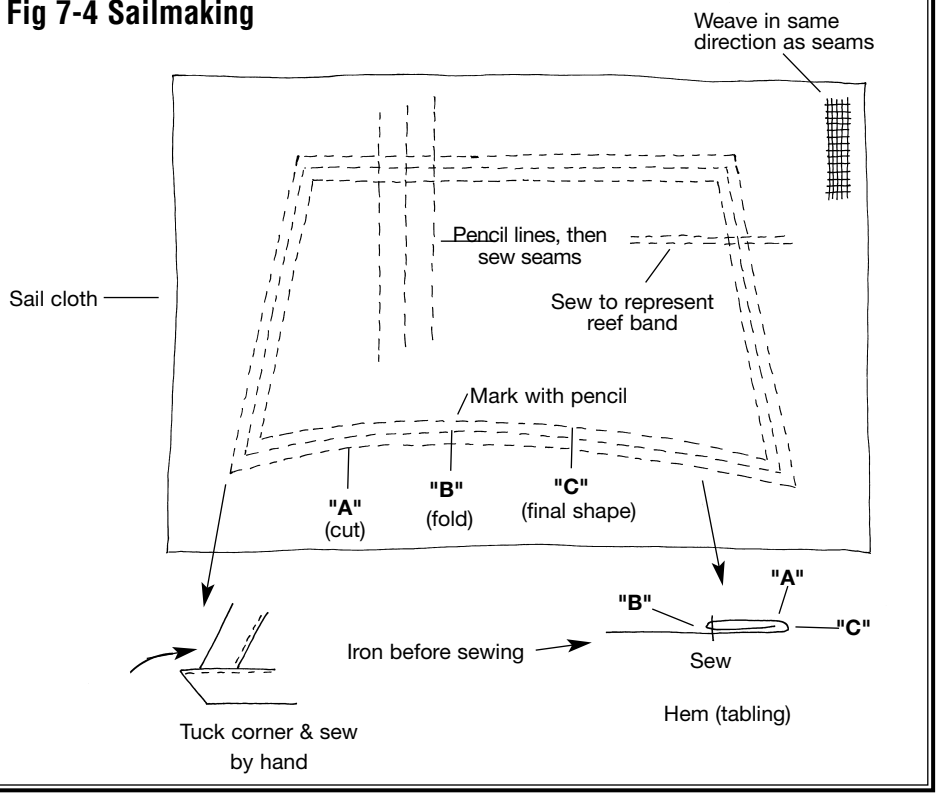


Fig 7-5 Boltropes and Reef Points

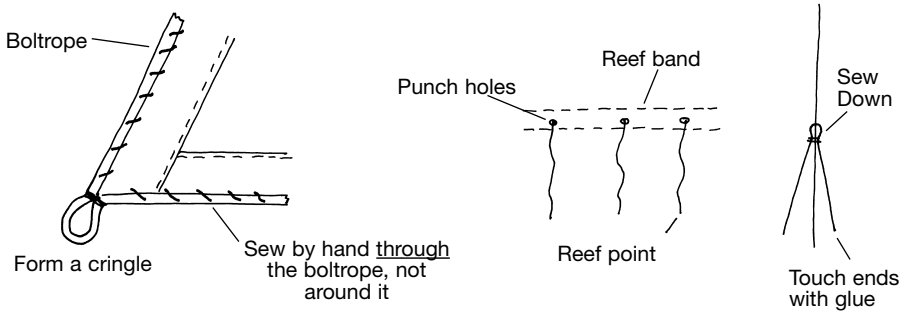
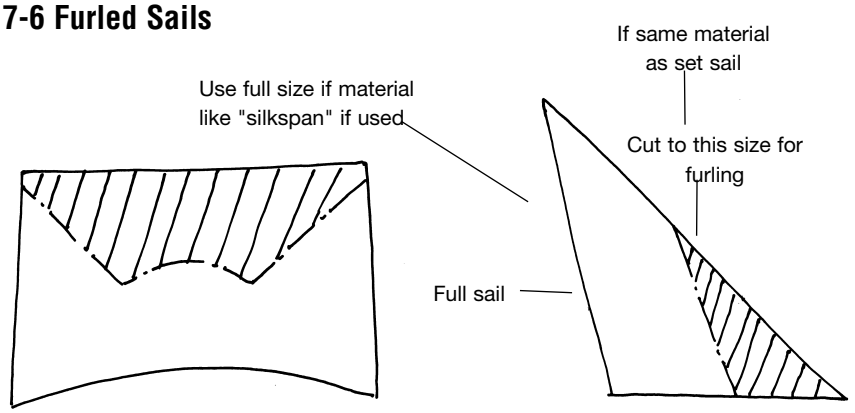


Fig 7-6 Furled Sails



sails need some seams and hems, as these details are visible.

9. Rigging the Model with No Sails or Furled Sails

No Sails: Include the lines that remain when sails are removed; i.e., clewlines, sheets, buntlines, leechlines, and fore and aft sail halliards and downhauls. These are shackled together, tied off, or secured to some other stowage point. While they can be omitted, more lines mean greater realism.

Furled Sails: Attach most lines even though the sail was proportionately reduced or cut from Silkspan.

Stage 9 illustrates a furled sail and no sail details for each sail group.

STAGE 8

Installing Standing Rigging

With the exception of the bowsprit manropes, standing rigging is black. Before starting, sort lines by size, coat with beeswax, and keep them handy. Use linen, silk, or nylon sewing thread for seizings. Treat this with beeswax. Keep white glue or cyano at the ready for dabbing on a seizing if necessary. Usually sewing through the shroud followed by a half hitch prevents a seizing from unraveling.

Looking Forward at Jibboom

Fig 8-1 Chain Plates

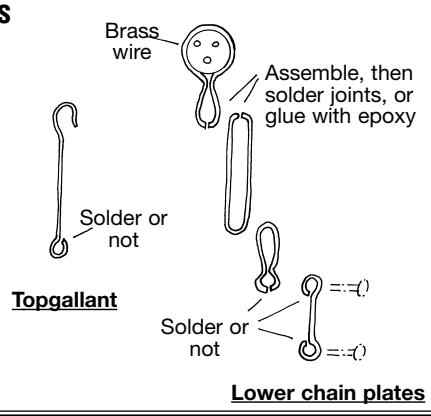
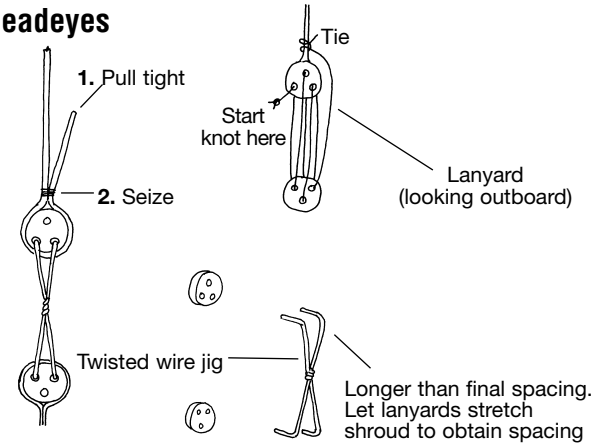


Fig 8-2 Spacing the Deadeyes



1. Shrouds

Note: The following assumes the shrouds were rigged first, then the fore and aft stays. However, one option is to rig the lower shrouds and stays, then the upper shrouds and stays. Remember, stays go over the shrouds.

Begin the standing rigging by making the lower shroud chain plates from brass wire (Figure 8-1).

To set up the shrouds, make a temporary brass wire fixture to space the deadeyes as seizing progresses (Figure 8-2). 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 8-2 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 topmasts have deadeyes and futtock shrouds. Topgallant shrouds have no deadeyes. They pass through the crosstrees and belay to a futtock stave (Figure 8-3).

After the shrouds are in place, mount the sheer poles. Make them from stripwood and paint black. Next, add the ratlines. Figure 8-4 shows several methods. Ratlines go all the way to the top, spaced as illustrated.

Before installing the ratlines, give them a generous coating of beeswax. This will help hold them in a slight downward curve. If the ratlines tend to bow upward, tug them gently into position. Touching the loops with white glue or cyano will help freeze them. Ratlines are difficult to do if tied with clove hitches. Use half hitches and avoid pulling the ratlines too tight, thereby altering the spacing between shrouds. The step or space between ratlines should be a scale 14 to 15 inches.

2. Backstays

Topmast, topgallant, and royal backstays are similar to shrouds, except they have no ratlines. Rig them after the shrouds are up. Note: Topgallant backstays have bullseyes, not deadeyes.

Use a fixture to set up the fore and main topmast and topgallant backstays. Chain plates are shorter and not as wide as those for the lower shrouds. The royal running backstay hooks with a tackle to an eyebolt in the waterway. Note: Pendants splice into the lower blocks and belay to eyebolts. The mainmast pendant is longer than the foremast pendant.

3. Fore and Aft Stays

Unless using an alternative method, install the fore and aft stays after the shrouds and backstays are up. Don't pull the masts out of line when tensioning the stays. Begin with the forward lower stays and work aft and up.

Forestay and Fore Preventer Stay: Both belay to laser-cut open and closed hearts at the bowsprit (Figure 8-5). On *Niagara*, seizing around the masthead incorporates a fancy eye with raised mouse. Substitute a simple eye splice seizing for the model.

Fore Topmast Stay, Inner Jib Stay, and Outer Jib Stay: The fore topmast stay and inner jib stay reeve through holes in the port and starboard bowsprit bees, then belay to bullseyes in the bow.

The outer jib stay reeves through the sheave at the end of the jibboom, and belays to a tackle secured to an eyebolt on the port side of the bowsprit cap. The fall belays to itself (Figure 8-6).

Fore Topgallant Stay and Flying Jib Stay: The topgallant stay passes over the dumb sheave at the end of the jibboom, reeves through a hole in the dolphin striker, and sets up to the starboard tackle. It has a double block and fiddle block. The fall secures to a belaying pin.

The flying jib stay reeves through the sheave at the end of the flying jibboom, reeves through a hole in the dolphin striker, and sets up to the port tackle. Both rigs are similar to Figure 8-6.

Fore Royal Stay: This stay passes over the dumb sheave at the end of the flying jibboom, then reeves through a hole in the dolphin striker. The stay progresses aft with an eyesplice and thimble. A backrope reeves through the thimble. Its port standing end seizes to an eyebolt in the bow. The starboard end reeves through a hole in the bow and belays to a cleat on the bowsprit (Figure 8-7).

Main Stay and Main Preventer Stay: The main stay belays to laser-cut hearts on the foremast (Figure 8-8). The preventer stay runs to starboard of the foremast, then

Fig 8-3 Futtock Shrouds

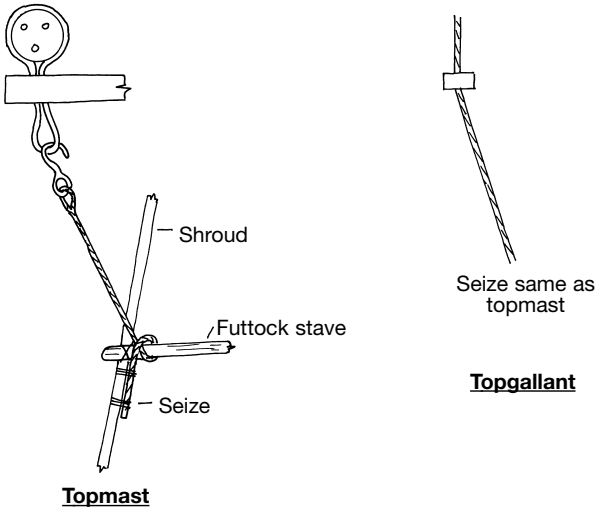


Fig 8-4 Ratlines

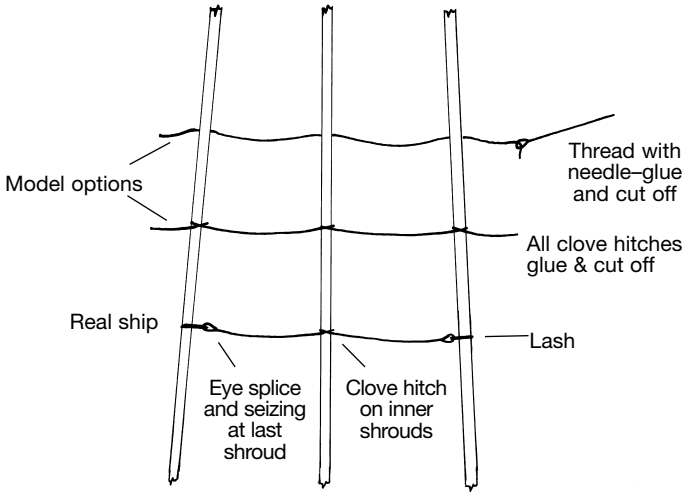
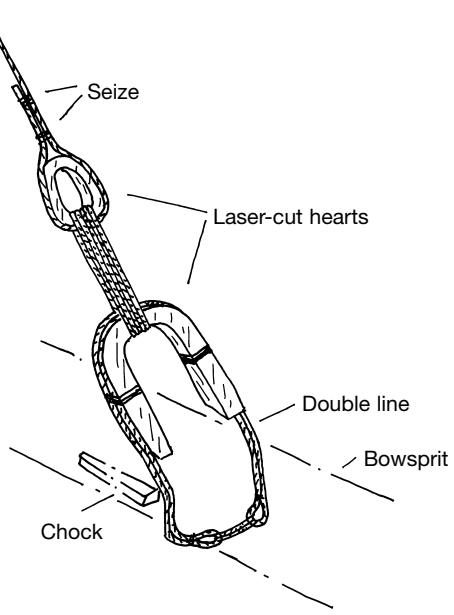


Fig 8-5 Fore Stay / Preventer at Bowsprit



sets up to laser-cut hearts and an eyebolt on the starboard bowsprit bitt. The chock on the foremast bends the stay down, while applying tension.

Main Topmast Stay and Spring Stay: These stays reeve through a collar with thimble on the foremast and belay to bullseyes and eyebolts in the deck. The topmast stay also reeves through a grommet attached to a metal band on the foremast.

Main Topgallant Stay and Royal Stay: The topgallant stay reeves through a collar with thimble on the fore topmast, then down to a tackle on the port side of the fore top. The tackle's fall belays to itself. The royal stay belays to thimbles with a lanyard on the starboard side of the fore top.

4. Bowsprit Rigging

Bobstays: The inner bobstay belays to hearts and a collar on the bowsprit, but the outer bobstay sets up to an iron band on it.

Jibboom Martingale: The martingale is eye spliced around the end of the jibboom and at the dolphin striker. From the dolphin striker, port and starboard backropes belay to bullseyes in the hull (Figure 8-9).

Flying Jibboom Martingale: This martingale is eye spliced to the flying jibboom head, then reeves through a hole in the dolphin striker. It ends in an eye splice and thimble just aft of the dolphin striker. A backrope reeves through the thimble and sets to an eyebolt on the port side of the hull and to bullseyes on the starboard side.

Bowsprit Shrouds: These shrouds belay to port and starboard eyebolts in the hull, then to bullseyes in a collar on the bowsprit (Figure 8-10).

Jibboom and Flying Jibboom Guys: Guys are eye spliced at the ends of the booms, pass over cleats on the spritsail yard, then belay to bullseyes at the catheads.

Manropes: *Niagara* has an elaborate network of manropes to prevent a crew member from falling overboard. Two long fore and aft lines, port and starboard, begin with a knot on the inside of the chock rail, reeve through holes in the rail, and seize to the shrouds and guys. Transverse short lines seize to the guys and long lines to form netting (Figure 8-11). Manropes are tan, even though they are standing rigging.

Option: Melbourne Smith's design shows traditional footropes on the jibboom and flying jibboom. If choosing this approach, add footropes on the spritsail yard.

Fig 8-6 Outer Jib Stay Tackle

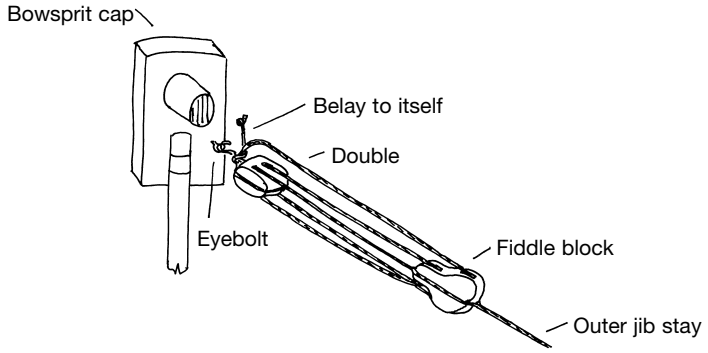


Fig 8-7 Fore Royal Stay Backrope

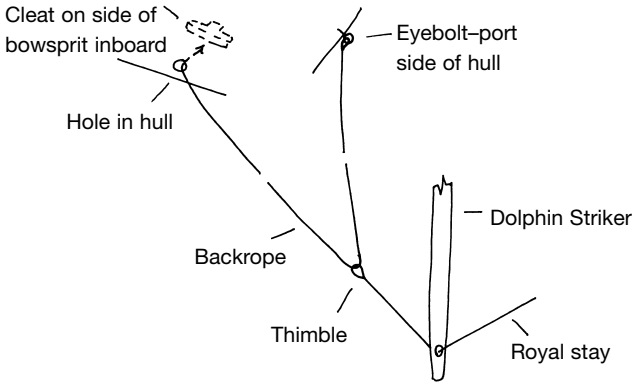


Fig 8-8 Mainstay at Foremast

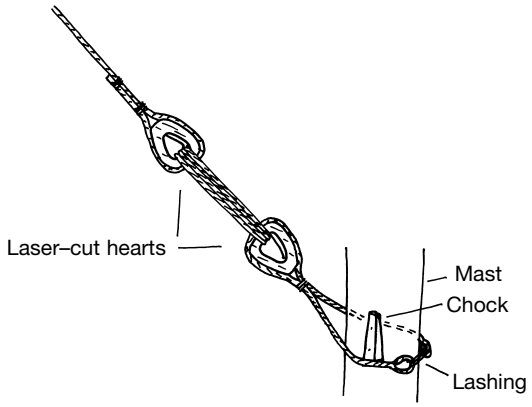
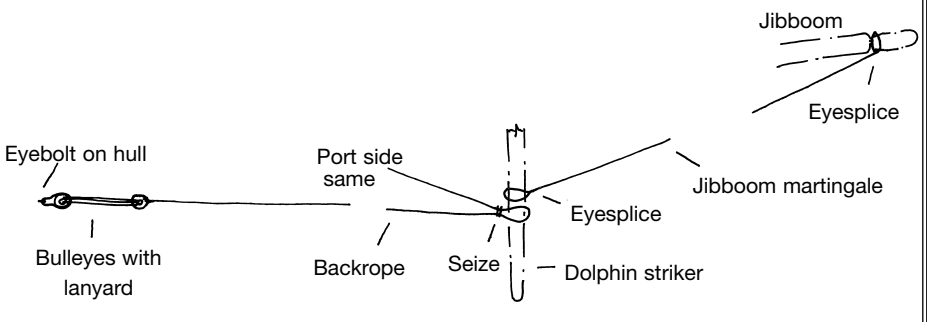


Fig 8-9 Jibboom Martingale



5. Footropes, Fixed Lifts, and Cranelines

As noted earlier, footropes for yards, spanker boom, and ends of fixed lifts are more easily installed with spars in hand. Footropes may require some adjusting before they hang naturally.

Cranelines are footropes running athwartships from the lower fore and mainmast shrouds. They pass behind the mast. Sailors stand on them to furl the spanker, main staysails, and course sails. Cranelines were not on the original ship and can be considered optional.

This completes the standing rigging. Check all lines for shiny glue spots and touch up with black paint or shoe polish.

STAGE 9

Installing Sails and 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. Seize blocks in place before adding sails and rigging. Each sail and its spars are presented separately. Finish one sail group before moving to the next. Although the rigging sequence isn't critical, starting at the bow and working aft is recommended. Do the fore and aft sails first, then the square sails.

1. Fore Staysails (Head Sails)

For simplicity, the fore staysail, inner jib, outer jib, and flying jib can be called head sails. If using sails, add their halliards, downhauls, and sheets before bending to their yards. Play out enough line for reeving, handling, and belaying. Don't be in a hurry to snip them flush. They may need retensioning as rigging progresses. To finish each line, coil it at the belaying point; or, belay it, then add a separate coil.

Niagara has wooden hanks to *bend* (fasten) the head sails to their stays (Sheet 6). Real hanks are difficult to make at 3/16" scale, so substitute split brass rings. Set sails either to port or starboard, but be consistent. It looks better.

Pull sheets taut on the sail side. Loosely drape the other sheets over the stays to their belaying points. Tacks hold the sail near the boom head. Attach these short lines and the downhaul blocks to a grommet on the guys.

Fig 8-10 Bowsprit Shrouds

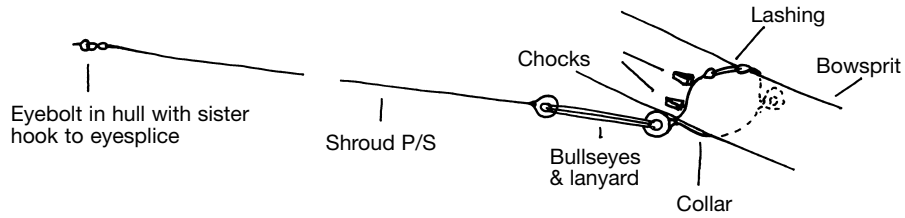


Fig 8-11 Manrope Netting

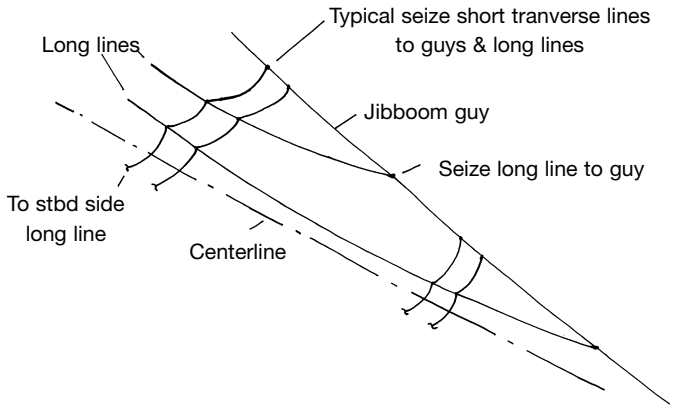


Fig 9-1 Head Sails Removed

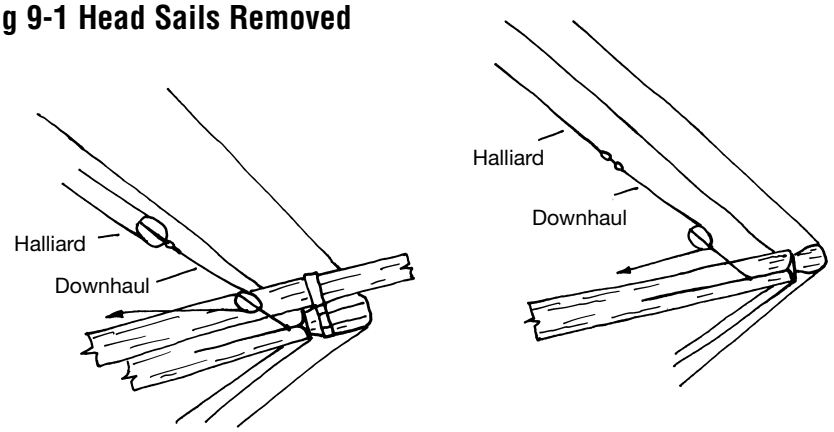
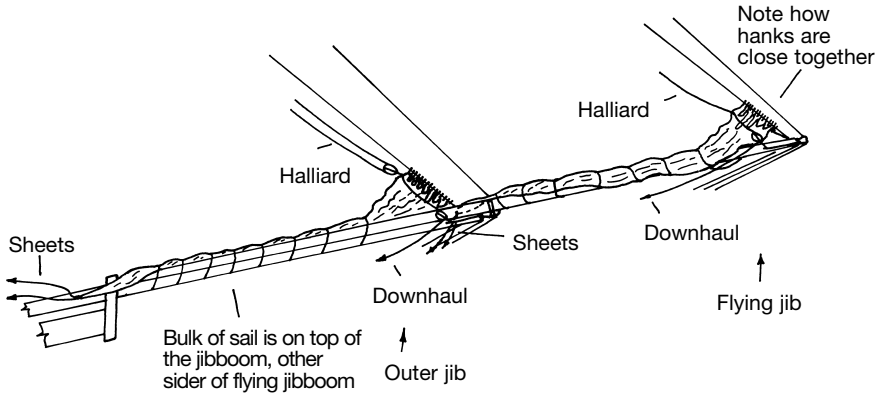


Fig 9-2 Furling the Outer Jib and Flying Jib



No Sails: Attach halliards to the downhauls and lead them to the end of the bowsprit (Figure 9-1). Halliard runs are identical to a rig with sails except for the head block's location. Remove sheets with the sails. If left on deck, they tend to clutter a model. Also, don't put hanks on the stays.

Furled Sails: Figure 9-2 illustrates a furled outer jib and flying jib. Notice their diminutive bulk and how hanks are gathered together. Fat furled sails are not realistic.

2. Main Staysails

Rig the staysails between the fore and mainmasts with hanks, downhauls, halliards, and sheets. The main topgallant staysail has a tack with thimble on the topgallant stay. The topmast staysail tack reeves through a fairlead on the topmast stay, then belays on deck.

Note: *Niagara* often sets the fore staysail on the main stay. The foremast generally carries a storm sail. If rigging the fore staysail, adjust the belaying arrangement to open up pins for it.

No Sails: Omit sheets and tacks. Hook the downhauls and halliards together (Figure 9-3).

Furled Sails: Figure 9-4 illustrates the furled main topmast staysail. Again, it is a compact, round bundle.

3. Spanker

Do as much work as possible with the boom and gaff in hand. When installing them, the most difficult task will be sewing the spanker mast hoops to the sail (Figure 9-5).

Reeve lines, but leave them loose. Set the boom sheet, then tighten the peak and throat halliards. Fit the brails, followed by the topping lifts and vangs. Add the flag halliard after making a standard. Topping lifts and throat halliard have collars at the masthead (Figure 9-6).

Lace the spanker to the gaff, but leave it loose footed at the boom (Figure 9-7). Hook the port tack tackle to a deck eyebolt, then belay it to the cleat on the fife rail bitt.

Fig 9-3 Topmast Staysail Removed

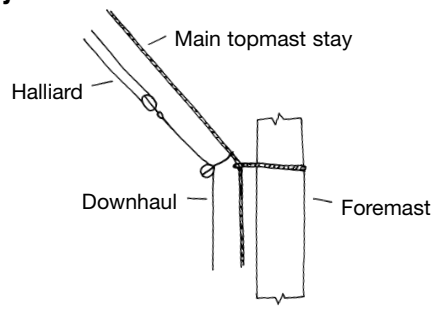


Fig 9-4 Furling the Main Topmast Staysail

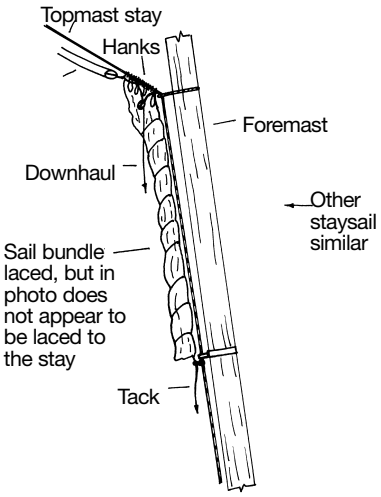


Fig 9-5 Sewing Mast Hoops

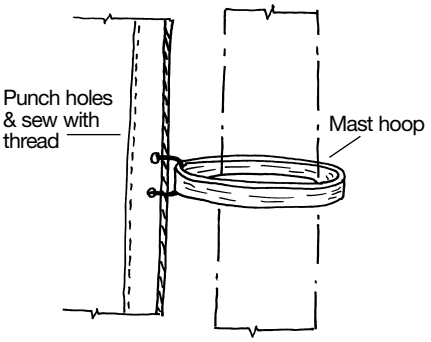
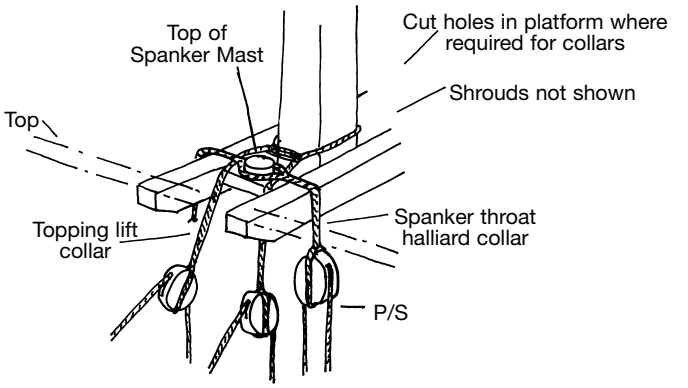


Fig 9-6 Spanker Halliard / Lift Collars



No Sail: The most accurate approach is lowering the gaff on top of the boom. However, some modelers prefer to leave it up, since it fills the space aft of the mainmast. Use the vangs to position the gaff and prevent it from swinging.

Remove brails with the sails, but rig all blocks attached to the gaff. Pile mast hoops at the boom. Topping lifts hold it up. Other lines remain in place.

Furled Sail: Figure 9-8 illustrates a furled spanker. Pull the clew up to the middle brail block on the mast and lead the clew outhaul to the boom end.

Boom Guys and Tiller Guys: Boom and tiller guys are used when the sails are furled or off. Although they steady the boom and tiller, the boom guy could assist the boom sheets in heavy weather.

Bend, furl, or omit the fore and aft sails. March on to the square sails.

4. Fore and Main Course Yards

Mount blocks to yards and reeve as many loose lines as possible. Lace the sail to the jackstays, then attach sheets, tacks, buntlines, leechlines, and clew garnets. Footropes and yard tackles should already be installed. Remember, leechlines and buntlines go on the sail's forward side, all others are on the aft side. Rig the lifts after the yard is in place.

Hang course yards from their slings. Each parrel or truss has a tackle to the deck by which sailors pulled a yard against its mast (Figure 9-9).

After the yard is in place, reeve and belay their lines. Install the braces. Seize most brace blocks to the shrouds with a short pendant. Brace the yards either perpendicular to the centerline and level or at a pleasing angle.

Run course sheets outboard, reeve through sheaves in the bulwarks, and belay to an inboard cleat. Hook the fore course tack into a short bridle fitted in a hole in the chock rail. Belay the fall to the lower rod in the cathead. The main course is seldom used. When it is, the tack is hooked into a bridle at the fore channels. For the model, hook and belay the tack at convenient locations.

No Sail: One option is to omit the sheets and tacks. Another is to hook them to the clew garnet and pull up to the yard. However, this is a little clumsy. A better alternative is to omit the sheets and tacks and hook the clew garnet to the reef tackle. Stop buntlines and leechlines at the yard fairleads (Figure 9-10). Another option is to omit the bunt and leechlines, but install the blocks.

Furled or Partially Furled Sails: Figure 9-11 illustrates a furled course sail and one partially pulled up by buntlines and leechlines.

5. Fore and Main Topsail Yards

The basic difference between rigging courses and topsails is in their sheets and lifts. If sails are bent, hoist the yard by the halliard and droop the lifts. Reeve sheets through the blocks on course yardarms.

Topsail halliards are a hefty rig with tackles in the port and starboard channels.

No Sails or Furled Sails: Figure 9-12 illustrates the yard without a sail and with one furled. In both cases, lower the yard and let it hang on the lifts.

Fig 9-7 Spanker Gaff Lacing

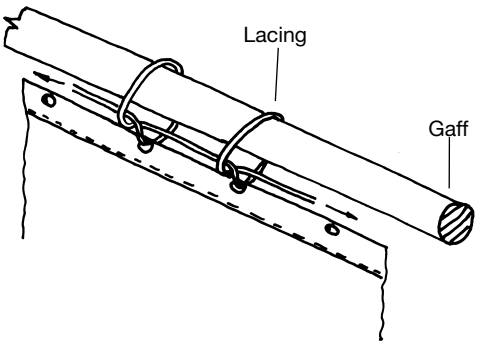


Fig 9-8 Furling the Spanker

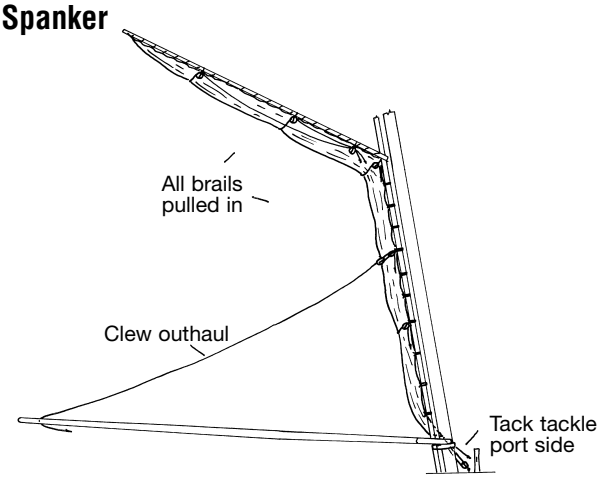


Fig 9-9 Course Yard Sling and Truss

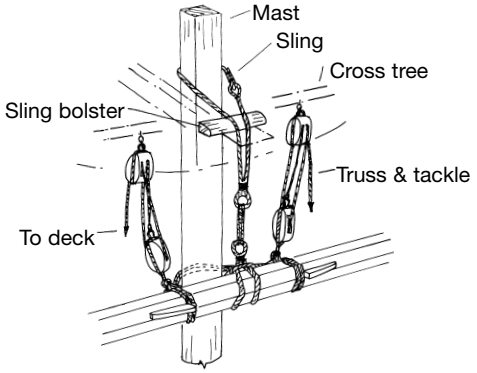
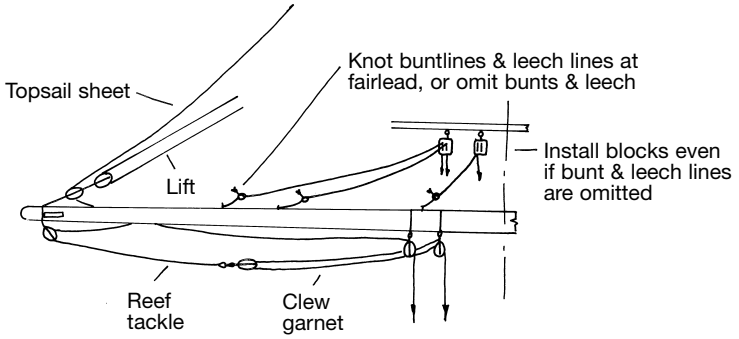


Fig 9-10 Course Yard – Sail Removed



6. Fore and Main Topgallant and Royal Yards

Niagara has a fully rigged royal, furled topside and braced like the topgallant. However, Melbourne Smith intended it to be a free flying rig. Since it is set from the deck, the yard has a halliard and downhaul, but no braces and footropes. Either way is acceptable.

7. Spritsail Yard

Reeve the spritsail yard's lifts through holes in the chock rail, then secure to belaying pins. Run braces to the foretop, then reeve through blocks shared with the fore course braces.

8. Miscellaneous Rigging

Flags and Flag Halliards: Flag halliards are a single line rove through a small block on the fore and mainmasts and at the end of the spanker gaff. Substitute an eyebolt if rigging the block proves difficult.

Installing flags is optional. However, they add interest to the model. Make flags from lightweight cotton cloth and paint with acrylics (they're flexible). If using paper, shape it before installing so the flag hangs naturally.

Stay Tackles: The fore stay and main stay have a tackle above the hatches. Unless depicted lifting cargo or boats, hook the fore tackle to the starboard cleat on the belfry and the main tackle to the base of the main stay.

Mast and Jibboom Tackles: Topmasts and topgallant/royal masts have a sheave in their heels. Masts are lowered or raised with a tackle fitted from the cap, rove through the sheave, and run back to the cap. However, they are not a permanent fitting on *Niagara* and can be omitted.

The tackle on the jibboom is an additional means of holding it in place.

Pendant Tackles: Tackles are hooked into the pendants at the fore and main tops to lift heavy objects. Unless showing them hoisting a cannon, omit the tackles. They are not permanent fittings.

FINAL TOUCHES

When the model is rigged, recheck every line. Be certain seizings are sound. Add another drop of glue if they aren't. Touch up shiny spots on standing rigging with black paint or 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.

Fig 9-11 Furling A Course

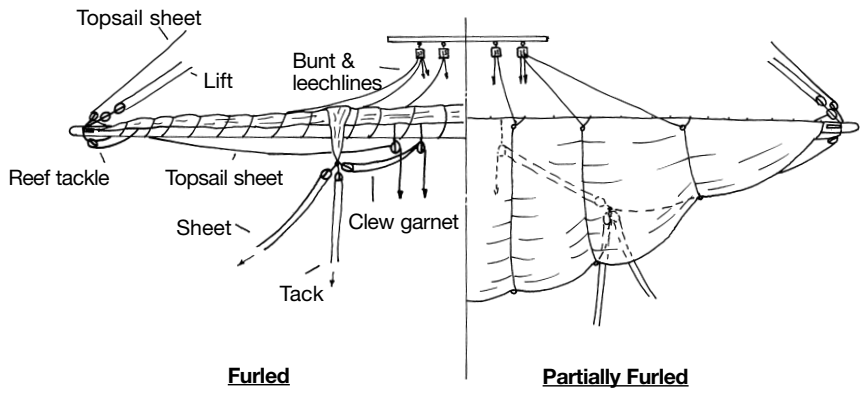
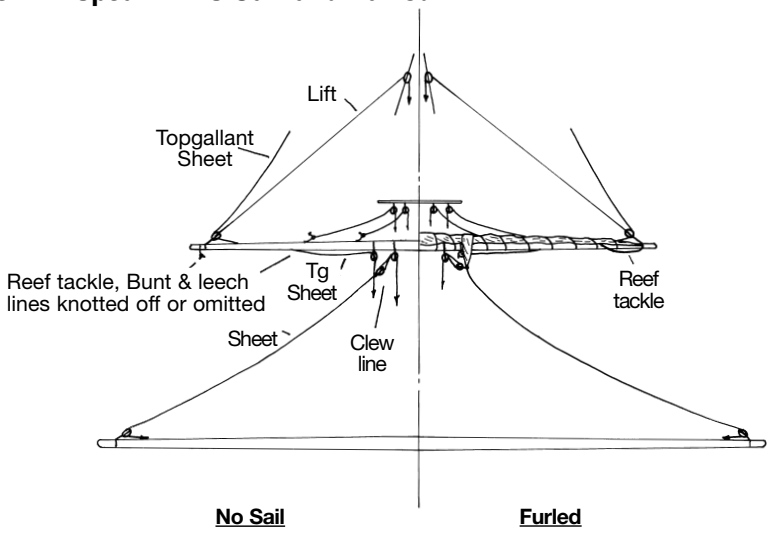


Fig 9-12 Topsail – No Sail and Furled




MAINMAST FIFE RAIL

CONGRATULATIONS

Niagara 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 ship modeling project.

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. Melbourne Smith, "U.S. Brig Niagara," *Seaways-Ships and Scale*,
(September/October 1991), 28-35;
(November/December 1991), 32-37; (January/February 1992), 24-26;
(March/April 1992), 40-45;
(May/June 1992), 52-55.

A description with excellent photographs of the reconstruction and original *Niagara* when recovered.

2. Bill Gilbert, "The Battle of Lake Erie," *Smithsonian*, (January, 1995), 24-34.

An account of the battle with discussions on shipbuilding.

3. *The War of 1812*, edited by Donald K. Beman. New York: Fine Art Historical American Prints Collection, The Knight Group, 1991.

Good account of the battle with plans of *Niagara* and other ships in the war. Quite a few reproductions of paintings.

4. *Tall Ships 1994*. Visitor's guide, Erie, PA.

Photos of tall ships gathering at Erie and a brief history of *Niagara*.

5. Robert Malcomson, "U.S. Brig Niagara Cruises on Lake Erie Again," *Model Ship Builder*, March/April 1991, May/June 1993, July/August 1993.

General discussion with photos of the restored *Niagara* and her history.

6. *HMS Detroit, The Battle for Lake Erie* by Thomas and Robert Malcomson. Annapolis: Naval Institute Press, 1990.

Extensive exposition of events precipitating the battle and a fearsome account of it. Heavily illustrated with prints, photographs, maps, and battle lines. Extensive bibliography for those seeking more information on the War of 1812 or other battles on Lake Erie.

TOPMAST CROSSTREES

SCALE CONVERSION TABLE

RIGGING

Diameters for Lifesize Vessel	Diameters in Tenths of an Inch	Diameters Converted to 3/16" Scale Inches in 10ths ÷ 64=
5/16"	.3125"	.005" (.12mm)
3/8"	.375"	.006" (.15mm)
1/2"	.5"	.008" (.20mm)
5/8"	.625"	.009" (.25mm)
3/4"	.75"	.012" (.30mm)
7/8"	.875"	.014" (.35mm)
1"	1"	.016" (.40mm)
1-1/4"	1.25"	.020" (.50mm)

BLOCKS

Lengths for Lifesize Vessel	Lengths Converted to 3/16" Scale Inches in 10ths ÷ 64=
4"	.06" (1.52mm or 1/16")
5"	.08" (2.03mm or 5/64")
6"	.09" (2.28mm or 3/32")
7"	.10"(2.54mm or 7/64")
8"	.13" (3.18mm or 1/8")
10"	.16" (4.06mm or 5/32")
12"	.19" (4.83mm or 3/16")

The Latest Kits from Model Shipways*

*As of the printing of this manual, some of these kits were not yet released. Please see our website (www.modelexpo-online.com) or call 1-800-222-3876 (Mon-Fri 9-5 ET) for availability, prices and expected in-stock dates.

HARRIET LANE, UPDATED! BACK BY POPULAR DEMAND

Built in New York for the U.S. Revenue Service in 1857, the *Harriet Lane* was powered by a combination of steam and sail. She was 180 ft. long, with a 30 ft. beam, and carried a 30 lb. Parrott rifle, plus three 9" smooth-bore Dahlgrens. Her design clearly illustrates the transition from sail to steam.

Harriet Lane features a machine carved hardwood hull which needs only light shaping and sanding. We provide plank-scored basswood for decking and cabins, spars and hardwood blocks. Ladders, anchors, paddle wheels, two ship's boats, four cannon with carriages and numerous other fittings are finely cast Britannia metal. We've upgraded the kit to include laser cut paddle wheel covers. Newly Detailed plans and newly written clear instructions by master ship modeler, Ben Lankford, are easy to follow. (Baseboard and brass pedestals are not included.)

Solid Hull Kit • Entry Level • No. MS2010 • Length 13-1/2" / Height 13-1/2" / Scale 1/8" = 1 ft. (1:96)

Harriet Lane Paint Set: *Seven 1 oz. bottles of Model Shipways paint:* ***No. MS2010MS***

Walnut Display Base: *Routed and ready for finishing. 20" x 4-1/2".* ***No. RH4520***

Brass Display Pedestals: *Pre-drilled from top to bottom and slotted to fit the keel. You'll need three. Height 1-1/8"* ***No. MS0812***

DESPATCH #9 SOLID HULL KIT

The Diesel harbor tug Despatch #9 was built for the Marine Corps in 1945 at Tampa, FL from a US Army design. Later sold to Standard Oil of California, she worked oil barges in the San Francisco Bay area. Powered by a Busch-Sulzer 6-cylinder engine, she was equipped with practically every modern device of the time, including electric capstan, electric towing machine and watertight doors. Despatch #9 was 85 ft. long with a 23 ft. beam.

Kit features a pre-shaped, machine carved solid wood hull, shaped deck house and superstructure. Other wooden parts include dowels, strips, sheets and blocks. Brass wire and airports, plus over 80 cast Britannia metal fittings outfit your model just like the real tug. Clear plans and instructions make building easy. (Wooden display base and brass pedestals are not included.)

Entry Level • No. MS2011 • Length 13-1/2" / Height 7-1/2" / Scale 5/32" = 1 ft.

Despatch No. 9 Paint Set: *Eight 1 oz. bottles of Model Shipways paint: 1 each/MS4839 Primer, MS4830 Hull/Spar Black, MS4801 Bulwarks Dark Green, MS4816 Deck House Dark Buff, MS4835 Bright Red Trim, MS4828 Iron/Cannon Black, MS4823 Clipper Pearl Gray, MS4962 Aluminum.* ***No. MS2011MS***

Walnut Display Base: *Routed and ready for finishing.* ***No. RH4512***

Brass Display Pedestals: *Pre-drilled from top to bottom and slotted to fit the keel. You'll need two.* ***No. MS0812***

FAIR AMERICAN, REVOLUTIONARY WAR BRIG, C. 1778 PLANK-ON-BULKHEAD KIT

Fair American is a reproduction of a model built over 200 years ago, now on exhibit at the U.S. Naval Academy Museum at Annapolis, MD. She is said to represent the 14-gun privateer Fair American sailing out of Charleston in 1778.

Plank-on-bulkhead construction uses high quality basswood, the preferred wood of professional modelers. All structural hull parts and major fittings are laser cut, so they fit together with remarkable ease. The kit contains over 60 cut or shaped wooden parts, plus 120 extra wood strips for a second layer of planking, should you wish to build your model with a double planked hull. More than 500 fittings of wood, brass and Britannia metal fittings include 14 brass guns on wooden carriages, cannon, chainplates, bell, anchors and wheel. Seven plan sheets a 48 page instruction book by Erik A.R. Ronnberg, Jr. and Ben Lankford, plus a 38-page guide to planking the hull make building easy.

(Display base and brass pedestals are not included.)

Intermediate Level • No. MS2015 • Length 26-1/2" / Height 22" / Scale 1/4" = 1 ft.

Fair American Paint Set: *Six 1 oz. bottles of Model Shipways paint: 1 each/MS4839 Primer, MS4830 Hull/Spar Black, MS4803 Hull Tallow, MS4802 Bulwarks Red, MS4825 Deck Light Gray, MS4969 Gold.* ***No. MS2015MS***

Walnut Display Base: *Routed and ready for finishing. 20" x 4-1/2"* ***No. RH4520***

Brass Display Pedestals: *Pre-drilled from top to bottom and slotted to fit the keel. You'll need two sizes for level display.* ***No. MS0812*** *Height 1-1/8"* ***No. MS0813*** *Height 1-3/8"*

DAPPER TOM SOLID HULL KIT

During the early 19th century, many Baltimore clippers were granted privateering licenses by the US government. Only a fast, well handled ship could be reasonably sure of reaching its destination. Privateers like the *Dapper Tom* depended on their sailing abilities and fire power to prey on foreign shipping and to escape the British men-of-war patrolling the high seas.

Kit features a machine carved basswood hull with accurately shaped bulwarks and transom. Fittings include 8 cast metal cannon, mast caps, anchors, capstan and gratings, brass eyebolts and belaying pins, plus hardwood blocks and deadeyes. Scribed decking, wooden masts and yards, and three diameters of cotton rigging provide the finishing touches of authenticity. With the help of clearly drawn plans and illustrated instructions, even first time builders can finish an impressive model. (Display base and brass pedestals are not included.)

Entry Level • No. MS2003 • Length 24"/Height 18"/Scale 5/32" = 1 ft.

Dapper Tom Paint Set: *Six 1 oz. bottles of Model Shipways paint: 1 each/MS4839 Primer, MS4830 Hull/Spar Black, MS4801 Bulwarks Dark Green, MS4803 Hull Tallow, MS4835 Bright Red Trim, MS4828 Iron/Cannon Black.* ***No. MS2003MS***

Walnut Display Base: *Routed and ready for finishing. 20" x 4-1/2".* ***No. RH4520***

Brass Display Pedestals: *Pre-drilled from top to bottom and slotted to fit the keel. You'll need two sizes for level display.* ***No. MS0812*** *Height 1-1/8"* ***No. MS0813*** *Height 1-3/8"*

1:16 SCALE AMERICAN CIVIL WAR ARTILLERY

WHITWORTH BREECH-LOADING 12-POUNDER

Designed by Sir Joseph Whitworth, the cannon that bore his name became a favored weapon of the Confederacy. Unusual in appearance as well as operation, the Whitworth was a breech-loader that fired an elongated 12-pound iron shell from a finely rifled 1,100 pound barrel. Accurate and easy to maneuver, it had a range of 4.5 miles and made a shrill, whistling noise which could be distinguished from all other cannon of the period. The Whitworth saw action at Gettysburg, Charleston, Vicksburg, Fredericksburg and many other American Civil War battlefields.

- Historically accurate and perfectly scaled
- Cleanly cast Britannia metal components
- Authentically detailed cannon barrel
- One-piece ready to assemble wheels
- Clearly written illustrated instructions
- Easy to build – assembly and painting time 5-10 hours

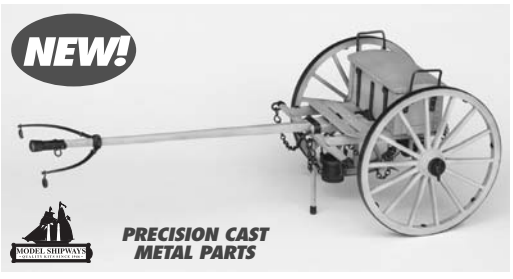
Entry Level • No. MS4001
Length 10" / Width 4" / Height 3-1/4"
Weight 1 lb., 4 oz. / Scale 1:16

GUNS of HISTORY BY MODEL SHIPWAYS

SEE OUR WEBSITE FOR AVAILABILITY
WWW.MODELEXPO-ONLINE.COM

1:16 SCALE AMERICAN CIVIL WAR ARTILLERY

LIMBER AMMUNITION CHEST



The limber was an indispensable piece of equipment during the American Civil War. It was a simple two-wheeled cart designed to carry an ammunition chest containing gunpowder and shot for the artillery pieces. A team of horses was hitched to the limber and a cannon was hooked on to its rear when the army was on the move.

The ammunition chest lid was large enough to seat up to three men. However, sitting above the gunpowder was dangerous, so after the first few months of the War, only the driver rode on the limber. In times of battle, the limber and horses were left behind the lines of fire.

- Historically accurate and perfectly scaled
- Cleanly cast Britannia metal components
- Authentically detailed ammunition chest
- One-piece ready to assemble wheels
- Clearly written illustrated instructions
- Easy to build – assembly and painting time 5-10 hours

Entry Level • No. MS4002
Length 10" / Width 4" / Height 3-1/4"
Weight 1 lb. / Scale 1:16

GUNS of HISTORY BY MODEL SHIPWAYS

SEE OUR WEBSITE FOR AVAILABILITY
WWW.MODELEXPO-ONLINE.COM

Other Fine Kits from Model Shipways

MODEL SHIPWAYS
• QUALITY KITS SINCE 1946 •

BEDFORD WHALEBOAT
Model Shipways Kit No. MS2645

WILLIE L. BENNETT
Model Shipways Kit No. MS2032

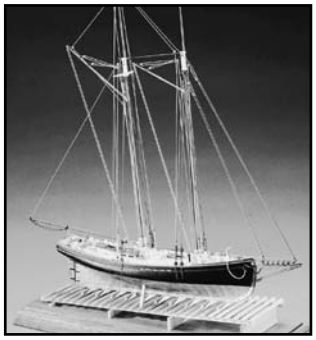
BLUENOSE
Model Shipways Kit No. MS2130

RATTLESNAKE
Model Shipways Kit No. MS2028

CHARLES MORGAN
Model Shipways Kit No. MS2140

BENJAMIN LATHAM
Model Shipways Kit No. MS2109

OUR GUARANTEE
If less than delighted, return your purchase within 30 days in original condition.



PHANTOM
Model Shipways Kit No. MS2027

EMMA C. BERRY
Model Shipways Kit No. MS2150

GLAD TIDINGS, PINKY SCHOONER
Model Shipways Kit No. MS2180

USS CONSTITUTION
Model Shipways Kit No. MS2040

SULTANA
Model Shipways Kit No. MS2016

FLYING FISH
Model Shipways Kit No. MS2018

PRINCE DE NEUFCHATEL
Model Shipways Kit No. MS2110

PRIDE OF BALTIMORE II
Model Shipways Kit No. MS2120

MODEL SHIPWAYS, INC.

Sold & Distributed by Model Expo, a division of Model Shipways, Inc.
3850 N. 29th Terrace, Hollywood, FL 33020
Toll-Free 800-222-3876 Monday - Friday 9-5 ET • Fax 800-742-7171

SAVE TIME & MONEY... ORDER DIRECTLY FROM OUR WEBSITE!
http://www.modelexpo-online.com