

# Building the Gunboat *Philadelphia*, 1776



## Technical Characteristics:

Scale 1:24 1/2" = 1 foot  
Overall hull length 26 3/8"  
Width 13 3/4"  
Height 24 5/8"

## Brief History of Revolutionary War Gunboats (courtesy Lake Champlain Maritime Museum)

The American Revolution was in its infancy when the Continental Congress gave orders "*to build, with all expedition, as many galleys and armed vessels as ... shall be sufficient to make us indisputably masters of the lakes Champlain and George.*" (Journal of the Continental Congress, June 17, 1776 in Clark, Morgan, and Crawford, *Naval Documents of the American Revolution*, 5:589.) American leaders were concerned about British forces to the north. All parties understood that control of the lakes meant control of routes of attack and retreat; the corridor that included the Richelieu River, Lakes Champlain and George, and the Hudson River was the most direct and easiest route between the cities of Quebec and New York.

Control of the lake meant getting weapons onto the water as quickly as possible. As a result, Skenesborough (now Whitehall, NY) became the "Birthplace of the American Navy" in the summer of 1776. General Philip Schuyler chose this

location for its two sawmills and an iron forge, its ease of defense, as well as access to the vast timber resources of the Adirondacks. The fleet construction itself was under the direction of Benedict Arnold, whose previous success as a merchant ship owner and master made him the ideal candidate.

Construction began that summer at a slow pace. Carpenters, riggers were reluctant to leave their lucrative businesses on the coast. Finally lured by higher wages, and despite the heat, mosquitoes, black flies, and long days, these craftsmen completed eight 54-foot gondolas, including *Philadelphia*, and four 72-foot galleys in just over two months.

The gunboat was a flat-bottomed rowing craft with square sails that enabled them to sail before the wind. The hulls were fitted out at Fort Ticonderoga. Across the lake at Mount Independence, they were moored at the foot of a shoreside cliff; spars and guns were lowered from the top of the cliff into position on board.

*Philadelphia* carried three carriage guns, one 12-pounder, and two 9-pounders, and eight swivel guns. She had a single mast with a square-rigged mainsail and topsail. Her crew of 44 was captained by 25-year-old Benjamin Rue, from Pennsylvania. With little experience in boat handling and none in naval combat, Rue's men typified the troops described to Major General Horatio Gates, as "*a wretched motley crew*".

This fledgling fleet spent the majority of their time that late summer and early fall of 1776 patrolling the lake in anticipation of the completion of the British fleet in Canada. Finally, on October 11, 1776, the British were carried southwards on a north wind. Arnold's fleet was moored in a protected bay between Valcour Island and the New York shore in anticipation. The British did not enter the Valcour Island passage from the north, but instead ran south to the east of Valcour Island, which meant that to engage the Americans, the British would have to sail into the wind, putting them at a disadvantage.

Despite this initial advantage, the British fleet was much more powerful than the Americans. At the end of the 6-hour battle, the schooner *Royal Savage* had been captured and burned, and the gunboat *Philadelphia* sunk. Other vessels sustained damage, and sixty men were killed or wounded. The British decided to wait until morning to finish off this rebel fleet, which proved to be a poor decision. During the night, the cunning Benedict Arnold led his fleet in an escape, rowing silently right under the noses of the British.

The next two days were spent in repair and retreat. Arnold abandoned two badly damaged gunboats, *Jersey* and *Providence*. When the British caught up to the remainder of the American fleet, they captured the galley *Washington*. Finally the Americans beached five of their ships, the galley *Congress*, and the gunboats New Haven, Boston, Connecticut, and New York, and retreated on land to Fort Ticonderoga.

During the summer of 1935, Colonel Lorenzo F. Hagglund, an experienced salvage engineer from New York, located the *Philadelphia* with a sweep chain, midway between Valcour Island and the New York shore. She was lying upright in 60 feet of water, her mast still standing, its top barely 15 feet beneath the surface. Hagglund describes his dives:



We are now approaching the blunt bow. Just above the mud line there is a hole in her side through the outer planking, a shattered rib and the inner planking; it measures about 10 x 12 inches. Just forward of this hold the starboard anchor stands in the mud under a cathead. The stock, made of two pieces of oak pined together, is now worn thin, but the remainder of the anchor, made of wrought iron, is so well preserved that in places the hammer marks can still be seen. It carries the number 320. A little forward of the cathead is what appears to be a white hole above the wearing strake. It is a lead-lined hawse pipe and the wear of the anchor rope is clearly visible.

We have arrived at the bow. In place of a bowsprit, we find a cannon with a peculiarly shaped object fixed in the muzzle. This object, now covered thickly with rust, is a bar shot. The bow gun crew had not completed the loading their gun, and as the *Philadelphia* went down bow first, this bar shot slid forward and half out of the muzzle, where, as one end dropped, its own leverage clamped it in position. The carriage of this gun is full forward on its slide.

Unfortunately, the recovery of *Philadelphia* is not a study in careful nautical archaeology. However, Hagglund's skill as a salvage engineer meant that the vessel was raised intact. He assumed financial responsibility for the vessel, and put her on a barge to tour the lake. After Hagglund's death, *Philadelphia* was donated to the Smithsonian's National Museum of American History, where she is on display to this day as the picture above. The Smithsonian commissioned a detailed study of the hull and produced a very detailed set of 16 drawings. Much of the missing elements of the vessel, e.g., masting and rigging, canopy structure, etc. were determined from knowledge of maritime practices of the time. It is from these drawings the kit was designed.

## **Building the Hull**

Locate the keel, part 17, the stem, part 18, and the stern post, part 19. Refer to Detail 2-1 and glue these parts together as shown on a flat surface. Glue part 18B to the stem and part 26 to the stern post. Study Detail 2-1 and the sections shown there to be sure you understand how these parts assemble. Carve and sand parts 18B and 26 to the shape shown. It is easier to accomplish this after these parts are glued to the assembly.

Carve and sand the bevels on parts 18A and 25 as shown. Glue these parts to the assembly noting where they locate. There will be a small gap between parts 18A and 18B, as well as parts 25 and 26. Study the cross sections for clarification. This method of construction provides the rabbet for the plank ends (hood ends) without the need to carve in the rabbet.

Glue in parts 20, 21, and 22 as shown. These assure that the keel is plumb when glued to the bottom as in the next step. Match up bottom parts 23S and 23P and apply a strip of Scotch tape to the joint. Turn over and apply a few spots of glue to the joint. Glue on part 24 and assure that the assembly is held flat while the glue dries. Carefully align and center the keel and glue to the bottom. It is important that the keel be centered for the bulkheads to fit properly. If your keel is not quite straight and has a little bow in it, glue it to the bottom at the ends only. When dry hold the keel straight by some means and then glue at the center. The bulkheads will firmly anchor the keel to the bottom.

Before removing the bulkheads from their boards use the parts identifier sheet and number the bulkheads with a soft pencil. Many of the bulkheads are very similar in shape and could be easily confused. Refer to detail 2-4. Carve and sand the bevels into the bulkheads as shown. The bevel line has been determined for you and laser engraved making it easy to form the bevels. In the midships section the bevel is so small as to be negligible. It is much easier to carve these bevels before gluing the bulkheads in place. It is a good idea to prepare a bulkhead, or pair of bulkheads, then glue in place. While the glue is drying prepare another bulkhead pair. Assure that the bulkheads are square to the keel. For the bulkheads that are comprised of 2 pieces ensure that they fit properly to the edge of the bottom. You may find that some adjustment may be required by shaving the center joint of the bulkhead.

**TIP:** In many instances in model building commercial squares are too large for the purpose. A convenient square for tight places is to snip a corner off a common note card or similar.

With the bulkheads in place, now is the best time to complete the cockpit floors. Refer to detail 2-5. Glue 2 parts 27 to either side of the keel in the forward cockpit. These parts serve two purposes, closing up the mast step and bringing the exposed part of the keel to scale thickness. Glue in the 3/16" square members as shown. These pieces raise the cockpit floor to scale height and provide the landing for the floorboards. Fit and glue in the 1/16" x 1/2" floorboards. Glue parts 29 and 29A as shown. Parts 29 are glued to the aft side of bulkhead 12 which is not shown for clarity. These parts provide the landing for the ceiling planks to be installed later which extend below the deck levels. Add an eyebolt just aft of the mast step as shown.

Similarly construct the aft cockpit with parts 28, 3/16" square stock, 1/16" x 1/2" floorboards and parts 5A and 6A as shown. Parts 6A are glued to the aft side of bulkhead 6 which is not shown for clarity. The width of the bailing well is about 7/8" fore and aft.

**Planking the hull:** Planking a full size ships hull begins with a process called "lining off". The goal is to establish lines along the hull that will determine the run of the planking, the width of the planks and the consideration of the width and length of the lumber available to plank the hull. Study the planking development drawing on plan sheet 1. A strake is the continuous run of plank along the hull from stem to the stern. A strake will consist of several planks. There are 2 strakes above the wale and 4 strakes below the wale in our model hull. The lower strakes are numbered 1 thru 4. Each strake is made up of a number of individual planks butt jointed on the bulkheads. Note the butt lines on the drawing. These are placed as they were on the full sized ship. Normal practice is to begin by dividing the hull into sections called belts. The number of belts depends on the size of the hull as well as the hull shape. Battens would be fastened along the length of the hull establishing the lines and adjusted until pleasing lines are achieved and the spacing between belts seemed

reasonable as to the number of strakes required. The bulkheads (or frames) would then each be divided into an equal number of strakes and so marked. Joining these marks along the length of the hull would establish each strake line. It all may sound complicated but in practice is easily accomplished once an understanding of the process is achieved. There are many variations of this process and usually the method and preferences of the master plinker governed.

Fortunately for our model we do not have to go through this process. Most of the work has been done for you in CAD. You will have noticed the laser engraved tick lines on the bulkheads. These are the marks that define the run of the strakes. It is advisable as you proceed with the planking to pin a batten, say a 1/16" x 1/8" strip to the bulkheads at the marks and then mark all bulkheads across their outboard surfaces (edges) clearly defining the run of the strake. A cordless rotary tool such as a Dremel Minimite model 754 is extremely useful for this work. Use a small bit to drill through the batten into the bulkhead and use common straight pins to fasten the batten to the bulkheads so that the strake line can be drawn. You can mark all strakes at this time or mark them as you go. Refer to the profile view on plan sheet 1. The ends of the planks that meet the stem at the bow are called "hood ends". Templates have been provided on the pattern sheet to locate the position and width of these hood ends. Cut out the templates, fit to the stem and stern post and mark the locations of the strake lines on the stem and sternpost. No marks are needed for the sheerstrake, the strake below the sheerstrake and the wale as these are constant width. Bevel the edges of the bottom and fair into the bulkheads. Note that the bottommost strake over laps the bottom.

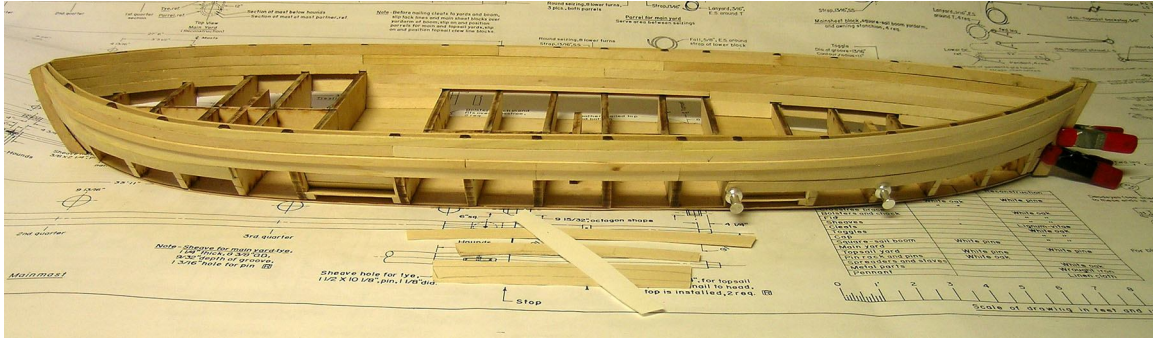
With the hull lined off we are ready to begin the planking. The Philadelphia hull is planked both inside and out. The inside planking is called the ceiling planking. This is a nautical term that goes way back into history. You will not be able to plank this hull without wet bending planks. Planks require both bending and twisting to properly fit to the hull. This is especially true at the bow and stern where curvatures are greatest. In addition most planks must be shaped by a process called spiling, more on this later. Wet bending means soaking a plank for sufficient time to allow it to soften and easily bend and twist. The plank is clamped in position on the hull and allowed to thoroughly dry before gluing in place. Planks can be soaked in water or even better boiling water. There are several methods used by modelers to bend and twist planks.

- Soak in hot water
- Soak in boiling water
- Soak in household ammonia. It is believed that ammonia somehow affects the wood cells making them more yielding. A tall bottle of ordinary household ammonia on the workbench is a handy method.
- Wet the plank and wrap in a wet paper towel and microwave until hot and wet. Caution: fire can result if overdone.

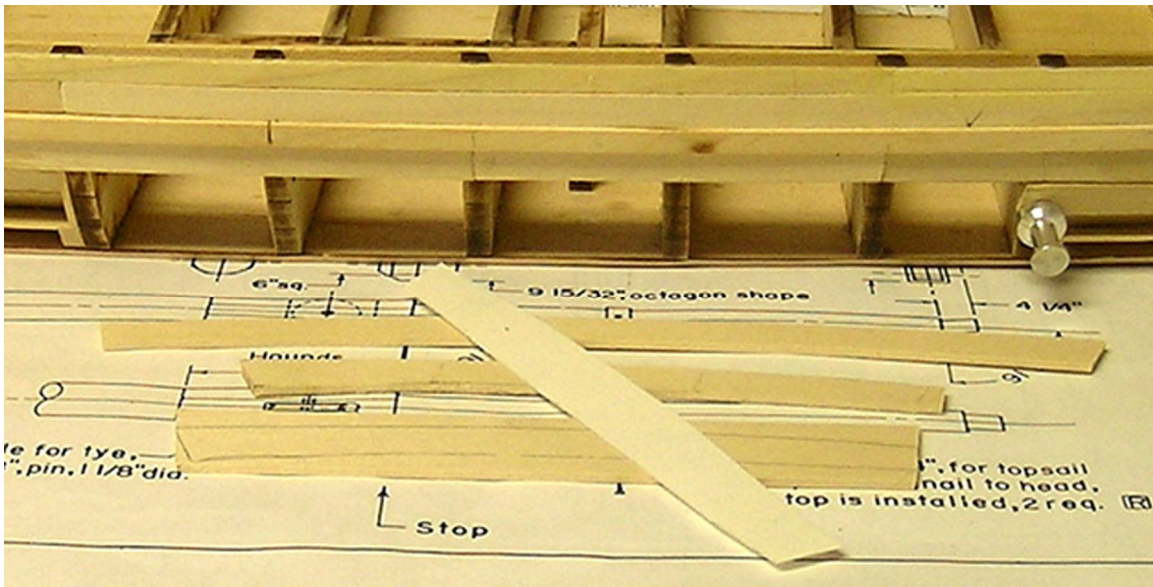
Begin with the sheerstrake. Refer to the section view, Detail 2-8 for the planking sequence. Study the planking development drawing on plan sheet 1. The development view illustrates the plank butt joints on the bulkheads. These are very close to the joints on the full size restored vessel and were used on the prototype model. Soak a 1/16" x 3/16" strip and clamp to the bulkhead tops from the bow to midships and let dry. Carefully align this strake with the tops of the bulkheads and glue in place. Repeat for the remaining sheerstrake planks from bow to stern and port and starboard. The next plank below the sheerstrake is 1/4" constant width. Again, wet, clamp, let dry, fit and glue. Next apply the 1/8" x 3/16" wales. Detail 2-6 illustrates the completion of these strakes. The ceiling planking can be begun at any time in the planking process. The ceiling planking is all 1/4" constant widths. No spiling and shaping is necessary for the ceiling planks. They can be applied with only moderate edge bending but must also be soaked, and clamped in position and allowed to dry. When the ceiling planks reach the bulkheads; simply notch the plank in way of the bulkheads allowing the plank to extend below the deck levels. All of this will be hidden when the decks are installed.

There are four strakes of planking below the wales numbered 1 through 4. These planks cannot be applied as full width but must be shaped to fit in their respective positions when bent and twisted to conform to the hull. The process of determining the shape of a plank is called spiling and simply means transferring a curve to a straight plank and then cutting them out. Study the spiling illustration on plan sheet 2 if you are not familiar with this process. Again review the suggested locations of the butt joints. Note that if you try to run the planks too long you will soon find you do not have enough plank width to meet the lined off marks. There are three widths of planking material for these lower strakes in your kit, 1/16" x 3/8", 1/2", and 3/4". Use the narrowest material in each case that is wide enough to let you fit the upper edge and still be able to reach the marks for the lower edge. Begin with strake 1 below the wale and work your way down. It is sometimes useful to use strips of thick paper such as common poster board to obtain a rough plank shape. Once a plank has been fitted to one side of the hull it can be used as a pattern for the plank on the other side of the hull. Planks at the bow and stern must be wet bent or gluing and clamping dry planks can be very difficult. A useful item for clamping material to the hull during spiling, fitting, and gluing are the Aluminum push pins sold at office supply stores.

Drill a slightly undersize hole in a bulkhead at the desired location and push the pin in to secure a plank. This is illustrated in photo 1, 2, and 3. Do not use the plastic variety as they shatter easily.



**Photo 1: planking in progress**



**Photo 2: typical plank shapes**

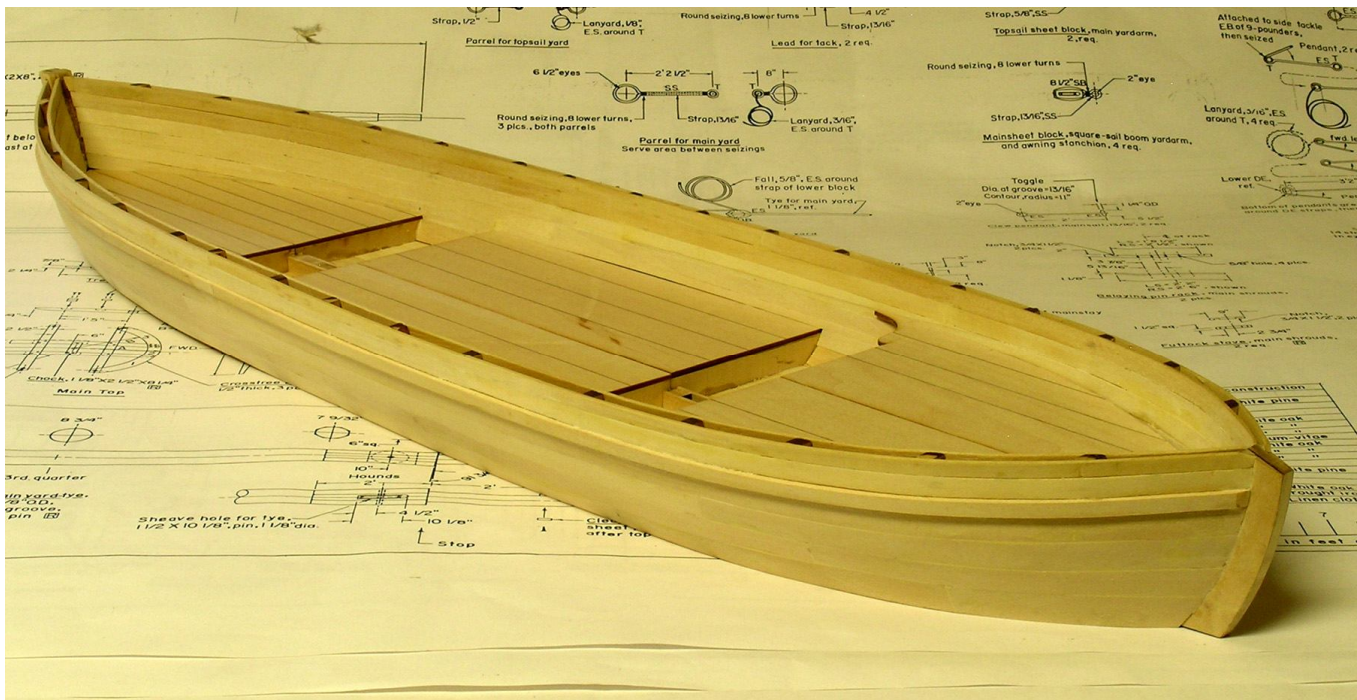


**Photo 3: method of clamping planks**

There are several things to note in these photos. In photo 1, note that the planks are installed at the bow and stern leaving the center section as the last plank to complete the strake. This is common practice. Also note that the short ceiling planks in the area of the cockpits have been completed down to the cockpit floors. In photo 2 the top plank shown is a fully fitted bow plank ready for wet bending and installation. The middle plank is a fully shaped stern plank ready for wet bending and installation. At the bottom is plank stock on which is traced the same stern plank ready for cutting out to be fitted to the other side. Photo 3 shows a fitted stern plank wetted and clamped to let dry.

With the hull planking complete trim the bottom strake flush with the bottom. As there was no evidence of paint on the recovered vessel we finished the prototype model with stains only. Minwax Golden Oak was used for the hull with Minwax Provincial, a slightly darker stain, on some parts to provide a little contrast. Sand your hull inside and out to your satisfaction and stain.

**Decks, knees, and chests:** The decks may now be installed. The foredeck is made up of parts 30P and 30S. The middeck is made up of parts 31P and 31S. The aft deck is made up of parts 32P and 32S. These pieces are deliberately a bit oversize to allow fitting to your model. If you are using a contrasting stain for the decks you may want to stain them before installation. Trim and sand these parts for a good fit and glue in place. The midship knees may now be installed. Refer to Detail 2-9. The knees were nailed in place on the restored ship. You may want to add a bit of realism by indicating a nail pattern on the knees using a dot from a pen or similar. Glue in knees K2 first then install the 1/16 x 3/16 coamings. Use the pattern supplied to locate the K3 knees on port and starboard sides. The pattern is designed to lie between the coamings and indicates the position of the knees. The spacing is different on the port and starboard sides to accommodate the two 9 pounder guns. The aft storage chests may be installed at this time. Locate the parts 40, 41, 42P and 42S, and 43. First shape and fit parts 40 and 41 to the hull in their respective positions then assemble and install the storage chests. These chests were probably used for small arms storage and/or personal gear.



**Photo 4: Hull planked and decked**

**Eyebolts, ring bolts and hawse holes:** There are quite a few eyebolts for guns and rigging on the Philadelphia. These eyebolts were installed by drilling through the ceiling planking and the outer planking, inserting the eyebolt, and then applying a washer and peening over the end of the bolt to secure it. These were called through hull holes. Now is a good time to locate the positions of these bolts and prepare a hole for them. Refer to detail 2-10. Patterns have been supplied to help you locate the positions of these holes. They are on the pattern sheet as well as shown on plan sheet 2. The patterns for the 9 pounder guns are designed to be located on the inside of the hull. Hold the pattern in place and use an appropriate drill bit to drill through the hull. Do not install these eyebolts and ring bolts at this time. It is much easier to rig the guns, breech line and side tackles, to the eyebolts while off of the vessel. Once the guns are built and rigged the eyebolts can be inserted in their respective positions and secured. In various places on the drawings the letters EB are

used to mean eyebolt, and the letters RB indicate a ring bolt. There are 3 other eyebolts that can be permanently installed at this time. Refer to Detail 2-10 and 5-1. The eyebolt for the topmast halyard and the ringbolt for the mainmast backstay may be installed at this time.

There are two eyebolts at the stern of the hull for the main braces. Refer to plan sheet 5 for their location. These are installed from the outside of the hull and may be installed at this time.

At the bow use the patterns supplied to locate the eyebolts and ring bolts and hawse holes. Note that there is a pattern for the inside hole locations and a pattern for the outside hawse hole. Again do not install the eyebolts and ringbolts for the 12 pounder gun at this time. Drill a small hole at the center of the hawse holes then use successively larger drills to enlarge the holes. Finish the hawse holes with a needle file. Use brass parts B2 to judge the size of the hole. The hawse holes were lined with a rolled lead pipe and the protruding ends hammered over to form a flange both inside and outside of the hull. These brass parts simulate the flanges. The brass parts may now be installed. Gel type CA glue works well here. Paint the brass a dull gray to represent the color of lead. Note in detail 2-10 the eyebolt in the stem where the foredeck meets the stem. This is for the forward stay. Drill a hole at this location for one of the larger eyebolts but do not install the eyebolt at this time. This will come in the rigging stage.

Note that the rail caps are yet to be installed. These will be installed later after the gun carriages are in place. This is so that the eyebolts and ring bolts can be inserted while there is still access to the space between inner and outer planking. It is much easier to insert the eyebolts through the ceiling planking and then find the hole through the outer planking while the hole is visible. This is true also for the lower deadeyes. The deadeyes are unusual in that they are stropped with heavy line and the two legs of the strop are passed through holes in the hull from the inside. They were secured by constructing a stopper knot in the end of the line. Use the patterns supplied to locate and drill for the stropps. It is best to use a small drill at this stage and a larger drill later. This will depend on the diameter of the line used. Note that there is a pattern for the starboard side and one for the port side. Hold these patterns to the outside of the hull and align with part K2 when drilling.

**Lower deadeyes:** Refer to Detail 3-1. Make up the deadeyes as shown leaving the strop line long. Use the largest line in your kit. Stiffen the ends of the line with CA glue so as to be able to work them through the holes in the hull. Drill out the holes to suit the diameter of your line and thread the strop lines through the holes. Pull tight and secure with CA glue. The appearance of a stopper knot can be created by using a couple of simple overhand knots around the strop line with smaller line. When all is secure, trim the lines for a good appearance.

**Installing the mast partner:** Refer to Detail 3-2. In order to properly position and set the mast partner an installation jig has been provided. Assemble the jig from the parts shown BUT DO NOT GLUE. The jig locates by butting to bulkhead 11. The mast partner has been deliberately cut long to allow for fitting. Trim the ends equally for a good fit to the ceiling planking. Measure carefully from the edges of the cutout as you go to ensure equal removal of material from each end. Glue the mast partner in place and remove the jig. It is best to drill and nail through the hull into the ends of the partner for increased strength as shown in Detail 3-2.

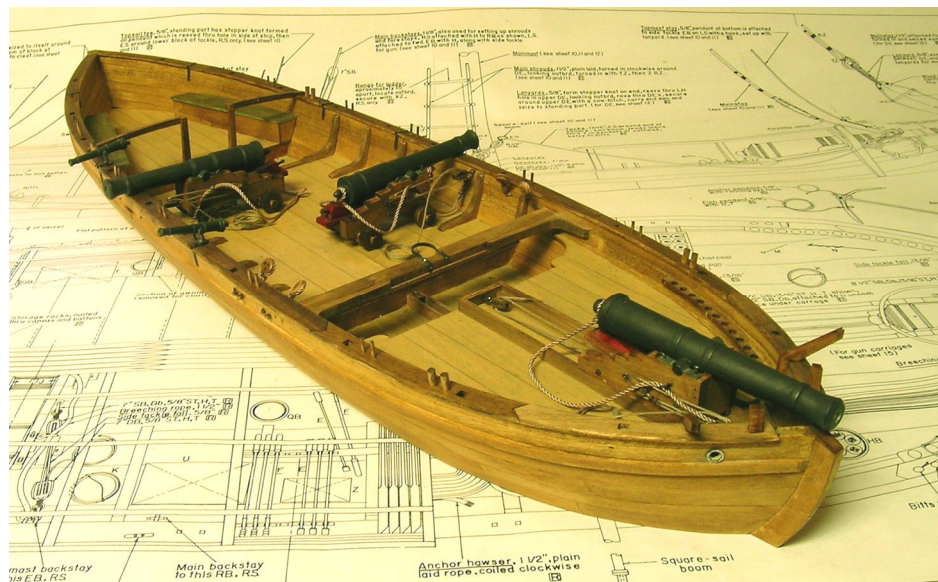
**Shot garlands (racks):** Use the full size top view to determine the location of the shot garlands. Some fitting and beveling may be required for a good fit, no two models can be exactly the same. To establish the proper height from the deck, Cut 2 pieces of 1/8" x 3/16" stock and 1 piece of 1/16 x 3/16 stock all about 1 1/2 inch long. Stack these and glue. Refer to Detail 3-1. The shot garland rests on this stack while the glue dries. For more joint strength pre-drill the garland for small nails as shown in Detail 3-1.

**Building the 9 pounder guns:** Refer to Detail 3-3. Locate the parts for the axles. Glue part C4 to C3. Carve and sand the axles round as shown. Check the fit of the axles to the wheels as you go. Pre-drill the carriage sides for the eyebolts and the transom bolts. Glue two parts C2 to C1R and C1L. Glue a 3/32" x 18" strip to the bottom inside of parts C1R and C1L as shown. Note that the 1/8" dimension is vertical. Assemble the sides, the frontspiece C6 and the axles as shown. Align the sides with the laser engraved marks on the axles. Glue these parts together checking for alignment and squareness. Cut two pieces of 1/8 square and glue in place as shown. The eyebolts, ringbolts, and transom bolts may now be installed. The bolts are made from 19 gauge black wire. Insert the bolts as shown and snip off a bit proud of the sides. Glue in place the washers, part B2. Prepare part C7 and glue in place. The quoin is glued up from two parts C8 but do not glue in place. The position of the quoin will be determined when the gun barrel is in place. Assemble the gun barrels cast parts using epoxy or CA gel. Paint the barrels a flat black. Common barbecue spray paint works well for this. An attractive metallic sheen on the barrels can be achieved by rubbing a common lead pencil on a piece of sandpaper creating a pile of dust. Use your finger to rub this lead dust all over the barrels. Make up the hinges and pins for the trunnion caps from 19 gauge wire as shown. The forward pin is made by hammering a flat in the end of the wire and shaping as shown. Place the barrel and caps in place and drill for the hinge and pin. Place the barrel in place and determine the position of the quoin to your preference for barrel elevation.

**Building the 12 pounder gun:** Pre-drill the carriage sides, parts G1R and G1L for the eyebolts, ring bolts, and transom bolts. Refer to Detail 3-4. Glue a 3/32" strip to the inside bottom edge of the carriage sides. Glue parts G2 to the carriage sides as shown. Cut 2 pieces of 1/8" square stock to the same length as the width of part G3. Insert an eyebolt to the inside of part G3 as shown. Assemble and glue these parts checking for squareness. Shape part G4 as shown and glue in place. Assemble the quoin from 2 parts G5 and a brass belay pin but do not glue to the part G4. Again, the position of the quoin will be determined when the gun barrel is in place. Apply the ring bolts and eyebolts and transom bolts. Note that the middle transom bolt would require drilling all the way through part G4 as was the original. This is not necessary; just insert a short piece of wire to simulate the through bolt. Assemble the barrel and make up the trunnion caps as you did for the 9 pounders. Make up the gun track from parts G6 and lengths of strip stock as shown. Use the top view of the hull to determine the length and cut a bit long to allow for fitting. Note that there are two parts G6. The one shown forward is temporary and is not glued but is used to maintain correct spacing as the glue dries. Fit and glue the gun track to the fore deck.

**Rigging the guns:** Refer to Detail 3-5. Kit blocks are not shaped very well. Their appearance can be much improved with a little work with knife, file, and sandpaper. This is more difficult for the smaller blocks. Blocks are *stropped* (encircled with either rope or iron straps). Also note that we will refer to a double block as DBL and a single block as SGL. We have chosen to strop our blocks with 28 gauge wire (.015 dia.). Detail 3-5 illustrates the method. Bring the wire around the block and twist tight. Twist far enough to allow forming a hook. If a becket is needed, insert an appropriate size wire, rod, or tool and lever the wire away from the block a bit. This also serves to tighten the wire snugly to the block. There are three sizes of blocks in the kit, 10 mm, 7mm, and 5mm. Use the 10mm blocks for rigging all guns

Refer to Detail 3-7 and 3-8. There are six sizes of rigging line in the kit. Select an appropriate size of line for the side tackles. Make up three pairs of side tackles using a single block with becket and hook, and a double block with hook. Make up the intackle for the 12 pounder similarly. For the breeching ropes, use the large line and make a small loop secured by a throat hitch. Measure equal lengths of the legs and secure to a ring bolt with seizing as shown. The carriages may now be placed on board and the ring bolts and eyebolts be inserted in their respective holes drilled through the hull. Secure these bolts with CA glue. To simulate the washers and peened ends on these bolts on the hull exterior, snip them off a bit proud of the hull and draw a circle around them with a fine point black Sharpie pen. Keep the pen in close contact with the bolt end. It is common modeling practice to pin ships guns to the deck. This can be accomplished by drilling through the axles between the wheel (truck) and the carriage side and through the deck at an angle. A common sewing straight pin is long enough to secure the guns. With the guns fastened to the deck the tackles can now be tightened up and the falls coiled and secured to the deck with a few spots of glue. The 12 pounder carriage can now be glued to the gun track and its tackles tightened up and the falls coiled and secured. It is a good idea to remove the gun barrels at this point while the remainder of the hull construction is carried out.



**Photo 5: Guns installed**

**Rail Caps & Stern Railings:** Refer to Detail 3-9. Remove the rail cap parts from board PA-10 and lay them out as shown in Detail 3-9. Be sure you have correctly identified each part and have the correct orientation end to end. Begin at the stern. A gel type CA glue in conjunction with carpenters glue works well here. Glue each piece in place from stern to bow. The upper edges of the caps should be rounded over a bit.

Refer to Detail 3-10. Now that the rail caps are installed we can add the stern railings. Note that the railings are not symmetrical. The starboard rail, part 39S is longer than the port rail.

**Catheads and Mooring Bits:** Refer to Detail 3-11. The catheads, parts 44, are shown full size. Drill holes for the anchor stopper rope and slot. The scale diameter for these holes is about .042" but is not critical. Finish the slots with



knife and needle files. For appearance, gently round over the edges of the catheads with sandpaper. Fit and install. Prepare the mooring bits by rounding edges and glue in place. Note that the notch in the bits goes to the inside of the hull.

**Swivel Gun Brackets, Thole Pins, Bitts, and Cleats:** Form the swivel gun brackets as shown in Detail 3-12 and glue in place. Gel type CA glue works well here, once in place drill through the rail cap and check for fit with the swivel gun yokes. Cut thole pins and bitts from dowel as shown. Install maintaining an exposed length of about 1/4 inch. The cleats may be installed at the locations shown on the top view of the plans.

**Rudder:** This is a good point to fit the rudder to the hull. Refer to the rudder detail on sheet 1. Carry the vertical joint lines to the other side of the rudder and mark with a pencil. Note that the horizontal battens are on one side of the rudder only. Mark and drill holes for the rudder slot in the tiller. Clean out the slot with knife and files and fit to the rudder. The top of the rudder will have to be rounded and shaped a bit. Locate the brass parts B5, B6, and B7. Note that the bend lines on B6 and B7, pintles have been etched into the brass. The bends should be made with the etched lines to the outside of the bend. Cut off brass pins as shown. Prepare the parts for soldering. As always the key to soldering success is clean parts. Use fine sandpaper to clean the surfaces to be soldered. Make the center bend in the pintles. Devise some method to position and hold the parts for soldering. Apply flux and position the pin in the pintle. Snip off a bit of solder and put in place then apply heat. Complete the bends and fit to the rudder. CA gel glue works well here. If desired drill a hole for a stopper rope as shown.

Carefully align the rudder to the stern post and mark the locations for the gudgeons. Drill holes in the stern post for the gudgeons and insert with CA gel glue. After fitting it is a good idea to remove the rudder while other construction steps are completed.

**Mast and Topmast:** At this point it prudent to get the mast ring in place before the structure becomes cluttered. Refer to Detail 3-14. To fit the mast ring we need to build the mast. The mast and topmast are glued up from parts as shown on plan sheet 4. This is called a "made mast" and is similar to full size practice. Study the full size drawings of the mast and topmast on plan sheet 4 to familiarize you with what needs to be done. Note that there are three sections of each mast, the lower part, the hounds, and the upper part.

Glue one part M2 to both sides of part M1. Carve and sand parts M2 to a uniform square taper as shown in Detail 4-1. The mast should now be square with equal sides. To assist in this step a pattern of the taper has been included on the card stock pattern sheet to guide the shaping. Carefully cut them out and apply to the untapered sides of the mast blank. Use rubber cement or similar so as to be easily removable. Carve and sand to an octagonal 8 side shape. Shave a bit off the corners approaching a 16 side shape. Take the mast to round shape with sandpaper. Take your time; this process is easier than it might look. To form the hounds glue 2 parts M3 to the assembly as shown. Again take these parts to a uniform square taper and then an octagonal shape. The sheave for the mainsail tye can be simulated by drilling two holes through the hounds and then shaping the sheave with knife and file work. Add the 1/32" x 1/8" filler blocks. Shape the tip top of the mast to fit the square hole in the mast cap, part M6. Note do NOT attach the mast cap or the cleats at this time. The cap and cleats will be added after the back stays and the shrouds are slipped over the mast. The four 3/8" cleats at the base of the mast may be added at this time.

With the mast completed the mast ring can now be fitted to the mast partner. Again refer to Detail 3-14. Anneal brass part B2. Seat the mast and bend the brass around the mast from aft to forward so that equal legs are created. Mark the position on both legs where you want the twist to begin. With two pairs of pliers, twist the legs 90 degrees. Make the final bends over the front of the mast partner. Install with shortened brass nails.

**TIP:** It is common practice NOT to glue a model's mast(s) to the hull. It is many times much easier to rig a mast with shrouds, stays, spars, and all the associated gear with the mast off of the model. The mast can then be stepped and all lines belayed to their intended locations. Also if the model should ever need repair it could be impossible to remove the mast(s) if needed.

The topmast is constructed much in the same manner as the mast with the exception that the hounds are an integral part of the structure. Refer to Detail 4-2 and the full size drawing above it. Glue up the parts M4 and two parts M5. Use a piece of 1/16" square stock through the square fid hole to ensure alignment. Be careful not to glue the fid to the assembly. Patterns to assist in this step have also been supplied. Carefully mark the demarcation line between the mast and the hounds. Carve and sand the mast below the hounds to a uniform square taper, then to octagonal and then to round. Carve and sand the hounds to uniform square taper and then to octagonal as shown. Drill holes to represent the topmast sheave checking to ensure you drill through a face 90 degrees to the fid orientation. Finish the top portion by carving and sanding to uniform square taper, then to octagonal and round.

**Main Top:** Refer to Detail 4-3. Assemble the top from parts M7, M8, and M9 as shown. Drill the holes for the topmast shrouds as shown. Shape the bolsters from 1/8" square stock. Check the fit of the top, cap, and topmast to the mast as shown in Detail 4-3. Adjust if necessary. Do not glue the top to the mast or install the topmast as yet. These parts should remain removable until a later stage. When adding the bolsters, ensure that the bolster is not so far forward as to interfere with the topmast fid.

**Spars:** Refer to Detail 4-4 and the spar drawings on plan sheet 4. Cut the spar dowels to length and taper and round as shown. It is a good idea on ship models to pin the spars to the mast. Spars do not have sufficient weight to hang naturally making it difficult if not impossible to display taut rigging. Rigging a spar can be frustrating if not held to the mast. Model pins are usually too short for this task. Use a common sewing straight pin with the head removed. Remove the mast and position the main spar on the mast and drill for the pin. Apply a bit of CA glue to secure the pin in the spar but not the mast. Similarly pin the topmast spar to the topmast. Remove the spars for rigging.

## Rigging the Model:

Refer to detail 4-5. Attach the main yard halyard and the downhaul as shown. You might want to make up and attach but do not glue the main yard brace pendants as shown in Detail 5-3. You could also attach the main yard lifts with a sufficient length of line to reeve and belay. Similarly attach the topmast halyard to the topmast spar.

**Note:** Hauling lines on a ship such as halyards and lifts must have sufficient length of hauling line so the yard can be lowered to the deck or appropriate location. When raised to sailing position this length of line (the fall) is usually coiled and stowed, to the deck, or belay pin, or cleat. This can be difficult to accomplish within the tangle of rigging on some models. It is model practice to belay the line with sufficient fall to reach the desired location, and then create a separate coil at that location to give the appearance of a continuous line.

Pin the main spar to the mast. Refer to Detail 4-5 and make up the parrel. This will be much easier with the mast and yard laying flat on a table. Cut off any excess pin length. Reeve the halyard through the hole in the mast.

**Note:** There are six sizes of rigging line in the kit. The heaviest line is used for the anchor hawsers and the breeching line on the guns. The lightest line is used for lanyards. In general line weight is heavier for lower mast rigging and gets lighter as we go upward to the topmast. Use your judgment as to which line to use for each purpose.

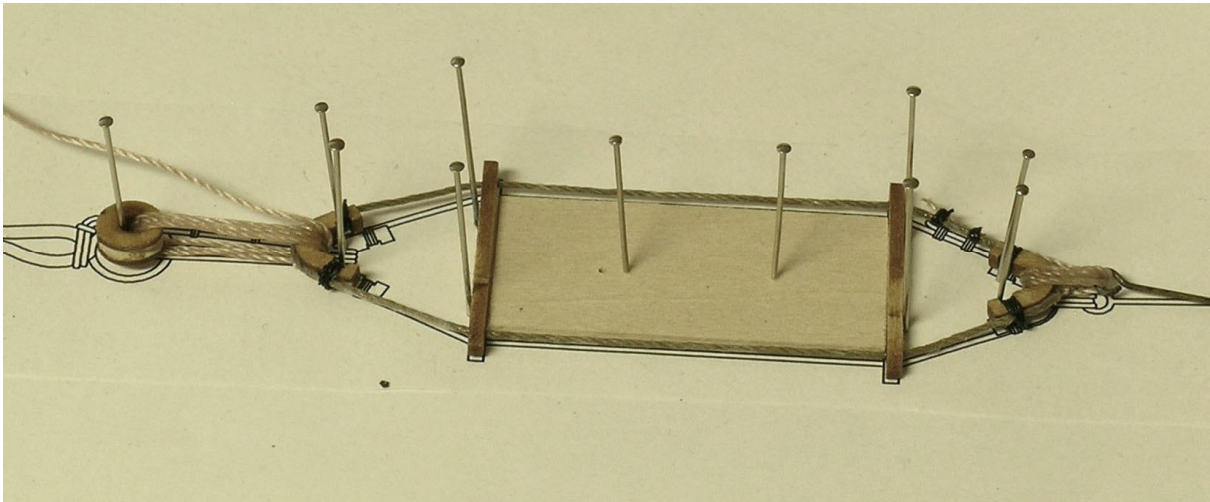
**Tip:** Rigging line supplied in model kits often comes tightly wound on a mandrel of some sort. This can result in annoying kinks in the line when unspooled. This is especially true of nylon line. You can remove these and straighten the line by boiling a length of the line in water for a few minutes and then hanging with a weight attached. Do not use kitchen pots for this but use something else such as a tin can.

The mainmast top can now be put in place. If you have a reasonable fit, it is not necessary to glue the top to the mast, the rigging will hold it in place. Step the mast and determine the length for the main spar halyard as shown in Detail 5-3. Strop the 7mm double block to the halyard. Make up the 7mm single block with becket and hook. Reeve the tackle as shown and secure the line to a cleat. The mast is no longer removable.

Study Detail 4-6 and 5-3. Note the sequence of rigging for the main mast. Make up the backstay and backstay pendants as shown. It was customary to serve the lines that passed around the mast head. For a model this is optional. If serving I planned, use the finest thread you can find. Don't forget the lanyards when stropping the blocks. Place the backstay over the mast head and setup the pendants and reeving. Refer to Detail 5-1 and 5-2.

Make up the shrouds as shown in Detail 4-6. Be sure to leave adequate length to setup the upper deadeyes. Place the shrouds over the mast head. Make up a jig as shown in Detail 5-8. Secure the shrouds to the upper deadeyes as shown. Reeve the port and starboard deadeyes with lanyards as shown. Observe the inboard and outboard views for proper reeving. Now is the best time to add the ladder rungs before more rigging is in place. A template for spacing the rungs is on plan sheet 6. Cut out this template and place behind the shrouds and hold in place with small clamps. Note that the ladder rungs are on the starboard side only. On the port side only the futtock stave is required. Make up the pin racks as shown and install.

Make up the forestay upper portion as shown in Detail 4-6. The lower forestay requires a spreader to accommodate the 12 pounder gun. Study Detail 5-6. Prepare parts R1, R2, and R3 as shown. A pattern is supplied on pattern sheet 2. Cut the pattern out and secure to a building board that will easily accommodate pins.



**Photo 6: Building the forestay spreader**

Cut a piece of 1/16 stock to serve as a spacer between the two parts R3 as shown in photo 6. Use common sewing straight pins to position and hold the parts for rigging. Refer to Detail 5-7 and install the spreader assembly as shown. Complete the forestay connecting the upper part with the spreader assembly.

The cleats that support the main yard lift pendants may now be installed. Make up the main yard lift pendants as in Detail 5-3 and install. The main yard lifts can now be reeved and belayed to the cleats at the base of the mast.

Study the topmast rigging in Details 5-4 and 5-5. Slip the mast cap over the top of the topmast and pin the topmast spar to the topmast. Rig the parrel. It is convenient to arrange a method of holding the topmast vertical on your workbench such as a vice. Study Detail 4-7, topmast rigging. Make up the shrouds, port and starboard. Note that these must be long enough to reeve through the holes in the mast top and tie to the futtock shrouds when installed. Make up the backstays and pendants with bullseyes as shown. Make up the forestay and pendant with bullseyes and hook. Make up the topsail yard lifts with 5mm single blocks. Slip all rigging on the topmast in the order shown and it is ready to install.

Place the topmast in place resting on the fid and fit the mast cap in place. There is no need to glue these parts as the rigging will hold them in place. Tie off the shrouds to the futtock staves. Setup the backstays, forestays, and yard lifts as shown. Finish the rigging by completing the yard braces.

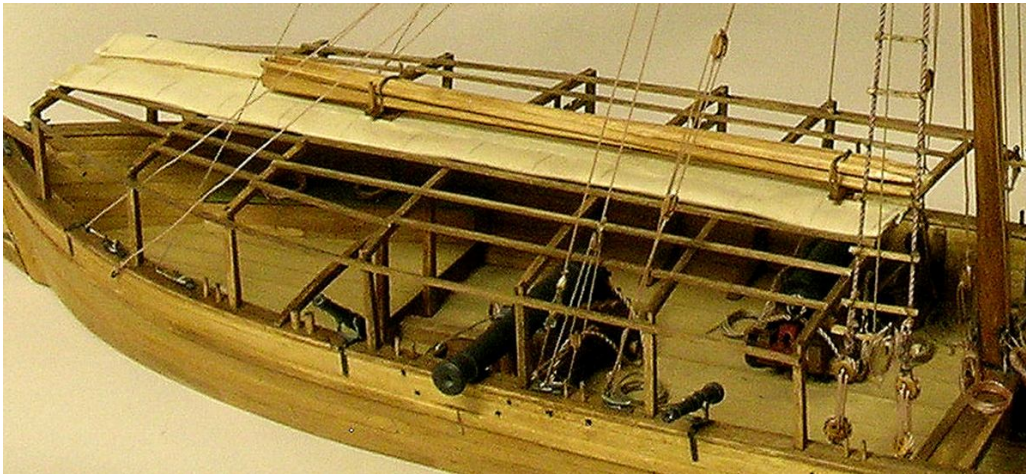
**Anchors, hawse lines, and fore rails:** Make up the hawse line coils. A convenient way to do this is to use a plastic lid from food containers that glue will not stick to. Coil the line tightly and glue as you go. If the glue discolors the line, turn over and use the other side. Glue the coils to the deck in position shown and run the hawse line forward and through the hawse holes.

Prepare the fore rails and stanchions, parts B9 and B10, and glue in place. Refer to Detail to Detail 4-8, building the anchors. Glue part A1 to part A2. It is recommended to use epoxy for this joint as well as drill and pin. Prepare the stocks as shown with slots to fit the anchor shank. The flukes are brass parts B8. Sheet 1 shows how the anchors are rigged. Secure the anchors to the center stanchion then rig the stopper rope as shown. Tie off the hawse to the anchor ring with an anchor hitch. If your hawse line is too stiff to complete an anchor hitch, improvise with a lesser knot.

**Awning structure:** Because the backstays and the topsail yard braces lead through the top of the awning structure, it is built last. It would be very difficult to complete the rigging with the awning structure in place. Locate and prepare the awning beams, B1 through B7, and the 14 awning stanchions, parts B8. It is a good idea to label the beams as several of them are very similar. A suggested procedure for construction is to cut the half lap joints in the beam ends and stanchion tops then drill through the joints and insert sewing pins without gluing. Test for fit to the hull. In some places it may be necessary to trim the lower end of a stanchion if interference with the bulkheads is encountered. Note that awning beams B2 and B3 are a bit skewed. This was probably done to facilitate working of the port side 9 pounder. When all beams have been fitted begin assembly by gluing beams B1 and B7 to their stanchions and to the hull. Carefully align these by eye both from the end of the hull and from the side. There are two flexible strips of 1/32" x 1/8" basswood in your kit. You may find these useful in helping to align the remaining beams as they are installed. Place beams B2 through B6 in place then lightly clamp the strips to the stanchions at B1 and B7. Remove the beams one at a time and glue the half lap joints leaving the pin in place and then glue the assembly to the hull. Check for alignment and let dry. Beams B5, B6, and B7 will need to be beveled in way of the side batten.

Refer to the batten layout on plan sheet 6. All battens are 1/8" x 3/32". The batten layout is as determined by the Smithsonian. Apply the side battens first to give some rigidity to the structure. With the battens in place we turn to the awning. Sailcloth for the awning is included in your kit. There are several options for displaying the awning. It can be rolled or folded as on the prototype model, it can be deployed on one side and rolled or folded on the other side, or it can be fully deployed; if deployed you will have to make some adjustments in way of the backstays. Use the patterns supplied to layout the awning on the sailcloth. Cut out the awning and seal the edges with a stop fray product available in sewing stores. If you want to indicate the hem lines and panel lines use an ordinary pencil. To make the grommets first indicate their locations with a pencil. Lay the grommet location on a drafting eraser or similar. Apply a small bit of CA glue at the grommet location and immediately press through the fabric with a sharp pointed tool. The CA glue will preserve the grommet hole.

Center the awning on the structure and glue to the two center battens. Be sure to apply glue at the locations of the sweeps storage rack. Make up the storage racks and glue in place. Carve, shape and sand the sweeps (oars) as shown on plan sheet 6. Arrange the sweeps in the rack and tie off.



**Photo 7: Awning structure and sweeps**

That's it, finished. Step back and enjoy your work and be prepared for the accolades of friends and relatives.

### References

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John R. Bratten

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ISBN 1-58544-147-3 (hardcover)

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The Gunboat Philadelphia and the Defense of Lake Champlain in 1776

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The internet has a lot of history and information about the Philadelphia.