

Building a Battle Station Model

By Russell Barnes

I. Introduction

The summer is usually a pretty difficult time for me to work in my workshop. Chores abound around the house and there is seemingly something to do almost every day that precludes any useful time spent in the workshop. The summer of 2004 was no different. By the time late July rolled around, I was desperate. I had not made anything for over a month. Something had to be done. What to do? Then it hit me. I was looking over the latest Model Expo catalogue and saw they still offered kit models of small battle stations. Not wanting to build a kit, I saw the potential for a quick scratch built project. Over the next two weeks I built a pretty little battle station model that turned out to be quite a conversation piece.

As fate would have it, that model was destroyed when Hurricane Katrina washed away the local museum. I have decided to replace the battle station model, but it occurred to me that others might benefit from my experience having built it. So, I redrew the plans, making some improvements, and decided to set down a guide to building the model. I am not an expert and I make no claim that my methods are the only way to build the model. Someone building from these plans should view my words as a col-

lection of helpful hints rather than a map to follow in order to arrive at a desired result. I envision this project as an introduction to scratch building. My hope is that the builder learns a few scratch building techniques that will help, not only on this model, but also in future projects whether they be kits or scratch built. There is nothing difficult here, but it will require the same level of patience and attention to detail to complete the model satisfactorily that is required of any well made model. If a beginner scratch builder can successfully complete this model, then I think the effort to draw the plans and set down some ideas about how to build it are well worth it.

The tools you will use to build this model are, for the most part, in every ship modeler's tool chest. The only power tool I used in building this model was a 4" table saw that



A view of the author's small workshop



Here are a few of the tools the author has found most useful in building small models such as the battle station

was used almost exclusively for most of the structural work. A scroll saw would also do the trick. For hand tools, I used two sets of jeweler's files, one set for large work and one for small details. Some cross locking tweezers or hemostats will be needed for holding small pieces. Cloth pins and bar clamps are good for holding pieces while the glue dries. You will need some pliers and end nippers for metal work. The end nippers are also good for trimming treenails. I did all my drilling with a twist drill and a small set of bits. I used a draw plate for making treenails and other odds and ends. For measuring and marking I used a sharp pencil, a 12" steel rule, and a small steel machinist's square.

The battle station is a simple deck section with a portion of bulwark, a single deck gun with a port, a hatch and grating, and a binnacle cabinet. I have chosen a scale of $3/8"=1'$ as it offers a lot of details and some of the parts are easier to fabricate. Some modelers may also wish to enlarge or reduce the plans and build at a different scale. That is fine. However, for the purposes of this guide, I will use the dimensions for a scale of $3/8"=1'$. The plans are very simple. There is a sheer view, a plan view, and a cross section view. I have also included details for the deck gun and its carriage and the binnacle. Study the plans carefully and become familiar with them.

II. Framing the model

To begin, take a piece of 6" x 12" plywood and cut your base out of that. The deck space is made 4 $13/16"$ across and 4 $1/16"$ long. I used $3/16"$ thick model aircraft grade plywood for the base of the deck section, but it is not beyond the skills of any modeler to use actual deck beams rather than the plywood base. I simply found it a nice short-cut. Make certain the base is squared up all around and mark which edge is the side and which is the forward end. Next, note the frame locations and carefully mark and cut out the slots in the plywood to receive those frames. Take care with this part of the operation because the frames must fit snugly and be at right angles to the plywood base. I used my 4" table saw with the blade lowered to make those slots, but you can easily use a scroll saw or cut them by hand. When I used my table saw to cut the slots, I began with the miter gauge and the plywood behind the blade and then ran it forward over the blade so that I could see the marks for the slots. Stand the plywood base on its end with the slots facing downward and hold it tight against the miter gauge as you run it back through the blade. Sneak up on the outer edges of the slots and take off only a bit with each pass. As always when you using a power tool, wear eye protection and watch your fingers. If you do not respect your tools they can hurt you.

When you have the slots cut, use some of your framing material to test fit the slots to ensure they are all a snug fit.



The base piece for the battle station. Note the mortises for the frames and how the forward end of the base has been marked.



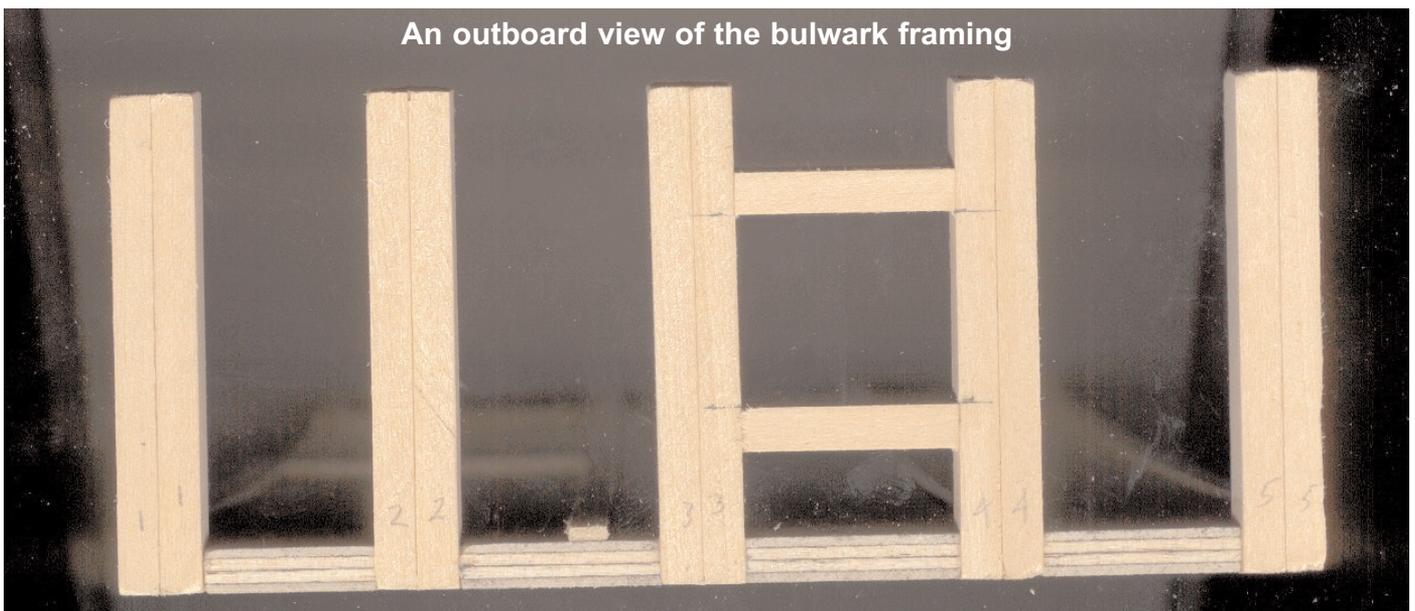
The bulwark frames for the battle station model. These have been built up of two pieces of basswood

The frame should just slide in with a slight amount of friction. If you need to take a bit more off, I would suggest using a coarse file to touch up the saw cut. One key to making accurate cuts is to have a sharp pencil. The sharper the pencil lead, the crisper the lines, and the more accurate the cuts. Measure the deck beam locations from the plan view and mark these out on the plywood base. It is best to have these marked out so that you can toenail your deck if you wish when you plank the deck.

Once the plywood base is cut with the frame slots, use some 3/16" square basswood to make up your frames. You could use solid 3/8" thick stock for this, but I had some 3/16" sheet stock from which I ripped my framing material. Another good reason for using the smaller stock and gluing them up in pairs is that if the slots you cut are a bit larger, the glue seam between the two frame halves will take up some of the space. I cross cut the frame sections on my table saw, using the miter gauge and rip fence to ensure consistently correct length and squared ends. Once you have the pieces cut for the frames, glue them up to create 3/8" sided thickness (when viewed from the side) and 3/16" moulded thickness (when viewed from fore or aft) frames. It is a good idea to take each frame and lay it down on the

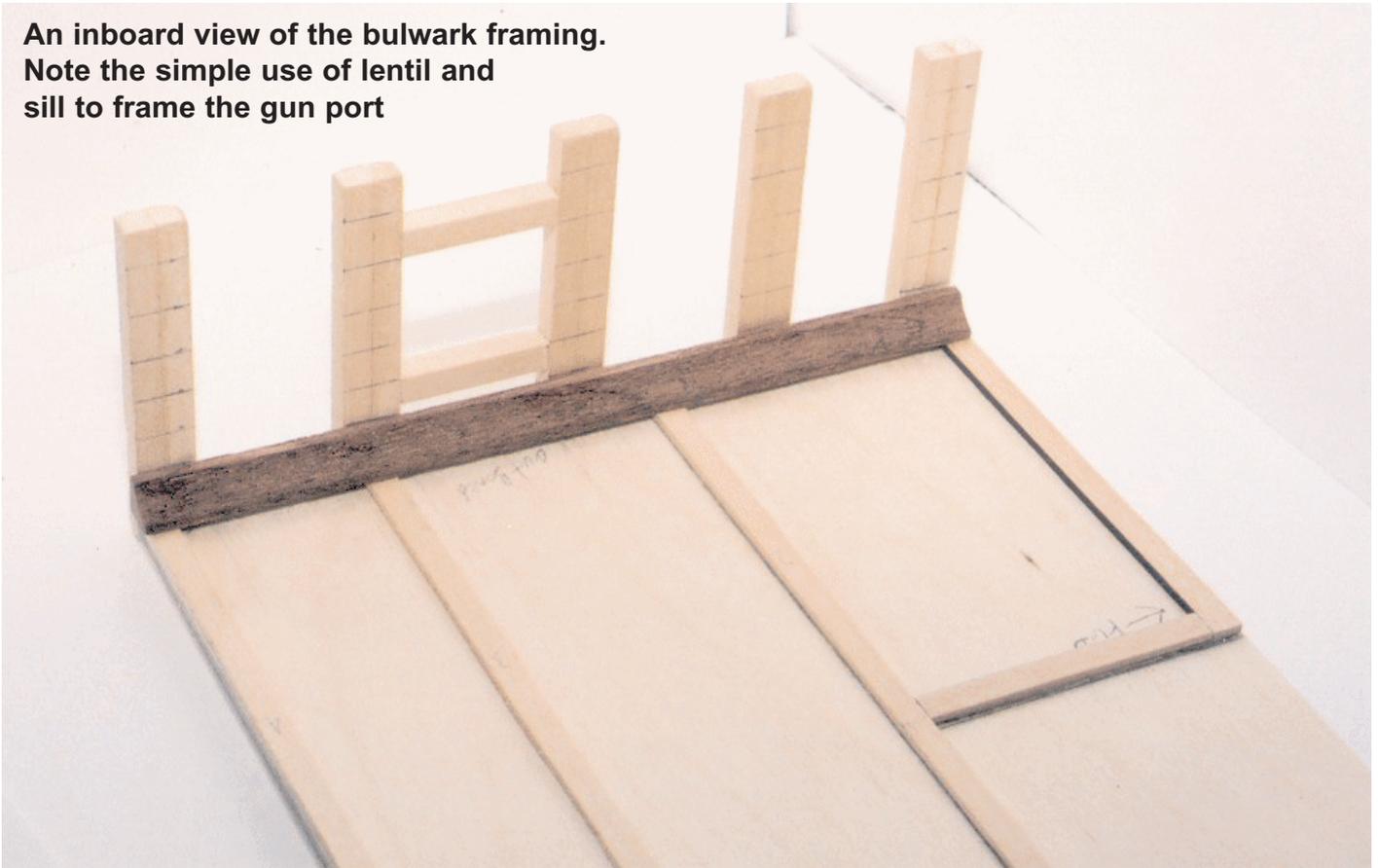
cross section drawing and compare its length to that in the drawing. If there is any discrepancy, remark your frames for length and re-cut the offending pieces. If you do not, your rail will not sit properly. Of course, if you measured and cut carefully the first time around, there should be no problem. Now, install the frames in the slots in the base, gluing each frame in and squaring it up with a machinist's square. Do not get careless here because the frames must all be at right angles to the plywood base and at the same height. If they are racked out of line, even in the slightest, the planking will not lie flat on the frames. If you need to add shims, that is fine. They will not be seen in the finished product. The most important thing is to get those frames all sitting perfectly square in their slots. I found that by setting the outermost frames first and then working inward to the gun port was the best way to go. For the purposes of building the model, I found that it was helpful during the framing and planking process to number the frames 1 through 5 beginning from the far left, moving along the bulwark to the right. This is not necessary, but it helps to keep things as organized as possible.

The next project is to install the gun port sill and lintel. The sill marks the bottom edge of the port and the lintel marks the upper edge. These are two pieces of basswood, 3/16" square. On the sheer plan measure up from the bottom of the base to the lower edge of the port. Mark that on the third and fourth frames. That is the upper edge of the sill. Make sure when you install the sill that the upper edge meets those marks. Measure carefully so you do not have the sill sitting at an angle. I used a machinist's square laid on the end frame to make sure the marks for the sill and lintel were transferred onto both frames 3 and 4. Repeat this operation with the lintel, the only difference being the mark you make will represent the lower edge of the lintel. It is a good idea to have a sample of the planking that will run just above and below the gun port to act as a gauge to make sure you have the sill and lintel properly placed. You are looking for the correct height and to double check that they are level.

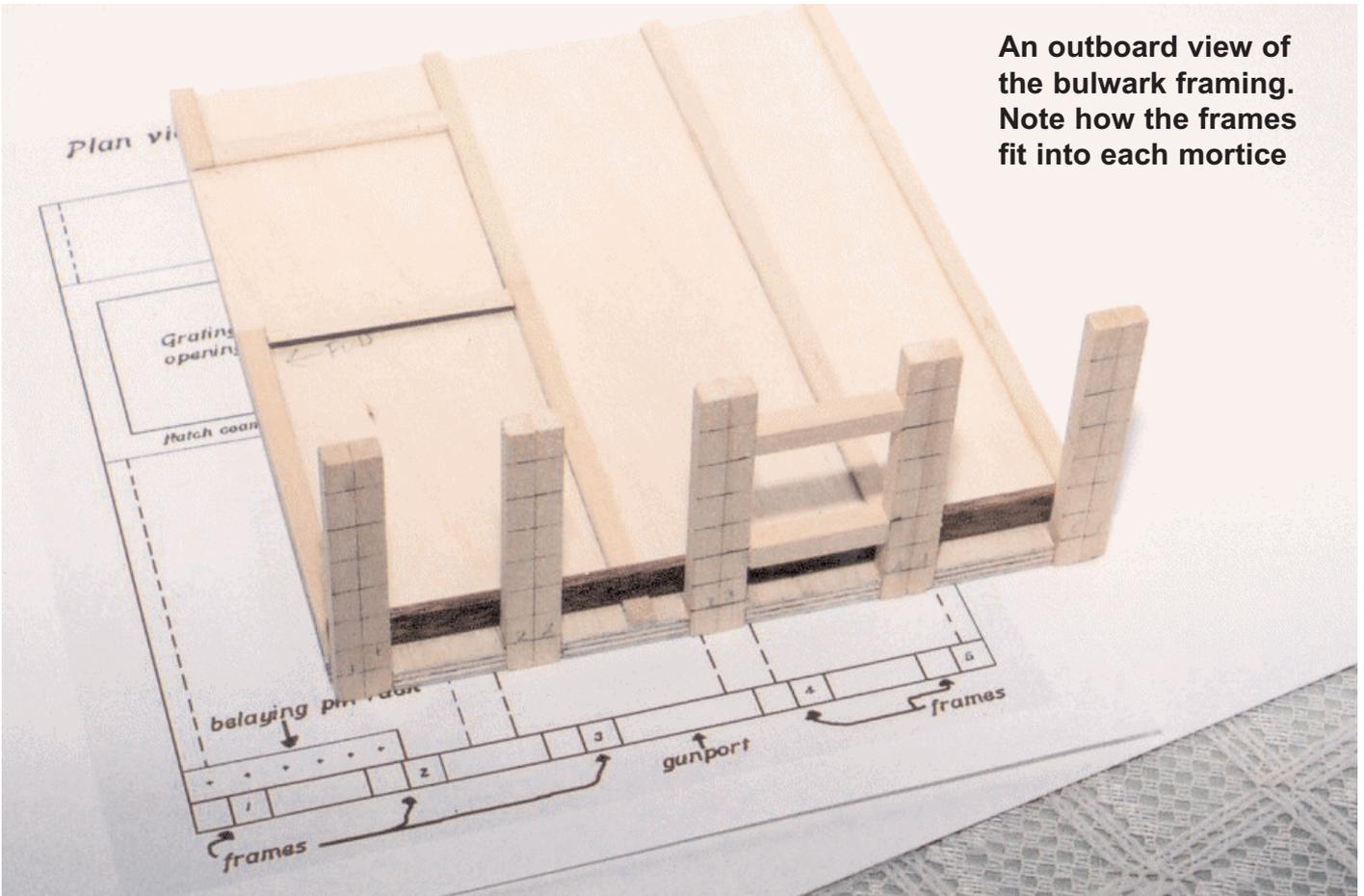


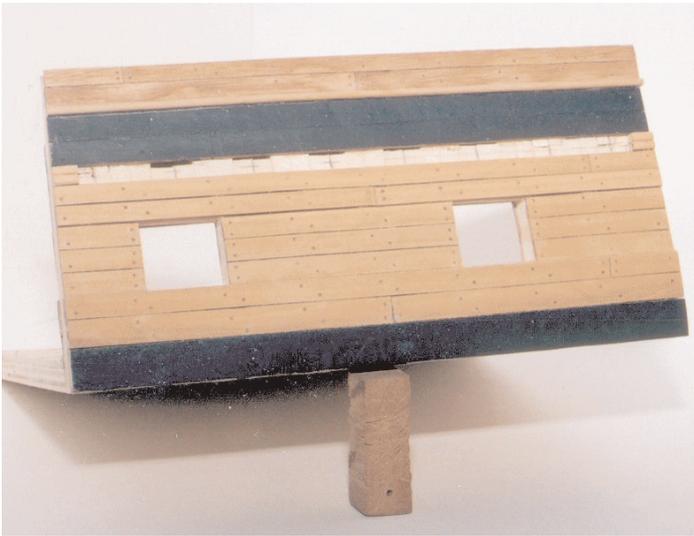
An outboard view of the bulwark framing

An inboard view of the bulwark framing.
Note the simple use of lenti and
sill to frame the gun port



An outboard view of
the bulwark framing.
Note how the frames
fit into each mortice





An outboard view of a larger battle station model. Note the planking seams and the use of bamboo tree nails. Also note the painted wales.

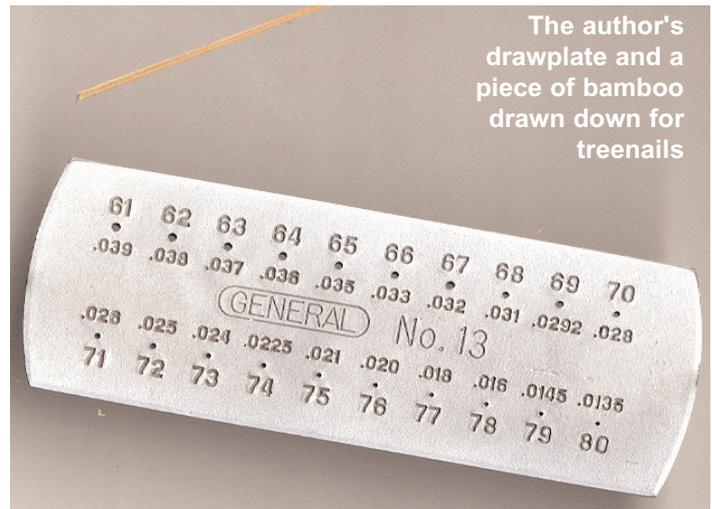
III Bulwarks planking

With the framing completed, you can now begin work on the bulwark planking. You can begin on the inside or outside of the bulwarks; it matters not which. I began on the outside. I like to mark out the run of the planks even though they are straight and without any difference from end to end. From the cross section plan, measure for the height of each plank from the bottom of the base and transfer these marks to each end of the bulwark frames. Again, use a sharp pencil and measure carefully. Strike a line between all the opposing points to get your planking reference lines.

I should say something about treenailing at this point. If you wish to treenail the planking, it might be better to do it as you go, rather than fit all the planks and then treenail. Treenailing as you go makes it easier to line up the treenail pattern because you can see the frames as you nail the planks. For each frame, the plank should receive one treenail centered in the upper outer corner of one side of the frame; then another centered at the lower outer corner of the other half of the frame. At the sides of the port, two treenails go in arranged vertically, one right above the other. I think a number 75 drill bit will be about right for this scale.

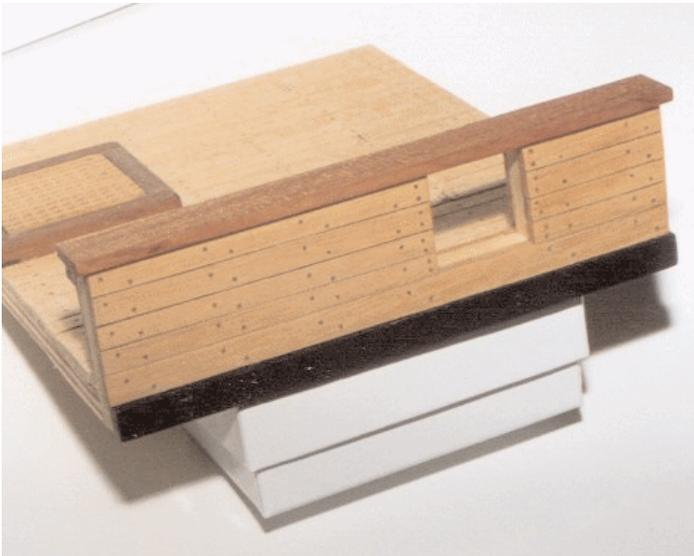
To make your treenailing material, a draw plate is necessary. Many modelers are a bit shy about using a draw plate. It is not that difficult. You can draw down any wood, but I find, as have many modelers before me, that bamboo is a good choice because it is easily split down its grain, but is fairly sturdy across the grain. Bamboo is actually a grass, but it seems to do very well imitating wooden treenails. A couple of good sources for bamboo are the skewers that you can buy at the local grocers and a long fishing pole that can be had at the local bait shop. To use

your draw plate, take a piece of bamboo about 6-8" long and split it down the length repeatedly until you have a strip that is just a shade large than your finished size. I never want to have to pull through more than 5-6 holes to get to my desired diameter. Sand one end to a point and then test it in a hole that is several sizes larger than your target diameter. You can hold your draw plate in a bench vise, if you have one, or you can do as I do and hold it in your left hand and pull the bamboo down through the holes with the thumb and forefinger of your right hand. I am right handed so for those who are lefties, they may want to reverse that process. When pulling the bamboo through the draw plate, give it a good sharp pull, leading with the end that was sanded down. Pull the bamboo through the same hole several times, altering the angle of the pull in several directions, and on each pull, changing the angle slightly. I also make a point of flipping the bamboo strip end for end and leading with the other end for a while before flipping it back to the original end leading through the hole. Only when you have the bamboo pulling through a hole without any material coming off should you move onto the next hole. If for some reason, the bamboo binds up, wet it down with water and pull it through a few times.



The author's drawplate and a piece of bamboo drawn down for treenails

Before actually cutting any planks, consider the finish of the planking. I chose cherry for the wales and then painted it black before installing the rest of the planking. This saved me from having to mask off the areas of the planking that I did not want painted. My idea was to have the black wales and then a contrast of natural finished boxwood for the rest of the upper planking. For the inner bulwarks planking, I just used a natural finish, but you could paint the inner bulwarks red or ochre if you chose. If you choose to keep your planks with the natural finish, I would suggest using a pencil to darken the edges of the planking on both the inner and outer bulwarks. The seams will show up better and enhance the finished look of your work. Of course, if you paint, then there is no reason to darken the edges of the planks unless you really want the seams to show up. For this model, there is no absolute right or wrong finished appearance, but you should consider the finish before you begin to plank.

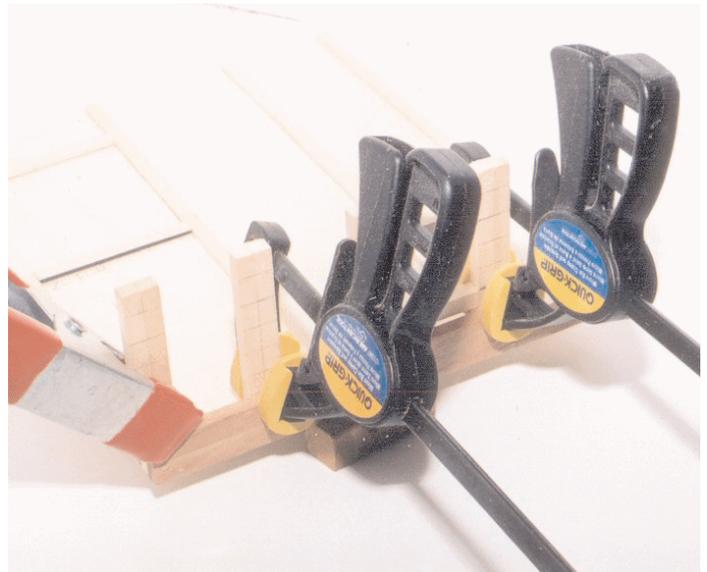


An outside view of the author's first battle station model under construction. Note the planking and the use of treenails

The first planks to install are the wales. The wales are the thick planks that run along the ship's hull just at or near its widest girth. On the model we have two wales planks. These are thick planks and will require some clamping. I used mini bar clamps, but you can use c clamps or even clothes pins if they will fit. Rip your stock and cut the planks to length, leaving them just a shade long for final fitting. Clamp the plank in place, making sure it meets the marks you made earlier and then mark the long end on the back of the plank. Remove the plank and then sand its end or cut it on the table saw to that line. Now glue it onto the frames, and clamp it. When the two wales planks are in, carefully fit the next plank up, called the black strake. It goes in just below the gun port. This plank needs special attention because it must run just along the underside of the port and its upper edge must be flush with the upper edge of the sill. If you need to sand or rip a little more off that plank's upper edge that's fine. It must fit correctly under the port.

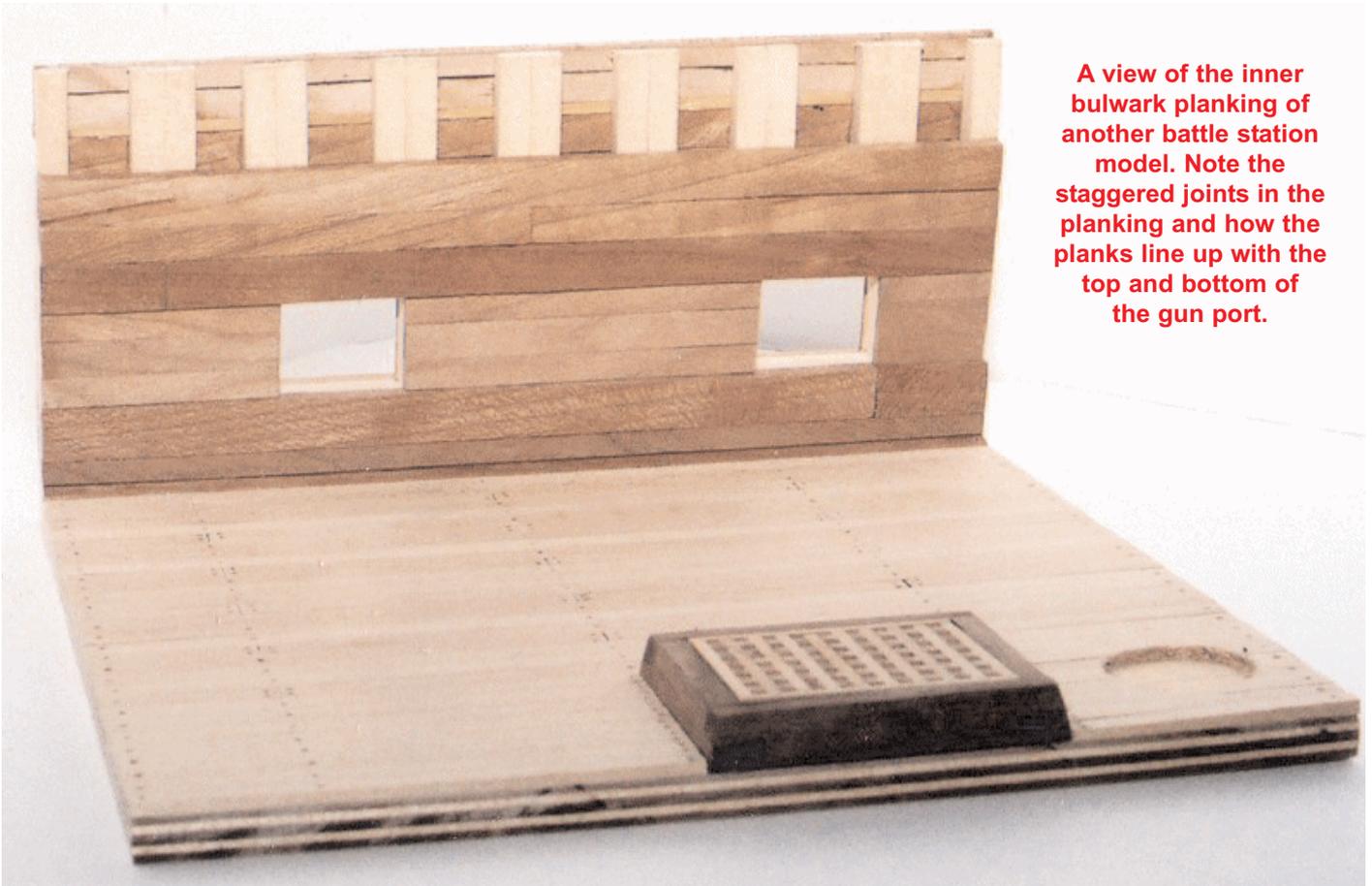
The plank that runs along the upper edge of the port goes in next. Fit this plank and then glue it on as you did with the planks below the port, but this time make sure the plank meets the lower edge of the lintel. Also, while you have it clamped on temporarily, measure the distance from its lower edge to the upper edge of the black strake at each end of the bulwarks. This is an additional check to make sure you have equal space for the three thinner planks that fit in the way of the port. Once you are satisfied with the fit and placement of the plank, glue it on and recheck that distance to ensure it sits level and that you have equal spacing for those three thinner planks. The thinner planks that run in the way of the port go in next. I fit these as full length planks and then removed the sections over the gun port. Clamp them onto the bulwark so that they are all aligned properly. While they are

clamped on, mark their inside faces in the way of the gun port so that they form butt joints on frames 3 and 4 that form the sides of the gun port. Make sure your pencil is sharp and you are making accurate marks on the planks through the gun port from the inside of the bulwarks. Remove the planks and cut out those sections that cover the gun port. After you cut out the parts of the planks that cover the ports, fit each plank, keeping one end flush with the edge of the port and measure it at the end of the bulwark to get the length. When they are installed, you should have a nice flush edge at both sides of the port. With the outer bulwarks planked, you can tackle the inner bulwarks. The methods are pretty much the same. Measure out from the cross section plan where the planking seams will fall and transfer these measurements to the inner side framing. Pay attention to the upper and lower edges of the gun port as you did with the outer planking. It is just as important that the inner planking line up with the gun port. If you wish to treenail, then do it as you go along with each plank. With the exception of the waterway, the rest of the inner bulwark planking is 1/16" thick.



Bar clamps and spring clamps can be used to get a tight glue joint when assembling bulwark planking

Since the waterway plank is actually part of the bulwarks planking rather than the deck planking, it should go on first. It has a special profile that needs to be made first. Begin by ripping a piece for the waterway 3/16" square. If you have a table saw with a tilting arbor, then you can tilt the blade and remove the majority of the material from the waterway that needs to come off to form the distinctive cove profile. If not, then you can mark the area to be removed both ends of the waterway, using a straight edge to connect the points. Do this for the upper edge of the waterway where it will blend in with the rest of the bulwarks planking and also down near the deck on its outer edge where it will blend in with the deck planking. This will give you two reference lines showing where the material should be removed. With the reference lines you can file or sand off



A view of the inner bulwark planking of another battle station model. Note the staggered joints in the planking and how the planks line up with the top and bottom of the gun port.

the unwanted material. Take care to do this carefully and go slowly. When you have the material removed to those reference lines, you should have a 1/16" thickness on the upper inner edge of the waterway where it meets the inner bulwark planking as well as the outer lower edge that will flow into the deck planking. Once you have the waterway's profile roughly shaped, you can use a curved exacto blade to scrape in the cove profile. You could also use a piece of sandpaper wrapped around a small dowel. If you use sandpaper let me recommend something coarse, say 80 grit or so.

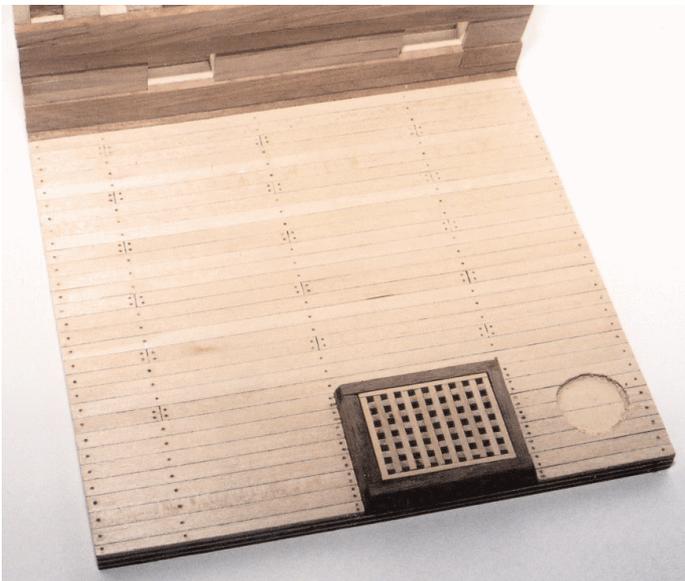
There is one other point in the inner bulwarks planking that requires mentioning. There is a belaying pin rack that fits into the upper edge of the third plank down from the railing. When installing this plank, take care to measure and cut out that portion of the plank where the pin rack will fit. The pin rack needs to fit against the framing to anchor it properly, so the plank must be cut out to admit the pin rack. To cut this area of the plank, I used my scroll saw and then cleaned up the cut with some fine sandpaper. If you plan to paint the inner bulwarks, now is the time to do it. Once the deck planking is in, it will be more difficult.

The last piece to go on the bulwarks is the cap rail. This is a piece of hardwood that sits flush with the inner and outer planking and flush with the ends of the bulwarks. On my first battle station model, I made the cap rail from cherry and left it natural, but now I think it might look

better painted black. If so, you might consider pre-painting it on the top and the edges. Then you can install it and treenail it to the frames with little problem. The only thing to remember is that if you paint it first, then install and treenail it, the paint on the top of the rail will have to be touched up after the treenails are trimmed off. To fasten the cap rail, use a number 61 drill or something close and put one treenail in per frame.



A close up view of the waterway for the battle station model. This was made from mahogany. A chisel was used to form the cove detail.



Overhead view of another battle station model's deck planking. Note the hatch coaming and grating

IV. Deck planking and the hatch

The deck planking is next. The deck was planked with scale 1/16" thick basswood strips 3/16" wide. To indicate caulked seams, I took a board of basswood 3/16" thick and painted one side of it black. I then ripped off the 1/16" thick deck planks along its edge so that when I laid them black edge to plain edge, I got a nice uniform caulked seam. Before laying the deck planks, it is well to mark out the position of the hatch coaming first to make sure you are keeping everything nice and square. In fact, you might consider making up a plywood template to the exact same size as the outer edges of your hatch coaming. You can use this template as a gauge for when you lay the plank right around the hatch coaming. I found this template most helpful in keeping the edges of the plank all evened out so that when the actual hatchway was put in place, all the seams were nice and tight. If you want to indicate planking butts in the deck, then now is the time to map them out. Keep in mind there should be no planking butts in the strakes (lines of plank) that run into the hatch coaming. There should be three strakes of plank between planking butts that fall on the same beam. Armed with this information, you can lay out your planking butts and then begin laying plank.

As you lay the planks, it is a good idea to check the remaining area to be planked at each end of the deck to make sure your planks are going on square. Even with factory milled stock it is not impossible for planks to creep over more at one end. As with the hull planks, trenail as you go rather than after all the planks are in. For deck planking, each plank gets one trenail centered in the deck beam over which it passes and two trenails side by side at each plank butt. Where the deck plank butt into the hatch coaming, they are treated as planking butts.

With the deck planking completed, it is a good time to install the hatch coaming. The hatch coamings are joined together at each corner with a half-lapped joint. I know that many models call for a miter joint, but that is just not correct. I made my hatch coaming out of walnut, but you can use whatever hardwood suits you. For the hatch coaming, you will need four lengths of material 5/16" wide and 3/16" thick. The half-lapped joints will occur in the width of the coamings and not the thickness. I used my table saw for this operation, lowering the blade and running the pieces over the blade to remove the unwanted material. You could use the scroll saw for this work, but it will have to be done free hand and it is difficult to get perfectly matched joints that way. I carefully cut each length of coaming so it fit snugly into the space left open on the plywood base during deck planking. If you used your template to help size that opening and keep it squared up, you will thank yourself now as you fit the coaming. When you are satisfied with the



Ripping a deck plank off the side of a sheet of basswood. Note that one side of the basswood sheet is painted black



The plank after it is cut off the basswood sheet

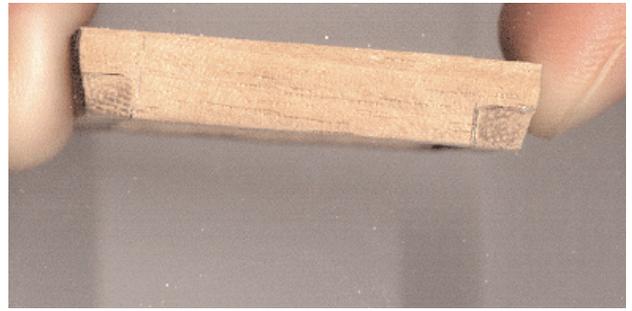


A hatch coaming made for the Battlestation model. Note the ledges on the inside to hold the grating

fit of your coaming within the deck opening and the joints at each corner, you can glue the coaming together setting it lightly in the deck opening to keep it square as the glue dries. Once it has dried hard, I would suggest doweling it together, running the dowels right down through each joint. Also, glue in some strips on the inside of the coaming. Rip these strips to 1/4" wide and 1/16" thick. Glue them in so that they sit flush with the bottom of the coaming and 1/16" shy of the top. This will do two things. First, it will further strengthen the structure and second it will form a lip upon which your grating will sit. As a final touch for my hatch coaming, I ran it through the table saw with the blade tilted slightly to take off the upper outer corners of the coaming structure. This is not an absolute necessity, but it was common practice to chamfer the upper edges of the coaming. I left about 3/32" flat along the top edge of my coaming.

V. Grating

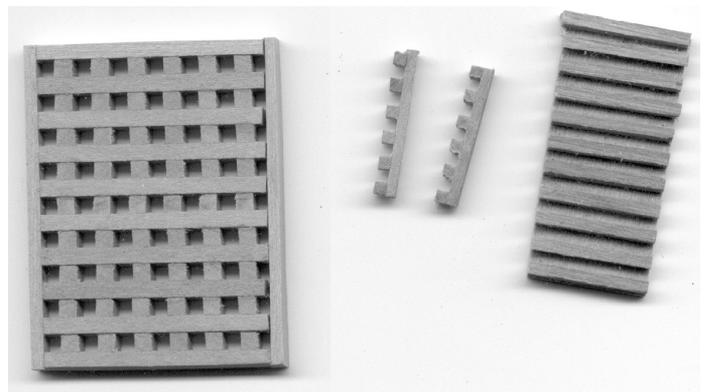
With the hatch coaming in place, I made a boxwood grating for it, using a technique I read about in NRG's Shipmodelers Shopnotes. I have used this method to make several gratings and it works very well. Although I suppose you can use many different hardwoods to make gratings, I have only used boxwood and that is the wood I will describe using. To use this method, you will need a strip of 1/16" thick boxwood and several 1/16" square sticks of boxwood. You will also need a 4" table saw with a zero clearance insert so that small bits cannot fall through the table. The boxwood strip needs to be sized so that its length is the same as the width of the opening in the hatch into which the grating will fit. Keep the strip's width at least twice the width of the opening. Once it is sized, glue a square stick onto the strip with the grain of the square stick running at right angles to the strip. Glue the first stick on, and then use a spare stick of the same size to act as a



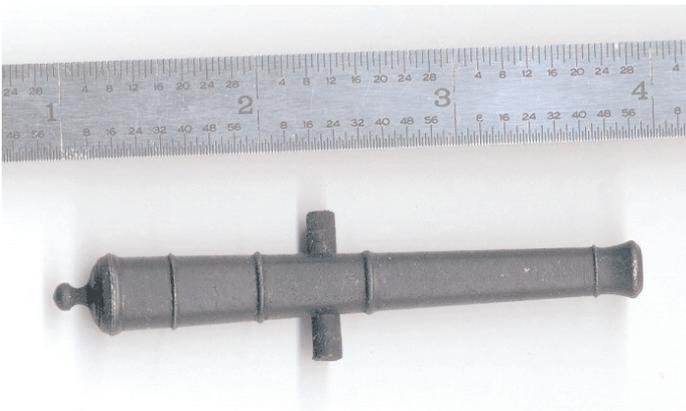
A view of the half lapped joints on the hatch coaming

spacer while gluing on the second stick, and so forth. This ensures that each stick is glued on with absolutely equal spacing. Once the assembly is dried hard, set the rip fence on your table saw to rip off 1/16" thick strips of material. Lower the blade so that it is slightly higher than the piece you are cutting and then rip sections off the assembly, running the assembly through so that the base strip is perpendicular to the blade. You are producing "racks" of material that, when turned on their sides and joined, will form the grating. The "rack" will have a solid strip with little "chunks", actually the ends of the sticks, protruding from it. Rip as many "racks" off this assembly as possible.

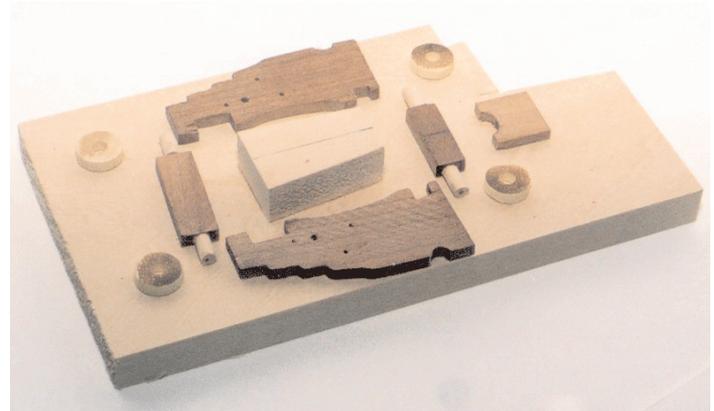
To assemble the racks into a grating, make a right angle jig. Square up a small piece of scrap plywood a bit larger than your grating. Glue on a hardwood strip along one edge so that it sits on top of the plywood. Glue another strip onto the plywood at right angles to the first strip. Now you can assemble your grating in the right angle thus created. Check your jig with a machinist's square to make sure it is really a right angle. Now, place glue on the tips of the "chunks" of a boxwood rack and glue another rack to it with the solid side to the "chunk" side. Place it in the jig and make sure it is aligned. Repeat the process until you have enough racks glued together to make up the grating. When it is all dried, place it in the hatch opening and check the grating's squareness and fit. You may need to add a thin strip of boxwood to one side to close off the grating. You may also need to trim one or more of the grating's edges slightly to get a nice fit in the hatch opening.



Here are the steps involved in making a grating. Note how the individual components are used to form the entire grating



Author's custom made gun barrel for the battle station's gun



A basswood block jig for assembling a gun carriage

VI. Building the Gun Carriage

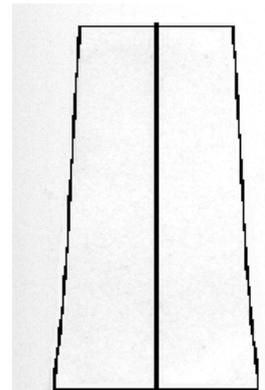
A battle station needs a gun, and it is next on the list. There are a few options at this point. You can do as I did and turn your gun barrel, you can cast it if you have the knack for that, or you can buy one of the appropriate size from a model supply house. I turned a gun-barrel out of birch and painted it black. If you wish to turn the barrel, you can use my drawing for a template.

The carriage I designed is built up using a drawing I found in Harold Hahn's Colonial Schooners book. I scanned the drawing, enlarged it to 1/32 scale, and then made a few small alterations to suit the model. If you wish to make the carriage in the plans, make a poster board template for use in marking out and checking the carriage bracket dimensions. To make the brackets, select a piece of wood that is about twice as thick as both brackets put together. The piece should also be a bit longer than the brackets so you will have a handle to hold on to during the shaping process. Shape the bracket's profile out of that thicker piece, not forgetting to drill holes in the bracket for the eyebolts and bed stool support. When the bracket is shaped and all the holes are drilled, set the rip fence on your table saw to slice the piece into two matching brackets. The result should be two matching brackets, one for each side of the carriage with all the holes drilled so they match as well.

To assemble the carriage, it is a good idea to create a jig around which the brackets and axel trees can be assembled. I used a chunk of wood cut to match the inside dimensions of the carriage and then glued it to a small baseboard. Then the brackets and axel trees are assembled around it. It works rather well, provided the jig is cut accurately. The rear end of the jig should be as wide as the forward end of the rear axel tree, while the forward end of the jig should be as wide as the rear edge of the transom. Remember, these measurements are taken on the inside of the brackets. With the brackets, axel trees, and transom assembled, all that remains to add to the carriage is the bed stool, bolster, and quoin. The bed stool's rear

section sits on the bolster that in turn sits on the rear axel tree. The bed stool has a half round cut out near its forward end that sits on a support pin that runs right through both brackets.

Do not forget to add the eyebolts and breeching rings to the sides of the carriages as noted in the plans. These are absolutely necessary for rigging the gun. The breeching rings are made with the same method as the eyebolts that I discuss below. You will use a larger diameter pin to form the eye and the eye will be cut off the stem of the eyebolt and then mounted on another eyebolt prior to installation on the carriage.



Gun Carriage Jig

The carriage trucks can be made from a length of dowel that is sized in the draw plate. Once you get the wood sized in the draw plate, mark and drill the holes for the axels. To make sure these holes are dead centered in the trucks, make a mark on the trucks with a sharp pencil and then use the point of a number 11 hobby blade to make a small dent for the drill bit to bite into when you drill the holes. If you have a drill press with a vise to hold the work, you can set up the dowel in the vise and drill right down into the end grain of the dowel to create the holes. I have no drill press so I used a pin chuck and eyeballed the hole from all angles as I drilled it. I drilled just deep enough for the first two trucks, then sliced them off on my table saw and then repeated the process for the last two trucks. The results were fairly good to my eye. By the by, to slice the trucks off the dowel, cross cut the dowel, holding the dowel against the miter gauge. To keep the truck from flying off the dowel when the saw blade parts it off, hold a piece of scrap wood with some double faced tape on it against the end of the dowel to hold the truck after the saw blade goes through the dowel.

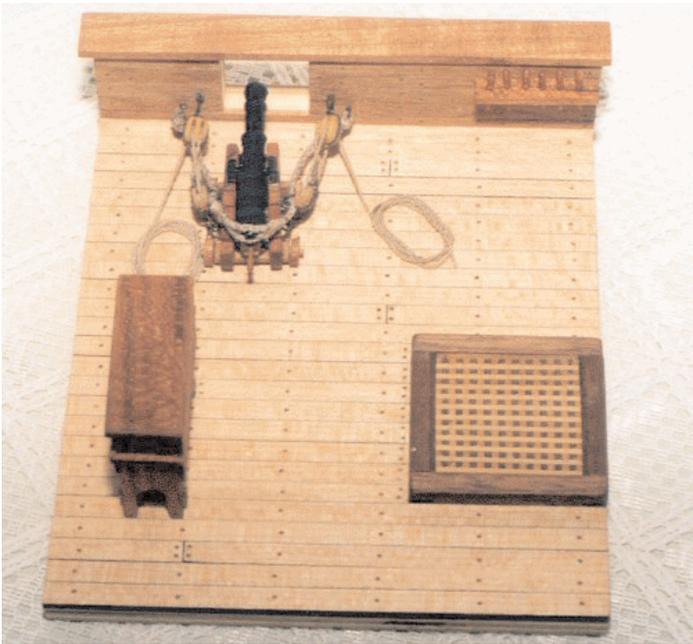


A nearly completed gun carriage

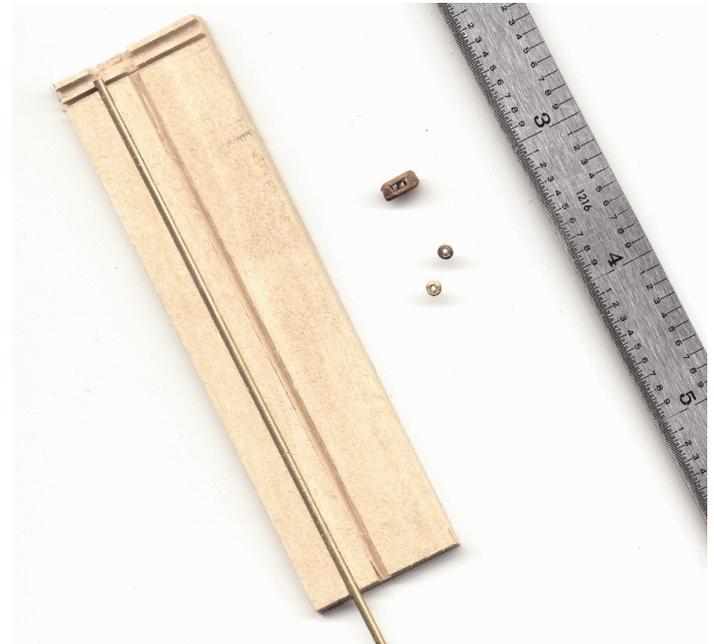


The completed gun carriage and gun





An overhead view of the author's first battle station model. Note the built up rigging blocks used for the gun tackles



The author's home made jig used for cutting off rings of brass tubing for rigging block sheaves on a table saw

VII. Blocks, rope making, and metal work

The blocks are built up out of boxwood and are 7 scale inches long. For the gun tackles you will need two double sheaved blocks and two single sheaved blocks. To build the blocks, use two side pieces with a spacer sandwiched between the sides at the upper and lower ends. The side pieces, called cheeks, are $7/32$ " long, about $7/64$ " wide, and $1/32$ " thick. The spacers at the upper and lower ends are $3/64$ " square. To make the double sheaved blocks, add a $1/32$ " strip just like the cheek pieces in the middle to form two sheave holes rather than one. Clamp these blanks in bar clamps to get a tight glue joint. After they are dry, the sheave pin hole is drilled right through the shell of the block from side to side. A brass sheave is inserted into the shell and a brass pin is glued into the hole so that the sheave turns on it. The sheave can be sawn off the end of a brass tube or it can be bought ready made. I found that $3/32$ " diameter sheaves worked for these blocks. Such sheaves are readily available from model supply houses. Once the block has its sheave, it can be shaped using files and sandpaper. A stropping groove is filed into its sides and both upper and lower ends. Of course, if you wish to use store bought blocks, they can be made to look very realistic. But, I think the effort to scratch build just what you want rather than buying a block and reshaping it to make do is much more satisfying.

The rigging for the gun was made up out of linen thread. I twisted up my rope to use for the straps, breeching, and the gun tackles, but you can just as easily use store bought

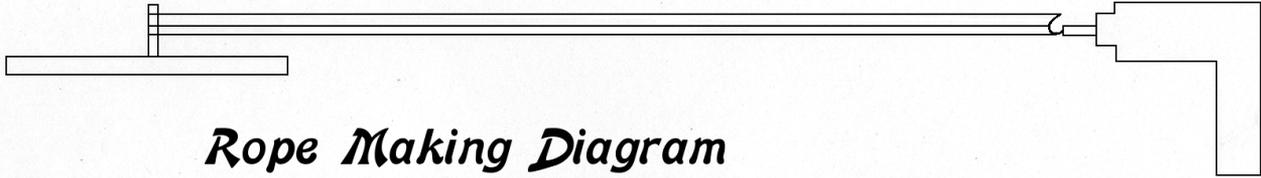
rigging thread. I made up a system for producing lengths of rope. It is rather unconventional, but it works fairly well. I drill a small piece of dowel and screw a small brass hook in its end. I chuck this dowel up in a cordless drill and attach three threads to the hook. The other ends of the threads are tied to a brass pin set in a hole at the far end of my workbench. I hold the drill so that the threads are tight, and then I pull the trigger, twisting the threads until they are tightly wound around each other. At this point their natural tendency is to release the built up tension by unwinding. I remove the thread from the hook in the drill,



How to manufacture built up rigging blocks. Note the glued up blank and the use of bar clamps



The finished blocks after shaping. Note the groove for the rope strop



Rope Making Diagram

This illustrates the set up for spinning several strands of thread to make model rope



The hook mounted in the drill with threads attached



The threads attached at the opposite end to the brass pin



The twisted up threads folded back onto themselves and allowed to twist up into rope

holding them taut so they will not unwind. Still holding them taut, I double the threads back on themselves, fastening both ends around the brass pin on the far end of the workbench where the other ends of the thread are tied. Now, holding the threads taut, I move my thumb and forefinger back along the threads about 1" or so, allowing the released section to unwind. Because the twisted threads have been doubled back on each other, they will lay up into rope as I allow them to untwist in small lengths. I continue moving back along the twisted up threads, little by little, allowing small sections to lay up into rope. As each section lays up, I give another extra twist to tighten the lay of the rope. Finally, when the entire length is laid up rope, I add a spot of cyano glue to the end of the rope and cut off the loose ends. The finished size for the tackle is .024" while the breeching is about .040". Both lines are dyed with Minwax Special Walnut stain. The block stops are made up out of linen and finished at .024". They are dyed with Minwax Jacobean stain.

The breeching needs a cut splice in its middle to fit around the pommel on the rear of the gun barrel. To make a cut splice, take about a 1/2" length of the same rope as the breeching and fray the ends a bit. This short length of rope should about the length of the loop you intended to make,

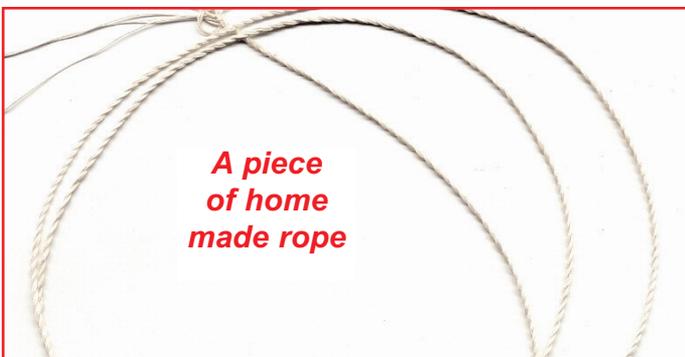
maybe a tad longer. Now cyano glue this length onto the breeching rope and wrap those frayed ends of the splice around the breeching so that they blend in a bit. This creates a small loop. Now cover the ends of the rope that were glued with seizings of .010" diameter thread dyed the same color. The result is a fairly realistic looking, but fake, cut splice. Set the breeching aside for the moment. The iron work is all blackened brass and blackened annealed steel wire. Blackened steel wire can be purchased from model supply houses in various gauges. It comes pre-blackened and is therefore a very attractive alternative to using brass wire that would have to be chemically treated with a blackening agent. Before any blocks



A method for making a faked cut splice



A finished cut splice ready for mounting on the gun barrel



A piece of home made rope



Using a modified third hand device to make a cut splice

are stropped, the hooks by which they attach to the eyebolts in the sides and the gun carriages must be made. For the hooks, I used black annealed steel wire. About 28 gauge will do. Wrap the wire around a number 67 drill bit shank to form a loop through which the strop will pass. Now, on the other end, use your pliers to form the hook and use your end nippers to cut the tail of the hook off to a correct length. The looped end of the hook should be soldered at this point. This can be done with soft soldering, using a soldering iron, or by hard soldering using a small torch. Having learned hard soldering, I will suggest that method, but soft solder will do for a joint that will not encounter any stress.

For hard soldering, you need a small torch and some pre-fluxed soldering paste. I hold small parts in a pair of cross locking tweezers or hemostats while I am soldering. Make sure the metal is clean and make sure the two points to be connected are touching. I like to file the pieces down and then over bend the pieces so that I can spring them



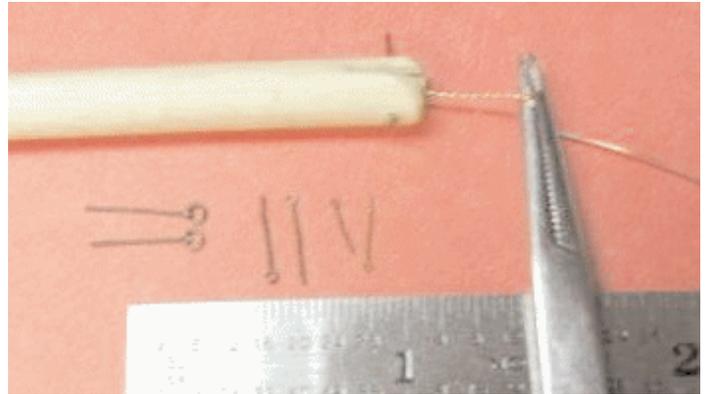
Rigging blocks with scratch built hooks

together to make sure the two points are actually touching. Apply a tiny fleck of paste and then apply the torch. Look closely and when you see the solder flash, immediately remove the flame and the joint is made. It takes some practice, but if you keep the pieces clean and touching, the rest should follow.

To make eyebolts, I use a small jig shown to me by fellow modeler Bob Craig. Take a common piece of wooden dowel about 5-6" long and saw

a slot into one end of the dowel, extending about 1/4" down into the dowel. Now, drill a hole at right angles to the slot and through the slot. Insert a piece of brass wire into that hole. The wire should be the same diameter as the eye of

the eyebolt you are making. Now, take another piece of wire and thread it into the slot, looping it around the other wire. Bring the free ends of this wire out of the slot and twist them. I use pliers to hold the wire in one hand while twisting the dowel in the other. Eventually, the wire will break, but that is good. Now, carefully remove the wire that was in the hole and a neatly made eyebolt will fall out of the slot. This eyebolt has a threaded shank and with a bit of trimming on the shank is ready to install in a predrilled hole wherever you need it. I have made several of these jigs, each for different sized eyebolts. No soldering is necessary in these eyebolts. If you use blackened annealed steel wire, then no other treatment is necessary. If you use brass, then they will need to be chemically blackened before installation.



An easy and fast way to make realistic looking eyebolts

VIII. Rigging the gun

The double sheaved blocks and the single sheaved blocks will each have slightly different stropping methods. To strop the double sheaved blocks, cyano glue one end of the strop onto the arse end of the block. Thread a hook onto the strop and then bring the strop up and over the head and down the other side of the block. Cyano glue the free end of the strop onto the arse end of the block, blending it in with the other end that is already glued on. In doing this trap the hook up against the head of the block. Make sure to be sparing with the glue to make a neat job of it. Now you have stropped block with a hook on it ready for rigging. Although many modelers think you have to form a becket or loop in the strop to hold the hook, it is actually not always true for the late 18th century. Back then, they quite often just ran the hook through the strop without any becket.

One thing to remember in rigging the gun tackles is the run of the tackle line. The tackle rope will be seized to the arse end of the single block, then run down through the inner sheave of the double block, then back up through the single sheave of the single block, and then back down through the outside sheave of the double block. To seize the tackle line in the strop of the single sheaved block is simple. Simply seize the tackle line as you normally would around the strop line before you install it on the block. When the seizing has dried, cyano glue the strop with the seized tackle line onto



Side view of a stopped block ready for rigging to the gun tackle



Frontal view of a stopped block ready for rigging. Note the invisible splice at the arse end of the block



A nearly side view of the stopped block. Note the strop running right through the end of the hook

the arse end of the block and run the strop up around the block on either side. Slide the hook for the single block onto one leg of the strop and then cyano glue that leg of the strop up over the head of the block, trapping the hook in place. Then finish the strop by bringing the remaining leg of the strop over the head of the block and cyano glue it down, blending it in with the rest of the strop. The key is to make that joint neat. I use a single edged razor to neatly trim the excess on each end of the strop that is glued on the head of the block.

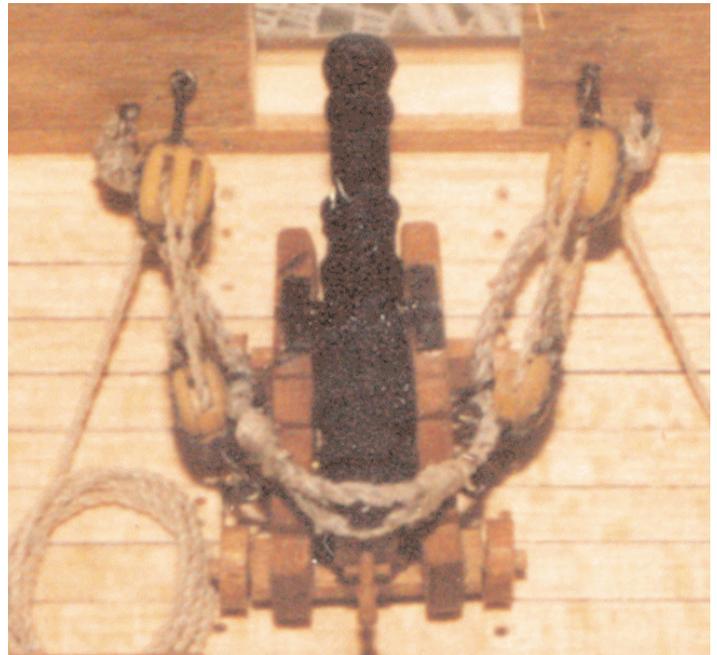
To rig your gun, first drill your holes for the eyebolts in the bulwarks. The breeching eyebolts are set down low near the waterway and just on either side of the port. The gun

fastened in place, pre-rig the breeching rope by making its eyebolts on either side and then seizing the breeching to the eyebolts. It is important to check the length of the breeching as you attach the eyebolts. Set the cut splice over the end of the barrel and glue the eyebolts into the holes you have drilled in the bulwarks. Make sure to let the breeching lay down loosely on either side of the carriage if the gun is run out. Only if the gun is run in for loading would the breeching be pulled taut. Go ahead and glue in the gun tackle eyebolts on the bulwarks. Connect the pre-rigged blocks with their hooks to the gun carriage and the eyebolts in the bulwarks. The free ends of the gun tackle



Here is a single block complete with gun tackle line seized onto the block. Note the seizing and how it blends in with the strop. Frontal view of the block. (left) Note how the two ends of the seizing blend in together at the top

tackle eyebolts are set about 1 1/8" out from the port and about 1/3 the way up from the deck. The key to rigging the gun is to pre-rig the tackles. It is easier to pre-rig the ropes and then attach them, blocks and all, after the gun is set into position. I fastened my gun carriage to the deck using bamboo locator pins set into the bottoms of the trucks. To just glue them would have probably worked, but I wanted to make sure the gun would not come loose. With the gun

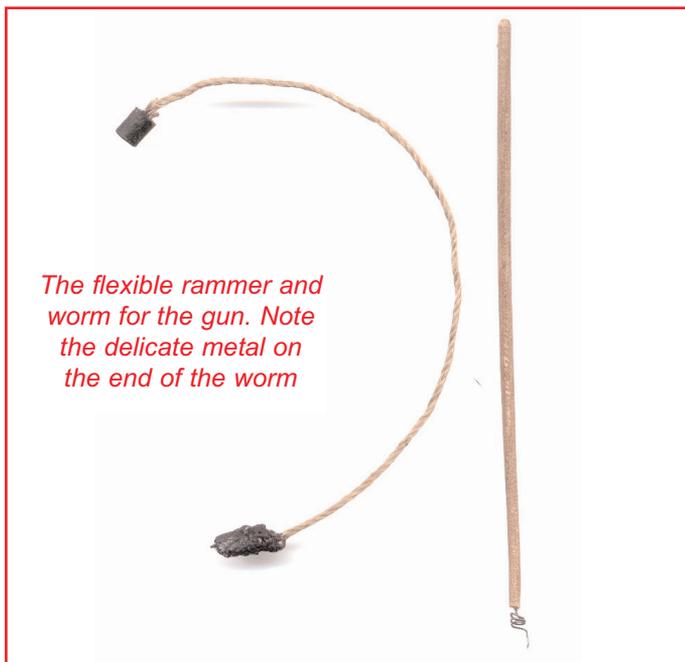


The rigging of the breeching and the gun tackles. Note the rope coils on the deck

should be glued to the deck using diluted white glue. They will be covered with rope coils. If you wish you can add some extra details for the gun such as a flexible rammer and sponge, and perhaps a worm for removing charges from the gun. The flexible rammer and sponge is made with a piece of rope for the flexible handle. The rammer can be made from a small piece of dowel

painted black with a hole drilled in one end to glue in the rope. The sponge can be made by wrapping thin strips of masking tape around the end of the rope. Paint the tape strips black. You can also use some cotton, but the fluffier the material you choose, the more difficult it will be to get the correct scale effect. The rammer and sponge should not be much more than 1/16" in diameter. On my model, the rope I used for the flexible handle was some of the same rope I used for the gun's breeching, but I think I would use something a bit smaller now.

For the worm, you need a thin dowel of smaller diameter than the gun's bore and a metal "curly q" shaped implement on it end. I made this metal part from stranded copper wire pulled out of some old electrical conduit. The stranded copper wire is flexible enough to be twisted in very small coils and it looks about right for the scale. Form the worm by wrapping the wire concentrically around the dowel several times to a length of about 1/4" or so. Leave the very end of the piece sticking out from the coil on both ends and glue the back end of the coil into a hole drilled into the end of the dowel. The dowel for the worm is somewhat longer than the bore of the gun. I laid these implements out on the deck near the gun and white glued them to the deck.



The flexible rammer and worm for the gun. Note the delicate metal on the end of the worm

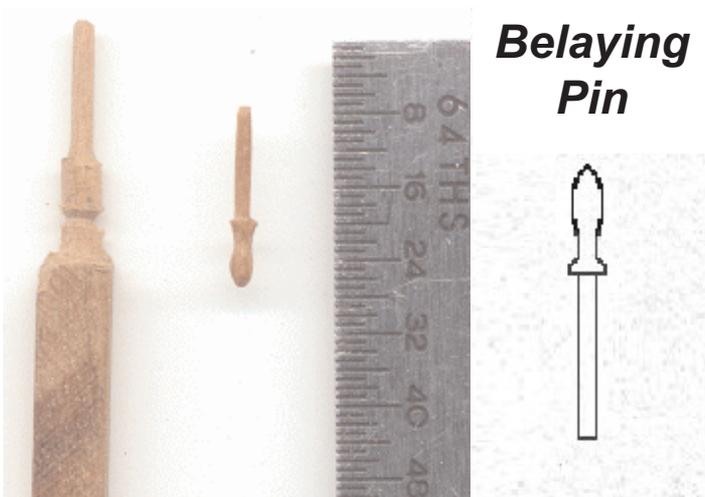
IX. Pin rail and belaying pins

With the gun installed and rigged, you can make the pin rail. Cut the rail to length from a strip of 1/8" thick, 9/32" wide cherry and then drill holes for six belaying pins. Use the plan view of the pin rack as a template to locate the centers for the belaying pin holes. Center punch at the marks for the holes to give your drill bit something to bite into. I made my holes with a number 61 drill bit and then enlarged the hole slightly as needed for the shanks of the pins. Attach the pin rail to the bulwarks using locating pins. Drill matching holes in the edge of the pin rail and the bul-

wark frames. Glue in bamboo locating pins to the pin rail edge and glue the entire assembly into the bulwark frame.

You might think that a toothpick or other small store bought dowel would be a good place to start, but I would caution against either alternative. The store bought dowel will have too much cross-grained material in it and it might break or chip out at any point in the process. The toothpick is, to my mind, too much of an unknown. Of what wood is it made? How was it manufactured? If you cannot answer either question, it is much better to make the belaying pins out of some wood that is known to have good working qualities. A hardwood is preferable, such as cherry, apple, or boxwood. I have made many belaying pins from 1/96 scale up through 1/16 scale using cherry and it is a good wood to use, but make sure to use clear stock. If it has a knot or a check, you could have a problem. So long as the stock is nice and clear, it will do just fine.

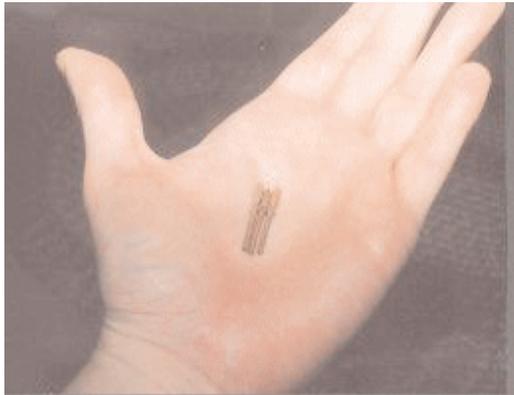
To make a belaying pin by hand, rip a piece of square stock a bit larger than the final diameter of the pin's head. It helps to have a stick to work on that has about twice as much material as you will need in your finished pin. The length of stock is about 6-8". On the end of the stick, mark out the length of the shaft on the end of the stick and then in from that, mark off the head. As with every part of the measuring and marking process, make sure your pencil is sharp. Double check your measurements as well. I always keep the shaft of the pin on the outermost end of the stick for easier shaping. If you did it the other way, the pin shaft would be so fragile that it might break before you were finished shaping the pin's head.



This is how you can make small belaying pins with a jeweler's file. The same method can be used for making large scale belaying pins.

The key to this technique is to be able to turn the stick slowly in your fingers as you remove material with the file. If you are right handed like me, hold the stick in your left hand and the file in your right and begin turning the stick slowly with your thumb, rolling it down your forefinger as you remove the material. Keep the area you are working on close to your finger and thumb and balance the length of the stick against

the four fingers of your left hand. As you turn the stick, you come to a point where you can not turn it any further. Note where you are in the turning process and reposition the stick to continue. An alternative is to simply reverse the turning motion, but this could result in a lopsided piece. Use a 7" flat file to knock off the corners of the stick where you will shape the pin and then round it over. Continue shaping the shaft of the pin, turning it in your fingers as you remove material. That 7" file will remove a lot of material in a short time.



These are some large scale pins made by the author for another project

When you have gotten the shaft rounded off, switch to the 4" square file and use its corner edge to cut into the wood, marking the intersection of the shaft and the lower edge of the pin's head. Now, switch to a 4" flat file and begin fine tuning the diameter. If you are not sure how far you have to go, size the shaft in your draw plate. With care, you can remove the last bit of material using the draw plate. One thing to keep in mind when turning the shaft in your fingers is to make sure you keep an eye on your mark for where the shaft meets the bottom edge of the pin head. This mark may be scratched off as you turn the shaft, but mark it again with a sharp pencil to keep you on track. When you have the shaft down to its final diameter, switch back to the 4" square cutting file and tune up the intersection between the shaft and head. The pin must sit down properly in its hole in the rack so make sure the intersection of the shaft and head is nice and square to allow it to do so.

With the pin's shaft sized, you can begin to turn the head. This can be a bit tricky, but with practice you can make a nice looking pin. One important tip is to watch the length of the head in relation to the shaft. If the shaft is a bit long, that is okay because its bottom end can be trimmed off later. However, the head's length needs to be monitored carefully to ensure it is not out of proportion with the rest of the pin. To shape the head, first take the diameter down with your 7" flat file. The diameter of the pin head is slightly more than the shaft. Get it down near the desired diameter, and then switch to the 4" flat file to get a better finish. Here is a good point to mark the top end of the pin. Measure this carefully and check it by holding the stick against your steel rule to see that you have the correct length and proportions. Now, take a 4" half round file and begin shaping

the bottom part of the head. The head of the pin has a slight concave bit in the profile just above its lower edge. Work this profile in with the half round file, working slowly as you turn the piece in your fingers. The smallest diameter in the concave area will be worked down to a dimension just shy of the shaft's diameter. Do not remove the very bottom bit of the head. The pin head diameter should contract as it goes down through that concave area and then widen back out to just a shade more than the shaft diameter right at the very bottom of the head. To finish shaping the head, use your 4" files to round over the head of the pin so that it begins to approach a point at the mark for the top end of the pin's head. The piece is very fragile now because there is not much material left where the pin meets the stick. You are nearly ready to part the pin off the stick. As you round over the top of the head, you will come to a point, where the pin will have to be removed. Use a razor saw to part it from the stick and then hold it in your fingers to finish rounding over the top of the pin's head. Be very careful to keep hold of the pin as you part it off the stick. If you apply too much pressure on the saw, then the pin will probably end up in another universe. This, in turn will lead to some very foul language. Once the pins are finished, they can be stained a darker color if you wish.

X. Building a binnacle cabinet

Next on the list is a binnacle cabinet. This is almost a project in itself, but it will be fun to create something so life-like for your battle station. I patterned my cabinet after the one described by Charles G. Davis in his book *The Built-Up Ship Model*. I made my cabinet out of cherry, but the main thing to remember is to use a good hardwood. The binnacle is a piece of furniture and I think it needs to be well finished.



A view of another large binnacle cabinet by the author showing the compass installed



The large scale binnacle cabinet showing side doors and handles

Begin by making up the side pieces. The sides are straight and 1/16" thick. There is a cut out in the bottom of the side that can be scroll sawn or filed out. Mark out where the shelves fall on each piece. There are two shelves for which rabbets must be cut. It is best to mark them together rather than to mark them separately. You need those shelves to be level and if you mark them separately, the risk increases that the marks are not really at the exact same level on each side piece. I held each piece down side by side and used my machinist's square to mark the lines across both pieces at the same time. I used my table saw to make the rabbets for the shelves. I lowered the blade to about 1/32" high off the table and then ran both side pieces through in the miter gauge with the rip fence set so that each rabbet was in the same place on each piece. This same method can be used for making any rabbet where you need a piece to set into another for structure's sake. By using the rabbeted joints, the piece will be a bit stronger than if you only glued it together.



These are all the parts of the cabinet's carcass

The shelves are more complex than you might imagine. The upper shelf needs two slots cut into its upper face to fit the two vertical panels that separate the lantern compartments from the center compass compartment. The upper shelf should have a 1/32" rebate cut into its back edge to allow the back panel to fit between the two side pieces and cover the edge grain of the upper shelf. But, the shelf should also have a 1/32" square chunk left at either end to fill the slot for the shelf in the side pieces. The front edge of the upper shelf should be flush with the front edge of the side pieces. The front panels for the lantern compartments will sit on the upper shelf and their inner ends will cover the edge grain of those two vertical panels that fit into the upper shelf.



The upper shelf. Note the slots for the vertical panels and the cut out on the back side of the shelf

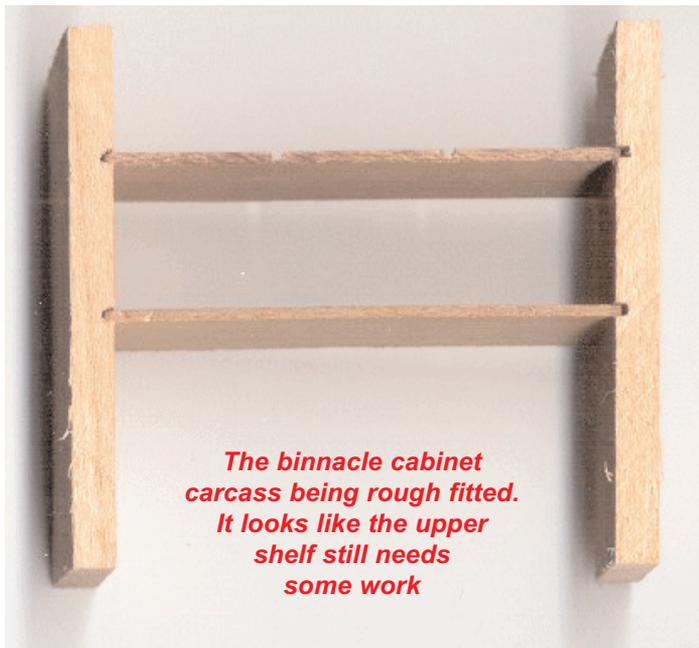
The bottom shelf is an interesting problem. We want to hide its edge grain on both front and back, but we also need to make sure that we fill in those mounting slots in both side pieces. The answer is to cut a 1/32" rebate along both front and back edges of the bottom shelf, yet leave a 1/32" square chunk at either end of the bottom shelf on both the front and back edges. This will allow the front drawer panel to cover the edge grain of the bottom shelf and for the back panel to cover the edge grain of the bottom shelf as well, and yet leave the slots filled in.



The lower shelf. Note the cut outs on both front and back sides of the shelf

Once the side pieces and shelves have been cut and the mounting slots created, it will be necessary to dry fit everything to make sure that it all fits together. The vertical panels that fit into the slots in the upper shelf must come up to the bottom edge of the cabinet top. If they are too tall, the top will not fit down onto the side pieces like it should. Once you have done a few dry fits and you are absolutely certain everything fits, you can assemble the cabinet. Fit the bottom shelf first, gluing it into one of the side pieces. Use

a machinist's square to keep it at right angles to the side of the cabinet. Before fitting the upper shelf, fit the vertical panels first. Glue them in and use your square to keep them exactly perpendicular to the shelf. Once the upper shelf is ready, glue it into the side piece that has the bottom shelf attached. When it has dried, you can attach the other side piece. While the glue dries, use your square to keep everything nice and square. I cannot over-emphasize the need to use that machinist's square on a task such as this. It will save you many headaches later on.



The binnacle cabinet carcass being rough fitted. It looks like the upper shelf still needs some work

When the cabinet carcass is dried, you can fit the back panel. The back panel is a 1/32" thick and cut to fit just under the top, flush with the side pieces, and just level with the bottom edge of the bottom shelf. If your cabinet was kept square as it dried, then the back panel should present no problems. I found it very helpful to install some small back pieces just inside the back panel on the side pieces. These backing pieces will give the back something to glue onto and just give it some extra positive support when it is installed.

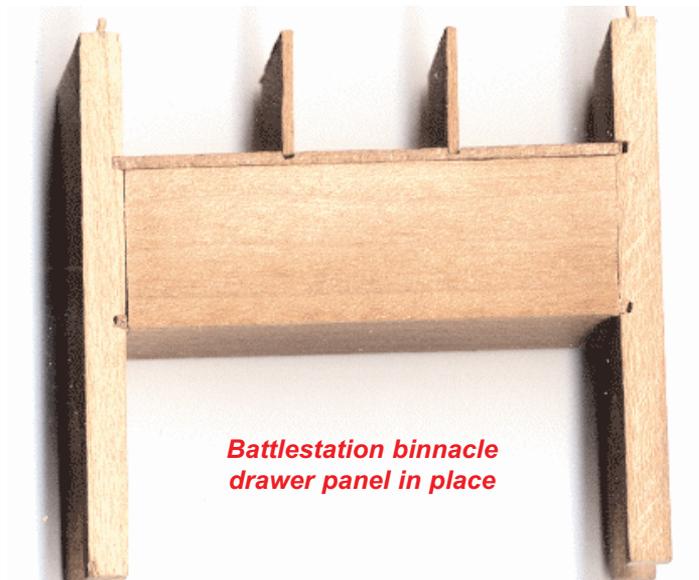


Here is the cabinet fitted with backing pieces. Note the pieces for the back panel, the front drawer panel and the lantern compartment panels



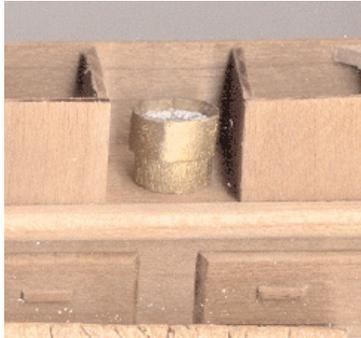
The binnacle cabinet having its back rough fitted

The front drawer panel can be fitted now. Its upper edge is the upper edge of the upper shelf while its lower edge is the lower edge of the bottom shelf. Its sides are flush with the inner edge of the side pieces. The grain for the drawer panel should run horizontally. The two front panels for the lantern compartments can go in now as well. They sit on the upper shelf and their upper edge fits right under the cabinet top. Their outer sides are flush with the inner edge of the side pieces while their inner sides are flush with the vertical panels and cover the edge grain of those panels. Their grain should run vertically. As with the back panel, installing some backing pieces for the front drawer panel and the lantern compartment panels will help keep everything rigid.



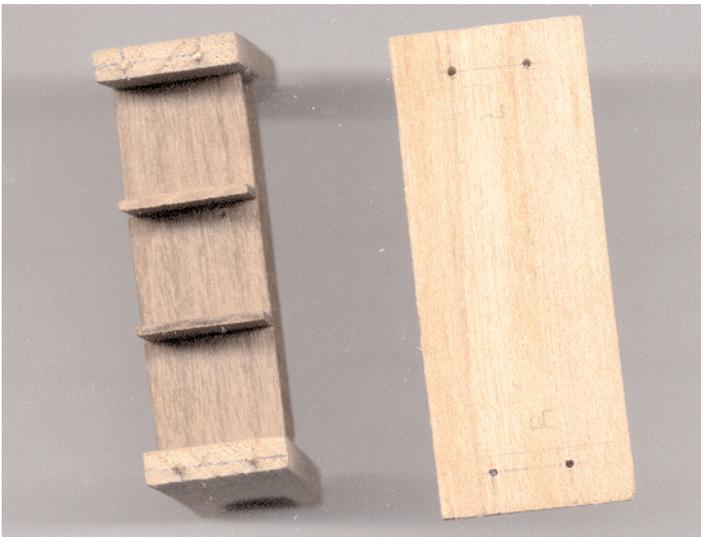
Battlestation binnacle drawer panel in place

Every binnacle needs a compass. To make a compass for this cabinet, I just used a small disc cut off the end of a dowel about 1/8" in diameter. I painted it brass and glued it onto the shelf in the middle compartment. If you can find a compass face in a book, scan it and reduce it until it fits the compass you have made. Just glue it right onto the top edge of the compass.



The author's compass. Its rather crude, but then it does get much attention. Here is a great face for a compass if you choose to make one this small.

Once the compass is installed, the top can be glued on. The top of the cabinet should have a slight bevel set into its edges all around. I used a jeweler's file for this, but if you have a better method, use what you know. Make sure when the top is glued on that it overhangs the structure on all sides equally. I fit two small locator dowels into the top of each side piece and then drilled matched holes into the bottom of the top piece. This way I knew when I sat the top down onto the cabinet sides it was in the correct position. In fact, the system works so well, I did not even permanently glue the top on my cabinet.



The top being aligned for final fitting on the side pieces. Note the locator dowels and the corresponding holes in the cabinet top

Once the top is on, all that remains is to fit the faux drawers on the front, the side doors, and the trim. The front drawers should have their edges slightly beveled. Take care they are centered on the panel so that they look like they belong. Before fitting the drawers, make up two cleats for handles and glue them on. Make sure these cleats are small and unobtrusive. They are there to suggest door handles. If they are too large, then scale effect is ruined. We use wooden cleats here because any iron on the binnacle cabinet would throw off the compass. The two small access doors on either end of the cabinet also need their edges

beveled slightly. Install small drawer handle cleats on them as well before gluing them on. Take care to position the side doors so they could give access to the lantern compartments.

The front trim piece below the compass compartment is actually made from three pieces. The corners are mitered as the trim wraps around the sides of the cabinet. Note that the trim has its outer face rounded over on both the upper and lower edges. While it is no doubt possible to assemble these trim pieces off the binnacle and then install it as one piece, I favor installing the front piece and then the two side pieces separately. It will be easier to cut the miters and get a nice tight fit at the corners by installing the trim as three pieces instead of one. The curved bottom trim pieces can be scroll sanded, but I would recommend that they be created on the end of a strip and then the finished piece sawn off that strip. This will keep your fingers from getting too close to the scroll saw blade.



A front view of the completed binnacle cabinet. Note the front trim and the drawers with very small wood handles



A side view of the completed binnacle cabinet. Note the side access doors for the lantern compartments

To mount the binnacle, make two small cleats, about as long as the cabinet sides are wide. These should be from about 1/16" square stock. Glue these cleats on to the inside of the legs at the bottom and then glue the binnacle and the cleats to the deck, centered abaft the hatchway. For my tastes, I would also add bamboo locator pins mounted in the bottom of those cleats and then drill corresponding holes in the deck to receive the pins. This will more permanently affix the cabinet to the deck. I finished my cabinet with cherry stain and some clear sealer, but it is up to you how to finish yours.

XI. Finishing touches

If you like you could add a couple of figures, either made up from clay or carved from boxwood or apple wood. Both woods make excellent material for carving. You can also find some suitable figures ready made, although they might cost a bit. My thinking is that if figures are added, there

should be at least two figures. Adding one figure really does not seem to make much of a difference, while adding two or more might really enhance the realism of the model.

Well, that's about it, I think. This was a very nifty little project that took about two weeks and 34 working hours to complete. I learned a few new tricks with this little battle station and it is a project that I would not mind repeating. I would recommend this type of model for anyone who is looking to test their scratch building skills before going on to a larger scratch built project. This model will not teach nearly everything you need to know about scratch building, but you can get your feet wet and learn a few valuable tricks along the way. You will have a nice looking model to show for your efforts and you will probably look at scratch building as a little less daunting for having built such a small model. Of course, the most important thing to remember is to have fun.

