BUILDING THE MONITOR

This operating model of the Monitor is constructed entirely from 1/16" sheet balsa, except for guns and propulsion hardware. Its two separate sections, hull and overhanging raft, are joined together after each has been completed. The turret is removable for access to the batteries. If both the Monitor and Virginia are built, it is recommended that the Monitor be constructed first because it is the easier of the two.

Before construction is started full-size plans must be on the worktable. The magazine plans can be enlarged by photostating or by drafting, or full-size plans can be purchased from Junior American Modeler Plan Service.

Construction begins with the hull or lower section. Trace the hull deck, hull bottom, and hull bulkheads Nos. 1, 2, 3 and 4 onto the wood. This is done by placing tissue paper over the full-size plan and tracing the piece to be cut. Now transfer this outline on the wood by drawing over the tissue so that the wood is dented with the image of the outline. Remove the tissue and redraw the lines on the wood with soft pencil or ballpoint pen so they are easily visible. Cut the wood to shape with a single-edge razor blade. This is done by holding the wood flat against a cutting board with one hand and carefully drawing the razor blade along the cutting line using only moderate pressure. Several strokes will be required to cut through the wood. Do not neglect to cut the two holes in the hull deck as the plans indicate. The hull is assembled upside down. Mark the outline of the hull bottom. Hold in place with straight pins that are pressed even with them, then cement the sides until smooth.

The motor, shaft, and stern tube are now installed. The motor is removed for access to the batteries. The motor compartment is then cleaned and the stern tube acts as a universal joint. When the motor is in line with the propeller shaft and the motor shaft, the propeller shaft with Vaseline and slide it into the tube. Be sure that the front end is wiped clean of Vaseline and press the plastic tubing on the propeller and motor shafts. This tube acts as a universal joint. When the motor is in line with the propeller shaft, it is cemented to the hull bottom. When dry, the two motor braces are cemented to the motor and hull bottom.

Next cover the hull sides. First, wrap fine sandpaper tightly around a block of wood (about 1 x 2 x 3") and secure the sandpaper with a thumbtack. Move this sandpaper block back and forth along each side of the hull to bevel or angle the edges of the hull bottom and deck as shown in the typical section. The grain of the hull sides must run vertically. Cut the sheet balsa into pieces that are about 1 1/4" high so they overlap the top and bottom by about 1/4". Begin cementing the side covering pieces to the edges of the hull bottom, hull deck and bulkheads at the center of the hull and work toward the bow and stern. Be sure to cement the covering pieces to each other as well as to the hull. Hold in place with straight pins that are pressed through the covering and into the deck, bottom or bulkhead. The last piece at the bow and stern must be trimmed to the proper angle before it is cemented in place. Also trim around the stern tube. When all the cement is dry, the straight pins are removed and all excess wood is trimmed flush with the hull bottom and hull deck. Using the block, sandpaper the deck and bottom to be sure the sides are even with them, then cement the sides until smooth.

All stern tubes leak a bit of water, so it is wise to waterproof the motor compartment. Brush several coats of sanding sealer on the sides and bottom of the motor compartment.

In order for our model to float at the proper scale waterline, we found it necessary to install 15 oz. of ballast (lead and pebbles). Begin by cutting a hatch in the hull deck at the two forward hull compartments. Fill the spaces with white crystal spar pebbles—the readily available 3/8" size white limestone chips that many homes have in the garden as paths, driveways, etc. Lead weights can also be used. A good source of lead is the local tire dealer who is sure to let you pick up the used lead weights from the floor that have been used for balancing wheels. Do not install any more weight than is shown on the plans. Lead weights must be cemented in place. Now, cement the hatches back into the hull deck and sandpaper smooth.

The raft is made in the same manner as the hull. Note that a rectangular hole is cut into the raft bottom to match the hull deck. A circular hole is cut in the raft deck for the gun turret. After the raft deck, bottom and bulkheads are assembled and the sides cemented in place, the entire raft
should be sandpapered with the sanding block. Line up the rectangular openings in the hull deck and raft bottom and cement the hull to the raft. Place some books on the assembly to press them together and let dry overnight.

The turret coaming is important because it prevents water from entering the turret opening. Using the pattern on the plans, cut the coaming to shape and cement the pieces together to form one piece. Notice the grain direction and the seams. Soak this strip in warm water for a few minutes and pat dry with a cloth. While wet and warm, test fit the coaming into the round opening in the raft deck. Press the strip against the opening all around, bending the wood gently to form the curve. Let this dry while in place. The pattern was made extra long so it will be necessary to mark the excess wood and cut it with a razor blade. Apply cement to the edge of the deck opening and press the coaming in place. Hold in place with pins if necessary. When cement is dry, the finished turret is trial fitted on the coaming. Do not force and, if the turret appears too tight, gently sandpaper the inside of the turret and the outside of the coaming until the fit is snug, but not tight. Cut the dowel guns and cement into holes in the turret.

Cut the rudder support from an ice pop stick, but if none is available, balsa wood will do. Carefully cut a notch in the hull bottom for the rudder support and cement the support in place. Rudder is traced and cut to shape. Bend the tabs as indicated and cement the rudder in place to the raft bottom and the support.

Check the entire hull for any seams that appear to be open and seal them well by wiping cement into all openings, especially around the stern tube. Cut out and assemble the pilot house, ventilators and smokestacks. The ventilators and smokestacks are optional because they were removed on the full-size Monitor when it went into battle. Cement these and the various hatches in place. The hatches can be cut from smooth cardboard and cemented in place.

The entire model must be absolutely watertight — the seepage of water into the wood will destroy your model. Before the model is painted, it must be given at least a dozen coats of wood sealer with a light sandpapering after each coat is thoroughly dry. The sealer must be flowed on liberally to be effective. Seal the inside as well as the outside of the turret and coaming. After sealing the turret again should be fitted on the coaming and sandpapered if too tight. The more sealer you apply, the better your model will look and the more watertight it will be.

Although the Monitor was iron, that portion under the waterline was covered with copper as were the wooden sailing ships of that period. The part of the model below the waterline is painted copper while the remainder of the model is dull or flat black. We used Pactra plastic model enamel paints. First paint the bottom and sides copper. Apply several coats. When thoroughly dry (at least twenty-four hours), apply paper masking tape to the hull with the upper edge of the tape forming the waterline. Press the tape firmly against the model and gently run a fingernail along the edge to prevent the black color from seeping under the tape. Paint the remainder of the model dull black and then carefully remove the tape. A nice, clean waterline should be the result between the copper and black. The turret is painted while off the model. Sandpaper the staffs to a taper and then paint the remainder of the model dull black and then paint the remainder of the model dull black and then.

Always carry the model carefully; if it is dropped it will break open because of the heavy ballast weights. Place in the water and turn on the switch. It will take several seconds for the model to begin moving because of the power required to overcome inertia — just like a real ship. Your model will then cut through the water and shift the weights until the model floats evenly in the water. Cement the weights in place and, before the cement dries, recheck the balance.

LIST OF MATERIALS:
- Four 1/16 x 2 x 36" Medium Balsa (Hull, Turret, etc.); one 1/16 OD x 4" Brass Rod (Propeller Shaft); one 1/16 ID x 3" Brass Tubing (Propeller Shaft Tube); one .015 x 1 x 1" Brass (Propeller); one .008 x 2 x 2" Aluminum (Rudder); one 3/32 dia. x 6" Wood Dowel (Guns and Masts); two 5/16" Metal (Cleats [Polks, page 154]. See Polks Marine Model Catalogue. Polks Model Craft Hobbies, 314 Fifth Ave., New York, N.Y.)
- Mabuchi: Mabuchi FA-130 motor; Acme No. 6 Pencil battery holder; fine copper wire (plastic coated); two dozen straight pins; four oz. Testers Sanding Sealer; 1/2 oz. flat black model enamel; 1/2 oz. copper metal enamel; 1/4" flat camel hair brush; four ft. paper masking tape about 1/4 in. wide; fine and very fine sandpaper; tube of cement (Am- broid or equal); 1/2 in. length of plastic tube for universal joint.

The battery holder for the Monitor is accessible through the turret opening as shown. Notice the coaming around the opening that prevents water from entering the hull.
BUILDING THE MERRIMAC (VIRGINIA)  WALTER MUSCIANO

Except for the hardware and fittings the Virginia is built entirely from 1/8" sheet balsa. First the hull is assembled and then the casemate is constructed on the hull. The batteries are accessible through hatches atop the casemate. Full-size plans are necessary to build this model. Either purchase a set from Junior American Modeler plan service or enlarge the magazine plans by drafting or photostating. This model should be built after the Monitor because it is slightly more complicated to build.

Begin construction with the hull. The hull shape on our model is not true to scale. The full-size Virginia had a deep hull (see section on the plans) which would be difficult to build and would require many pounds of ballast to float at the proper waterline. Our model performed well with the shallow hull and the flat bottom makes it easy to display because no stand is necessary.

Trace the hull bottom, deck and bulkheads onto the sheet balsa as was described for the Monitor. Notice that the deck and bottom are identical except that the deck has two areas that are cut out. Save the pieces that are cut out of the deck. The deck and bottom must be assembled from pieces of sheet balsa before they are cut to shape. Two sheets of 1/8 x 2" balsa, cemented together at the centerline, is the ideal arrangement for the deck and bottom. Cement the bulkheads to the bottom in their proper location and, when dry, cement the deck atop the bulkheads.

Cut the propeller shaft and stern tube to proper length with the edge of a fine file or a fine hacksaw. Slip the brass shaft tube through the holes in the bulkheads and cement firmly. Be sure the end of the tube does not extend into the motor compartment any further than is shown on the plans, so the compartment can be drained. Propeller is cut from sheet brass using the pattern on the plans. This is soldered or carefully glued with epoxy to the shaft. (Soldering is preferred.) The blades are carefully twisted so there is about 1/4" distance between the two edges of each blade. Smear the shaft with Vaseline and slide it into the tube. It must fit snugly, but be loose enough to rotate freely. A Mabuchi electric motor was used on our model. Solder two 12-in. lengths of fine copper plastic insulated wires to the motor connections. Fit a short length of rubber or plastic tube (fuel line can be used and is available at model shops) onto the propeller shaft and the motor shaft. Cement the motor to the hull bottom and then cement the motor braces to the motor sides and the bottom. Test the motor by placing the batteries in the aluminum holders and connect the motor wiring. When operation is satisfactory, the motor wires are led out of the motor compartment through the open hatch.

Cover the hull sides with sheet balsa in small sections at a time. The grain should run vertically to make the covering easy to bend. Cut the sheet balsa into pieces that are about 1/8" higher than the hull. Cement each piece to the edge of the deck, bottom and bulkheads, as well as to each other. Begin at the center and work toward the bow and stern. Cover both sides of the ship simultaneously. Hold in place with pins until dry. These are pushed through the sides and into the deck, bottom or bulkheads. Trim the side pieces where they meet at the bow and stern. When dry, the excess above the deck and below the bottom is trimmed away with a sharp knife (an X-Acto No. 26 blade or a single-edge razor blade). Sand flat with a sanding block. Waterproof the motor compartment with several coats of sanding sealer. Pour a bit of sealer into the compartment and tilt the hull at various angles so the sealer runs onto all surfaces of the wood and soaks into the grain. This is necessary so that the shaft leakage will not harm the ship when it drips into the motor compartment. Cement the piece that you saved back into the hole in the deck over the motor compartment.

In order to make our model float at the scale waterline, it was necessary to add 51 oz. of ballast weight. Most of this is white crushed rock sometimes called Crystal Spar, Limestone Pebbles or Marble Chips and is used in garden paths, driveways and around plants. This is easy to obtain and cheaper than lead. Ordinary pebbles can also be used. Seven compartments in the hull and casemate were filled with this material. The three hull compartments are now filled. Carefully cut a hatch over each ballasted compartment that is noted on the plans. This opening should be no less than one inch square. Fill the compartments one at a time until absolutely full. Tap and shake the hull gently to be sure that the ballast has settled. Just before the hatch is cemented into the hole, pour several drops of cement through the opening onto the pebbles.

Cement the casemate bulkheads to the main deck and pass the motor wires through the bulkheads—one to the switch compartment and the other to the battery compartment. Cement the casemate end braces to the deck and bulkhead. Carefully level the edge of the casemate templates to the angle of the casemate sloping sides and cement to the main deck by slipping them under the casemate end braces. Cut the casemate deck to shape and level the edge to the angle of the casemate sloping sides. Cement this atop the bulkheads and casemate end braces. Solder the motor wire to one switch terminal and solder another 12-in. wire to the other switch terminal. We cemented the switch to the underside of the casemate deck with only the knob protruding so it would not mar the model's scale appearance. The switch can also be mounted atop the casemate deck if desired, in which case a larger hole must be cut in the deck to accommodate the switch body. Lead the loose switch wire into the battery compartment.

Solder 12-in. wires to the Acme battery holders. The battery holders are not attached to the model, but merely rest on the bottom of the hull. The wire must have plenty of slack so the battery holders can be removed through the two hatches in order to change the batteries. Solder wires to the holder terminals following the wiring diagram on the
plans. Install the batteries and check the circuit with the switch.

The sides of the casemate are covered with sheets of wood, while the ends, which curve rather sharply, are covered with strips of balsa about 3/8-in. wide. Actually these strips should taper slightly with the narrow dimension at the top. The strips run vertically from main deck to casemate deck. When the casemate is covered and the cement is dry, the excess wood can be cut even with the casemate deck. Trim the end covering with a sharp knife so the curve is smooth. Check the model and press Plastic Balsa into any imperfections and spaces between the covering pieces. Sand well.

Cut the stern deck and stem to shape and cement to the hull. The breakwater is cut and fitted to the hull and casemate before it is cemented in place. Trim as required and cement to the deck and casemate. The hawsepipe platform and ram beam pieces are cemented to the hull and to each other now. Notice that the platform has holes in which an eyelot is cemented. Pilot house is made from sheet balsa disks cemented together and trimmed to a cone. Cement in place.

Very carefully cut out a hatch in the casemate deck over each of the four compartments that require ballast and save the pieces. Fill the compartments with the pebbles as previously described and be sure the pebbles are well compressed before the hatches are cemented into the holes once more.

The removable hatches for battery access are made with two pieces of balsa cemented one atop the other. The lower piece fits the rectangular hole in the casemate deck while the upper piece must be about 1/8-in. larger all around. Cement together and trial fit into the hole, trim as necessary and set aside. Cut out and cement the permanent hatch cover behind the pilot house.

Smokestack can be made in many ways: carved from a block of wood, sheet balsa soaked in hot water and wrapped around a dowel, or a hardwood dowel with a hole drilled in the top. We used the last mentioned. The flanges are simulated with a thin strip of gummed paper or tape. Cut to about 1/16-in. wide and wrap it around the stack until a thickness builds with the layers of paper or tape. Cement the end to keep it from unwrapping.

Cut a slot in the bottom for the stern frame support and cement this in place. Add the stern frame and carefully cut a slot for the rudder. The rudder is cut from very thin aluminum, only slightly heavier than foil, and is cemented into the slot in the stern frame.

Before it is painted, the model must receive at least ten, and preferably more, coats of a wood sealer. Liberally brush each application over the entire model and sand each coat when dry. When the model is very smooth, it is ready for painting.

Note the location of the waterline. First paint the portion below the waterline with copper plastic model enamel. Apply several coats and let dry overnight. Now, apply paper masking tape to the hull at the waterline. Place round lead weights on the drafts and paint over the tape. Let dry. Pull the tape and paint the model above the waterline. A sharp and clear color separation line should be the result.

Miscellaneous details such as smokestack, anchor, chain, ventilators and hatch covers are now painted and cemented in place. Mark the locations on the hull and then make holes with an awl, icepick or drill. Cut the guns to proper length and cement them into the holes. Paint black. The end of the chains are secured with a pin pressed through the last link and into the model. Hold with a droplet of cement. Lifeboats are carved from scrap wood or they can be plastic or metal which are available from a model shop. Paint white. Cut the lifeboat mounts, seal, and paint black. Cement to the casemate side and cement the lifeboat into the mount.

Casemate railing is made from black thread that is cemented to the outside of straight pin stanchions. Cut off the heads of straight pins until 1/2-in. of the pin remains. Press these into the casemate deck where shown and stretch the heavy black thread all around the outside of the top of the pins. Apply a droplet of cement to the thread-pin junctions. The thread guy wires are added now. Cement one end of each of the four wires to the top of the smokestack and let dry. Push four or five straight pins into the casemate at the point where the wires are anchored leaving 1/8-in. of the pin protruding from the casemate. Holding the thread taut, wrap the loose end around the pin and push the pin all the way into the casemate. Seal with a droplet of cement and cut away excess thread with a sharp single-edge razor blade.

The model now requires only a final ballasting. This is done in the battery compartment with lead weights used for balancing automobile wheels. Used weights are generally found on the floor of the local tire installation garage. The prototype model required 8-1/2 oz. of lead. Place the model in the tub and loosely insert the weights in the hull outboard of the batteries and atop the main deck as shown on the typical section. Shift the weights until the model floats on an even keel at the required waterline. A long tweezers (six or eight in.) is ideal for moving the weights. When properly located, the weights are cemented in place.

Always carry this heavy model with one hand under the hull, because if dropped the craft will smash to bits due to the tremendous weight. Place the model in the local pond or lake and turn on the switch. As with a full-size ship, the model requires several seconds to begin moving because of the great mass. Should the model run backwards, merely reverse the batteries in the holders. After several runs, turn the model on end with propeller down and run the motor for a few seconds to let any water that may have leaked into the hull via the propeller shaft tube to drain out.

LIST OF MATERIALS: seven 1/8 x 2 x 36" Medium Balsa (Hull, Casemate, etc.); two 1/4 x 1/2" Metal (Cowl, Ventilators [Polks No. 152]); two 1-3/4 or 2" single-ended Metal (Lifeboats [Polks No. 155]); one 1/8 dia. x 4" Wood Dowel (Galley Smokesipe and Safety Valve Exhaust); one 3/32 dia. x 12" Wood Dowel (Guns and Masts); one 18" long (10 links per inch) Metal (Chain [Polks No. 155]); one 1" long Metal (Kedge Anchor [Polks No. 150]); one 1/16 OD x 6" Brass (Propeller Shaft); one 1/16 ID x 6" Brass (Propeller Shaft Tube); one 0.015 x 1" 1/8" Brass (Propeller); one .008 x 2 x 3/8" Medium Balsa (Rudder); four 1/2" Metal Bits (Polks No. 151).

Miscellaneous: Four oz. Testers Sanding Sealer; Tube Cement (Ambroid or equal); 1/2 oz. flat black model enamel; 1/2 oz. copper model enamel; 3/8-in. flat camel hair brush; two dozen straight pins; black thread; fine and very fine sandpaper; Mabuchi RE-260 motor; Acme No. 6 Pencilcell battery holders; fine and very fine plastic tube for universal joint.

("Polks No." for metal fittings refers to the page number in the Polks Marine Model Catalogue from Polks Modelcraft Hobbies, 314 Fifth Ave. New York, N.Y.)