

Scratchbuild A Backwoods Water Tank

Part IV - The Supporting Trestle Work & Water Pipe

By Dwight Ennis



Now we'll turn our attention to the water tank's supporting trestle work. Once we've built that, and made the water pipe, we'll be ready to mount the tank onto the trestle work.

By the way, for those wishing to build a trestle, the procedure for building the bents and applying the diagonal braces is exactly the same as that described here. You make a drawing of your bent, make a jig with it, and build your bents in exactly the same way. You might decide to use real threaded rod, washers, and nuts to help hold things together, but the method of construction is essentially the same. Once the bents are built with their diagonal bracing, all that remains is to glue and/or nail them to the stringers under the track, then make and apply any outside sway bracing just as is done here. If you want your trestle to follow prototype practices, I highly recommend Kalmbach's book *Model Railroad Bridges and Trestles*. There's a lot of information in it concerning the angle of the pilings, bent construction and bracing, bent spacing, sway bracing, stringer configuration - everything you need to know to design and build a realistic trestle.

Download the Drawings

The following drawings are for this section:

- [Drawing Six - Supporting Bent](#)
- [Drawing Seven - Supporting Trestle Work Front View](#)
- [Drawing Eight - Supporting Trestle Work Right-Side View](#)
- [Drawing Nine - Supporting Trestle Work Left-Side View](#)
- [Drawing Ten - Supporting Trestle Work Bottom View](#)
- [Drawing Eleven - Supporting Trestle Work Top View](#)
- [Drawing Twelve - Water Pipe Details](#)

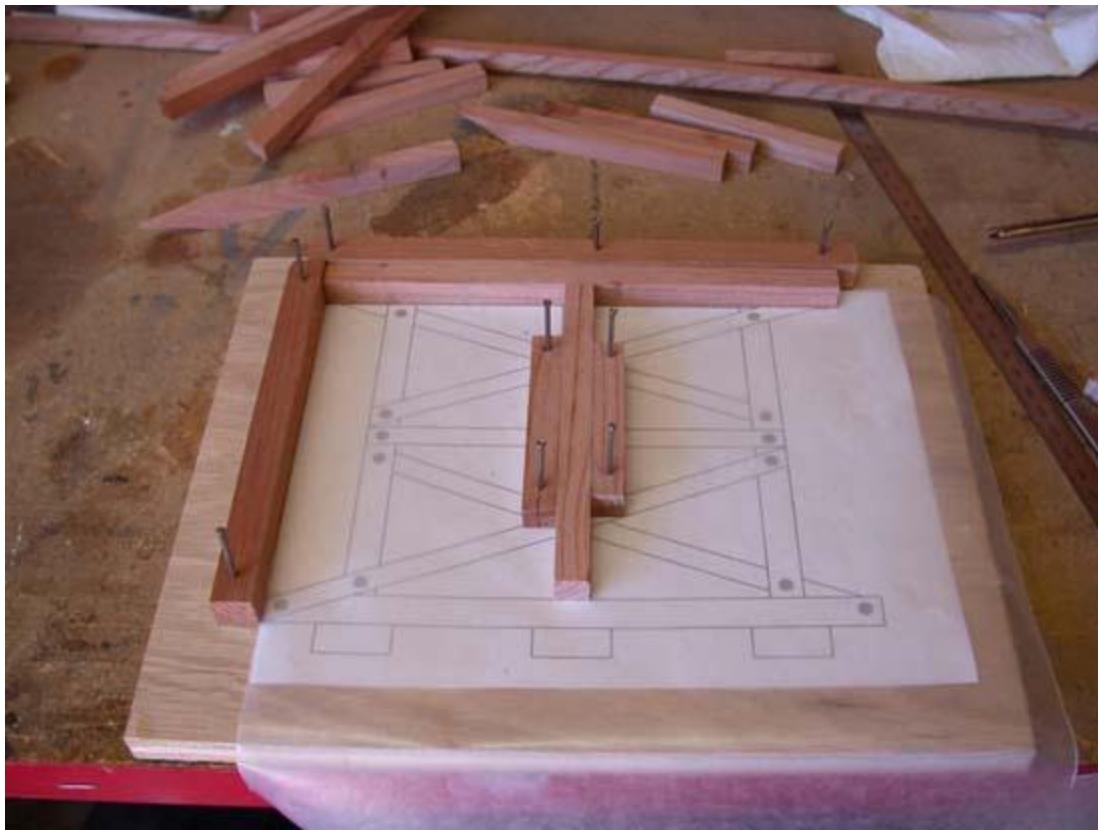
After downloading the drawings, print one or more copies.

Making a Jig for the Bents

First up on the agenda is to build the bents for the supporting structure. Since these all need to be exactly the same, we're going to create a jig to ensure that they are. We'll create the jig pretty much the same as we did before.

The bents are constructed of 8 x 8's (0.40 x 0.40), with 2 x 6 sway braces (0.10 x 0.30), so go ahead and rip up some scale lumber to these dimensions. From the 8 x 8 lumber, cut twelve bent legs 8'-4" (5.00") long, and eight horizontal beams 12'-0" (7.20") long.

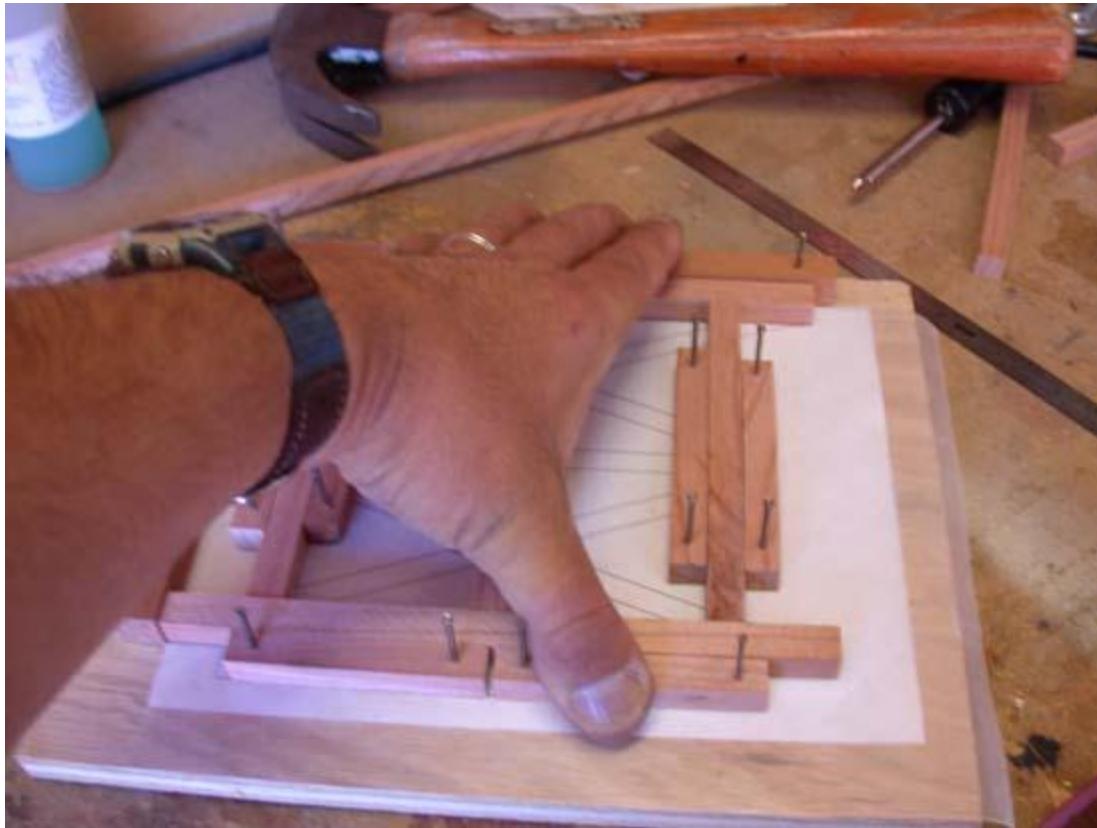
Get a new piece of plywood (or whatever you're using for the jig base), that's 8" x 6.5" or larger, and tape a copy of **Drawing Six - Supporting Bent** to it. Lay a piece of waxed paper over it to prevent the glue from sticking to the jig. Nail a piece of straight scrap to the jig base so its inner edge is right even with the top of the bent in the drawing. Nail another piece along the left side so its inner edge is right even with the left edge of the top and bottom horizontal beams. Lay one of your horizontal beams against the top and left guides just installed, and lay a bent leg in the center position, butting it against the top horizontal beam. Nail two short scraps so they snugly hold the center leg in position (again, you want a snug fit here, but not too tight).



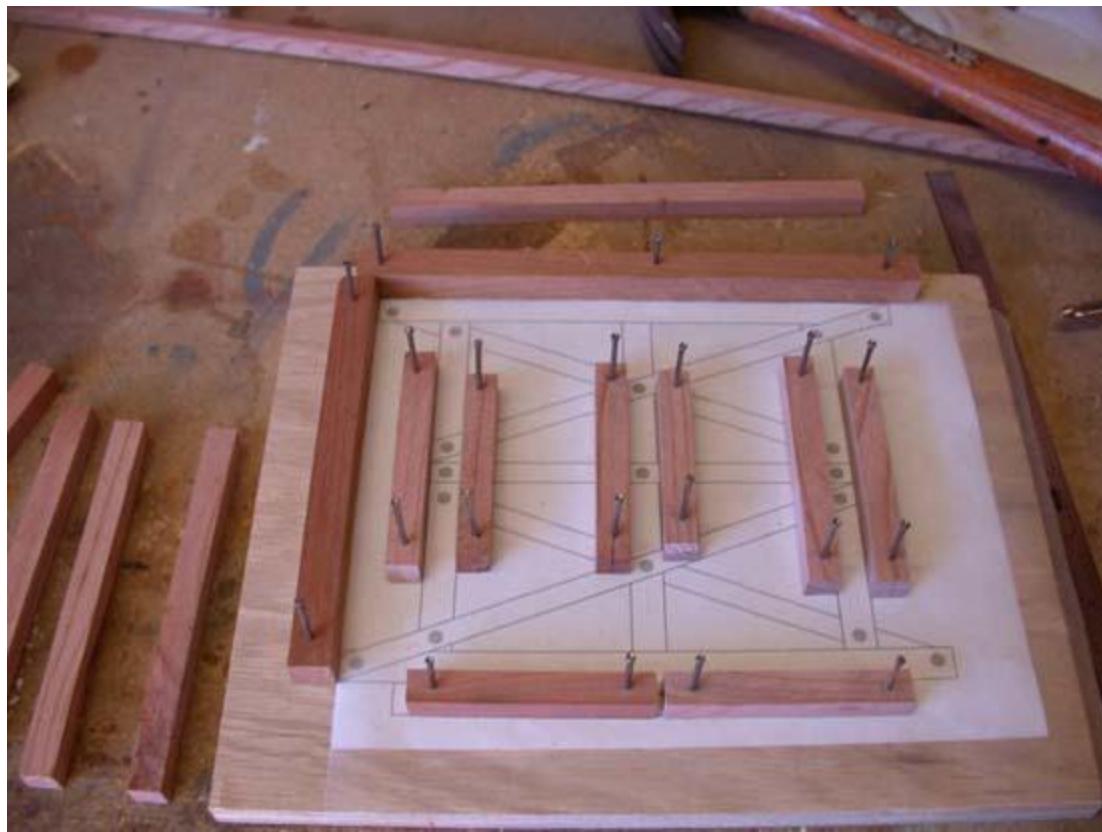
Repeat the last step with the two outer bent legs.



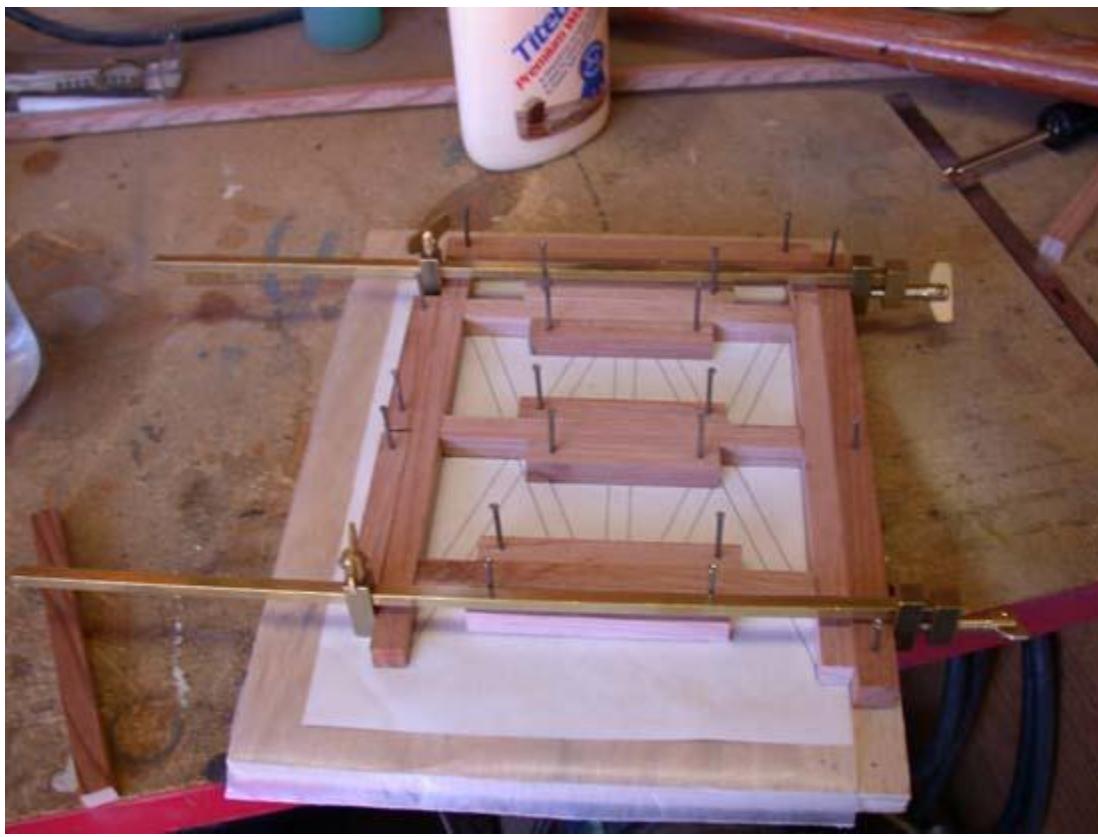
Lay the bottom horizontal beam into place with its left side butted against the left guide. While squeezing the bottom beam against the top guide, nail a couple of short strips tight against the bottom beam (I found it easier to use two strips on the bottom, but one will work too). This part of the jig assembly needs to be ***tight***, since it will apply your clamping pressure for you while the glue sets up.



Your jig is now complete and should look something like the photo below.

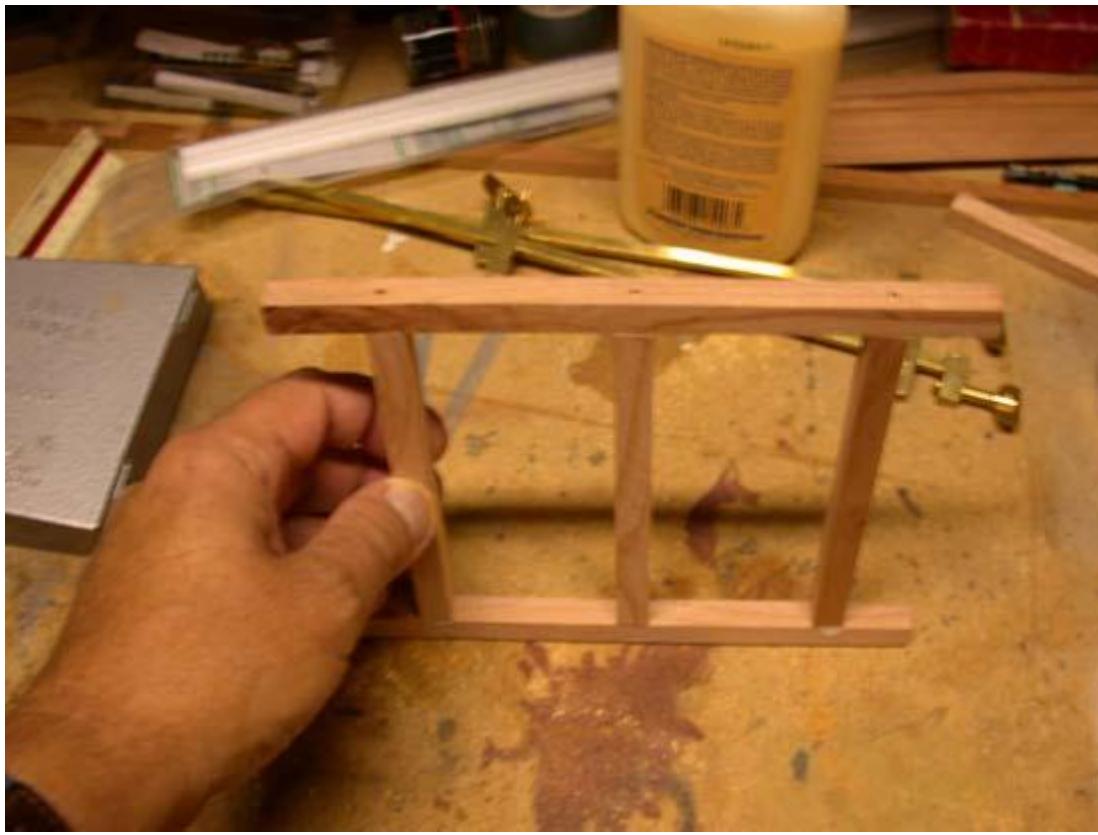


Reinsert your top beam into the jig. One by one, apply glue to BOTH ends of each leg, and insert into the leg guides. I suggest being a bit more liberal with the glue here, since end grain seems to soak it up. Press each leg tightly against the top beam. When all legs are in place, position the bottom beam against the left and bottom guides and press it firmly into place. If any glue squeezes out along the top or inside corners, use your finger or a toothpick to remove it. If for some reason the bottom beam feels loose once in the jig, apply a couple of clamps (this is another instance where the Micro-Mark mini bar clamps are worth their weight). Let things dry for the required amount of time.



Make three more bents just like the first.

We're going to nail the legs to the beams for added strength. I used some #18 x 1" brass escutcheon pins. Using a drill bit which is about 0.005" to 0.010" smaller than the diameter of the nail or pin you intend to use, drill a hole through the beams into the legs roughly centered in the legs. Gently tap a nail into each hole. Use a nail set punch to finish driving the nail the last 1/16 to 1/8 so as not to mar the beams. If a nail bends while driving, don't bother trying to straighten it - just use wire cutters to pry it out and start again with a fresh nail. Don't use a lot of force when driving the nails, since you might break loose a glue joint by jarring it too much. Rather, take your time and tap them into place. If they seem to be too difficult to drive, enlarge the hole with a drill bit that's a couple of thousandths larger. You want the nails to grip the wood, but you also want them to drive fairly easily without splitting the wood.



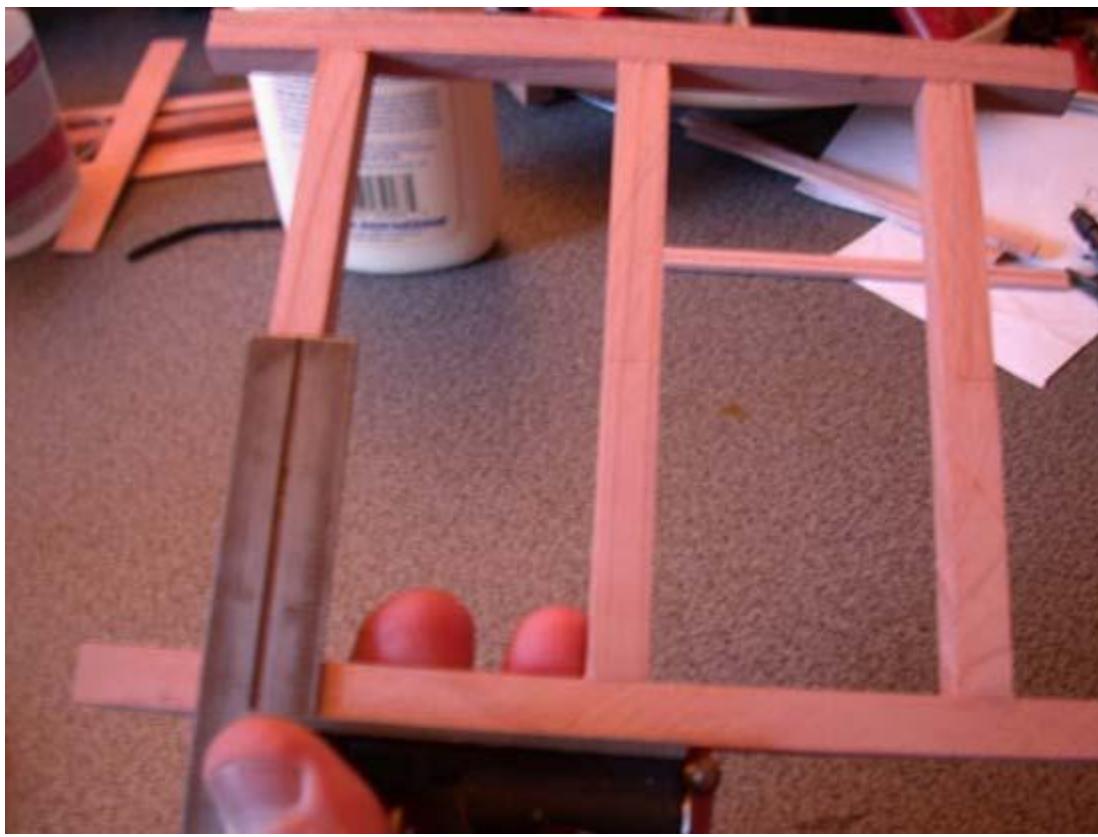
You may find that a glue joint breaks loose despite your best efforts. If this happens, there's no choice but to re-glue it and put it back in the jig.

At this time, take a look at the back side of the bents - the side that was facing down and against the waxed paper in the jig. It's very likely that glue was squeezed out on that side which couldn't be seen or removed while the bent was in the jig. This glue can now be removed with a sanding block.



Set your four bents on a level surface and hold them together. It's likely that they aren't symmetrical left-to-right. Flip them around until they all match up, then put a mark on the bottom beam of each towards one side for later reference of top/bottom and left/right.

Measure up 2.75 from the bottom beam and draw or scribe a light line on each leg. Do this on both sides of each bent.

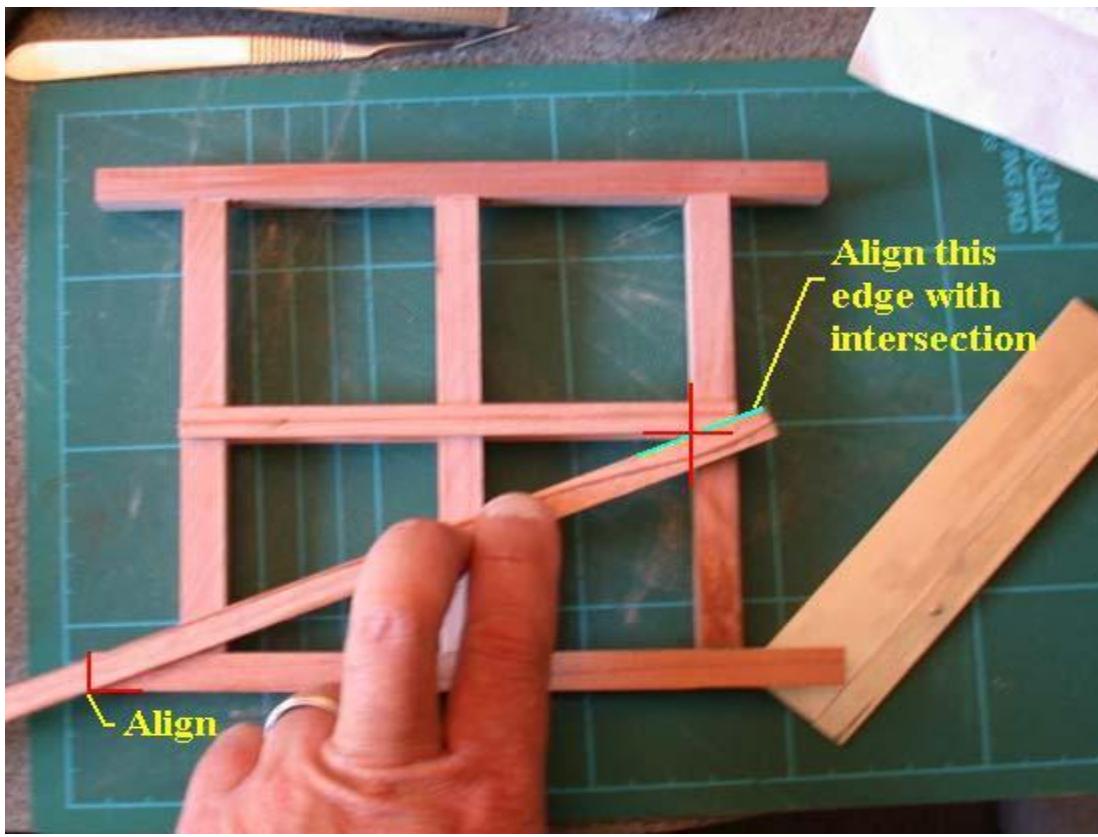


Measure the distance between the outer edges of the outer legs - it should be right around 5.40". Take your 2 x 6's (0.10 x 0.30) and cut eight pieces to the length you measured. Glue one piece to each side of each bent with the bottom edge aligned with the line just drawn. This is another case where it helps to hold the piece in place and also scribe or draw a line at its top edge to serve as a guide for where to place glue. Use glue sparingly here, and smooth it out with your finger as necessary to prevent squeeze-out, just as you did before. Clamp these pieces and allow to dry.

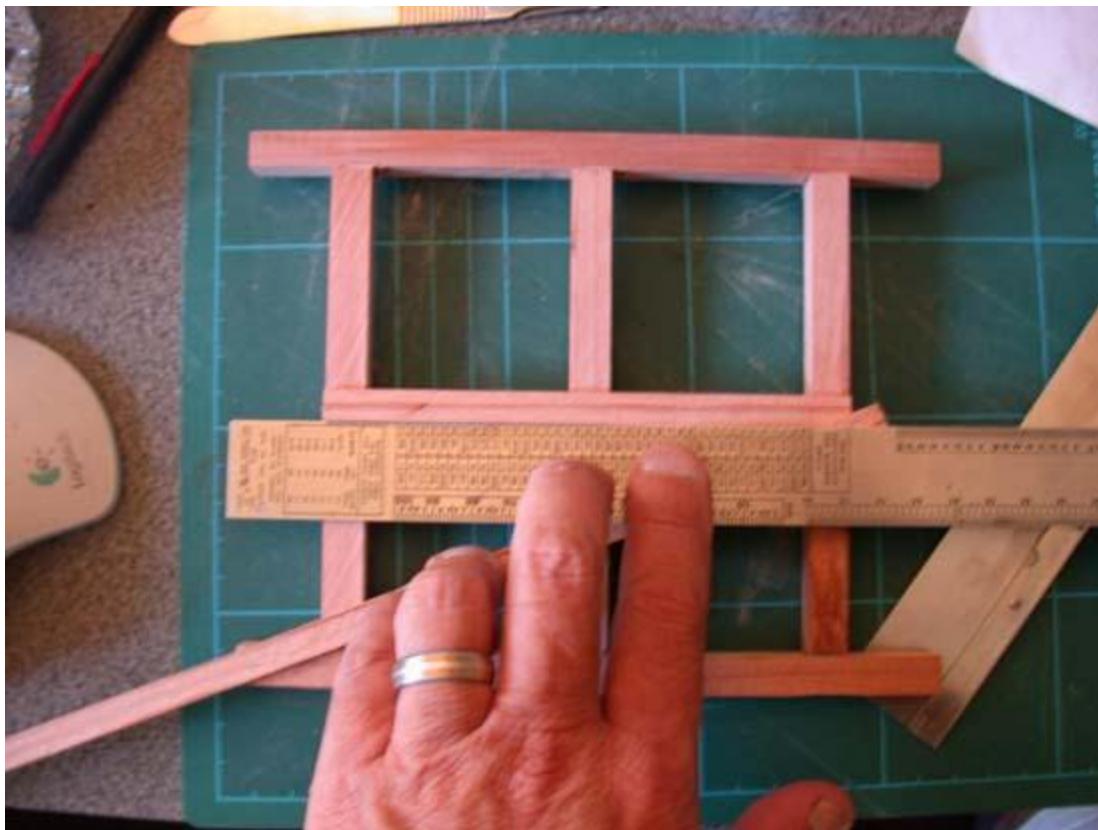


When the horizontal sway braces have set up, we can fit the diagonal sway braces. Cutting these angles really isn't too hard.

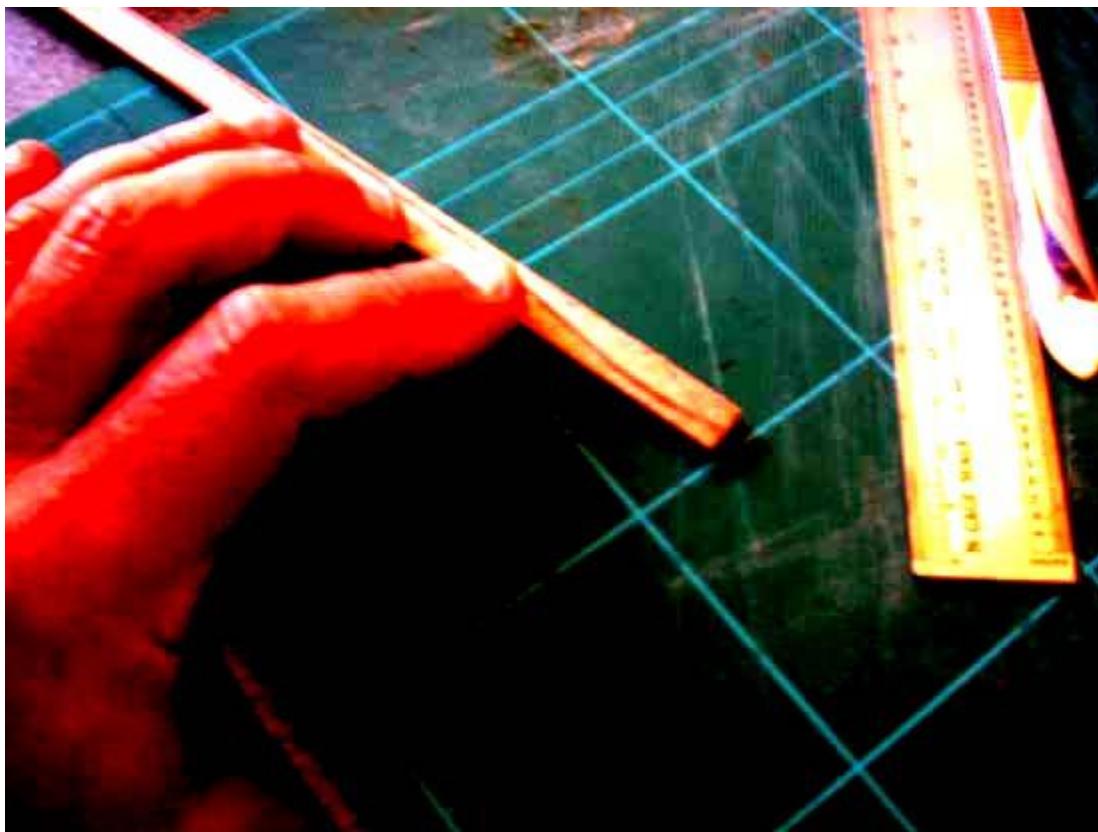
Take a look at the bent drawing and you'll see that the bottom diagonal sway brace has its bottom edge aligned with the bottom-left corner of the bottom beam, and its top edge aligned with the intersection of the right leg's inner edge and the horizontal sway brace's bottom edge.



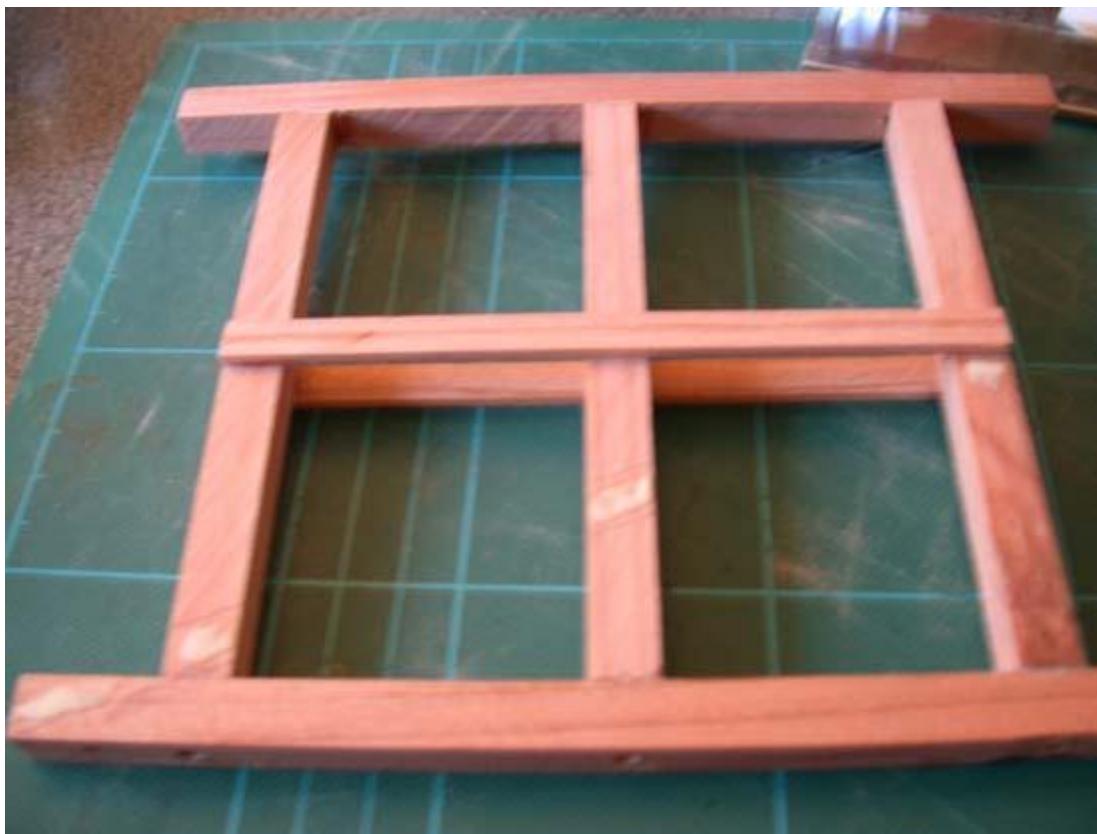
With the diagonal brace held in its aligned position as shown above, lay a straight edge along the bottom edge of the horizontal sway brace and scribe a line (the back of the tip of a #11 scalpel or hobby knife works well for this).



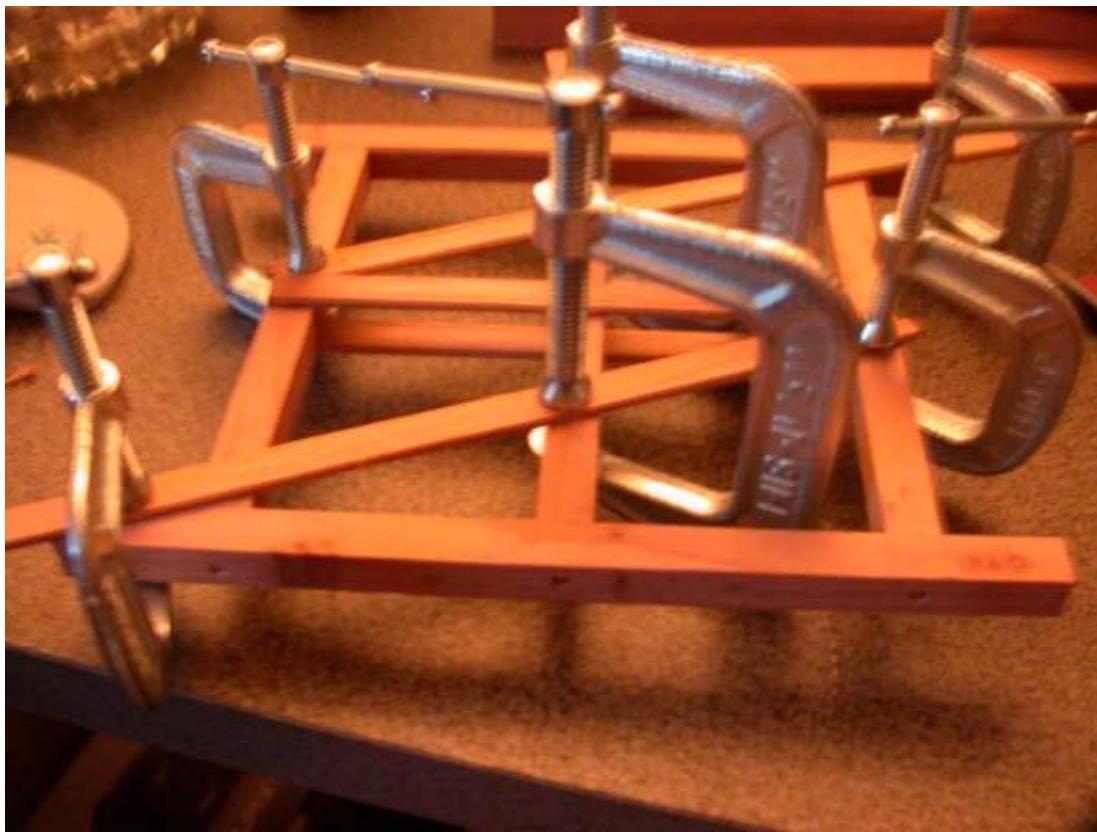
In the photo below, I've darkened it up and enhanced the contrast quite a bit so the scribed line at the end shows up pretty well. Make the score fairly deep, and it will serve as a guide for your razor saw blade. Cut the diagonal keeping your saw blade as vertical as you can.



After cutting the main angle, hold the brace in place and scribe or lightly draw lines for your glue guides. Apply glue as before and glue the brace in place.

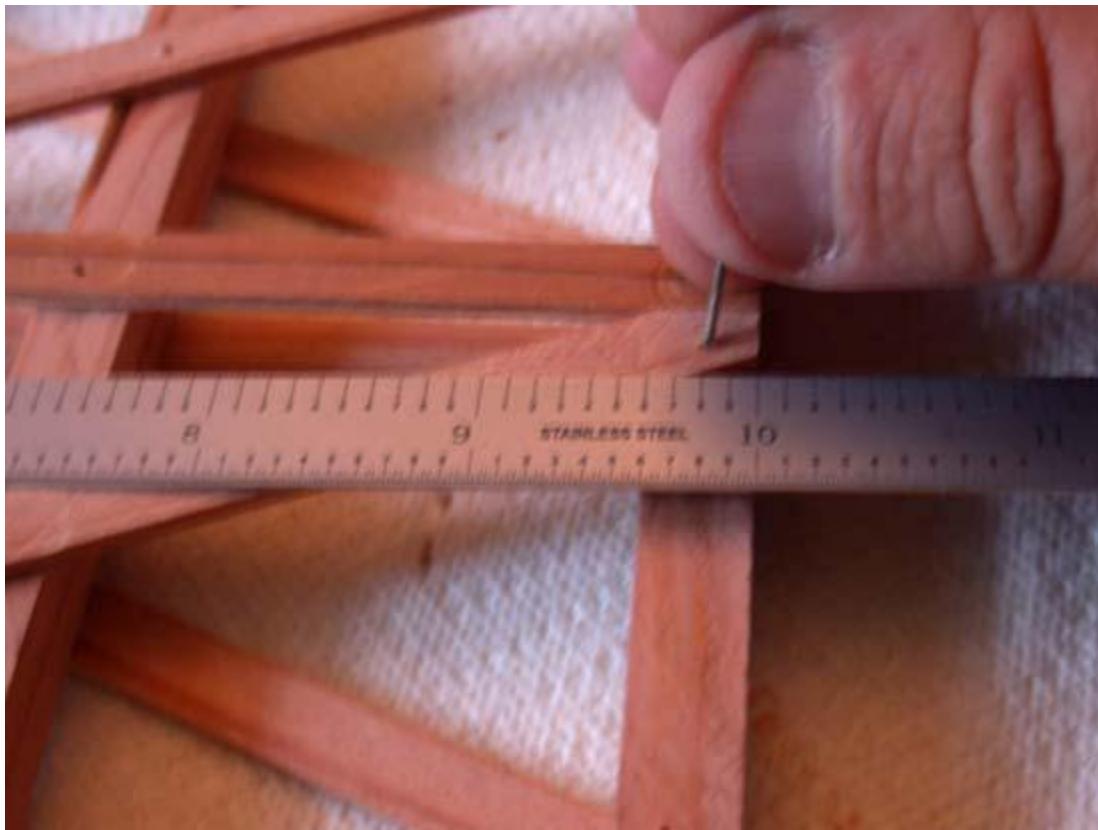


Repeat the process for the top diagonal brace and glue it in place.

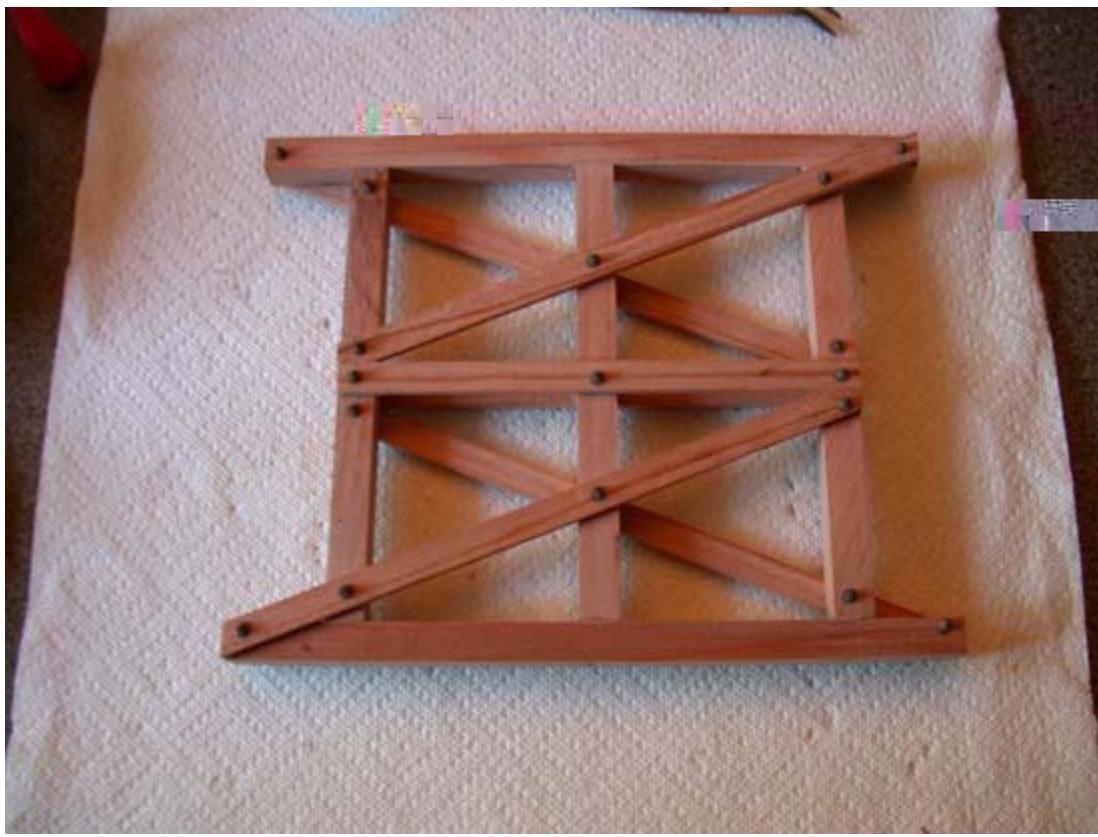


Repeat the above to make and install the diagonal braces on the back side of the bent. Do this for the remaining three bents.

Now we need to drill the bents for the NBW castings. The NBW's should be centered in each joint, except where the diagonal sway brace meets the bent leg and horizontal brace. I offset these down slightly. Using a scale laid across the joint as a guide, punch a hole at each NBW location with a pin. Using your #53 drill bit, drill all the holes. Check both sides of each bent to make sure you got them all - a hole or two is easy to miss, and it's a lot easier to drill them before the NBW's are installed.



With all four bents drilled, glue the blackened NBW castings in place. Your bents are now complete. By the way, the three NBW's on the center leg should be left off of one side of two bents to make room for the frost box. I didn't do this, and had to remove them when I got around to building the frost box. It's no big deal, but there's no sense in wasting castings (when removed, the pins break off half the time - super glue is good stuff).



Building the Basic Framework

Look over your bents for appearance and decide which will go where (obviously you'll want your best one facing forward). Keep in mind the marks you made on the bottom beams determining top/bottom and left/right in [Making the Bents - Page Two](#). Also keep in mind that the rear two bents are missing the NBW castings to allow for the frost box. If you change your mind now based upon appearance, and want to substitute bents, add the NBW's and pull the others out now. The top/bottom and left/right, however, are already written in concrete unless your bents are absolutely symmetrical!

Mounting the Bents

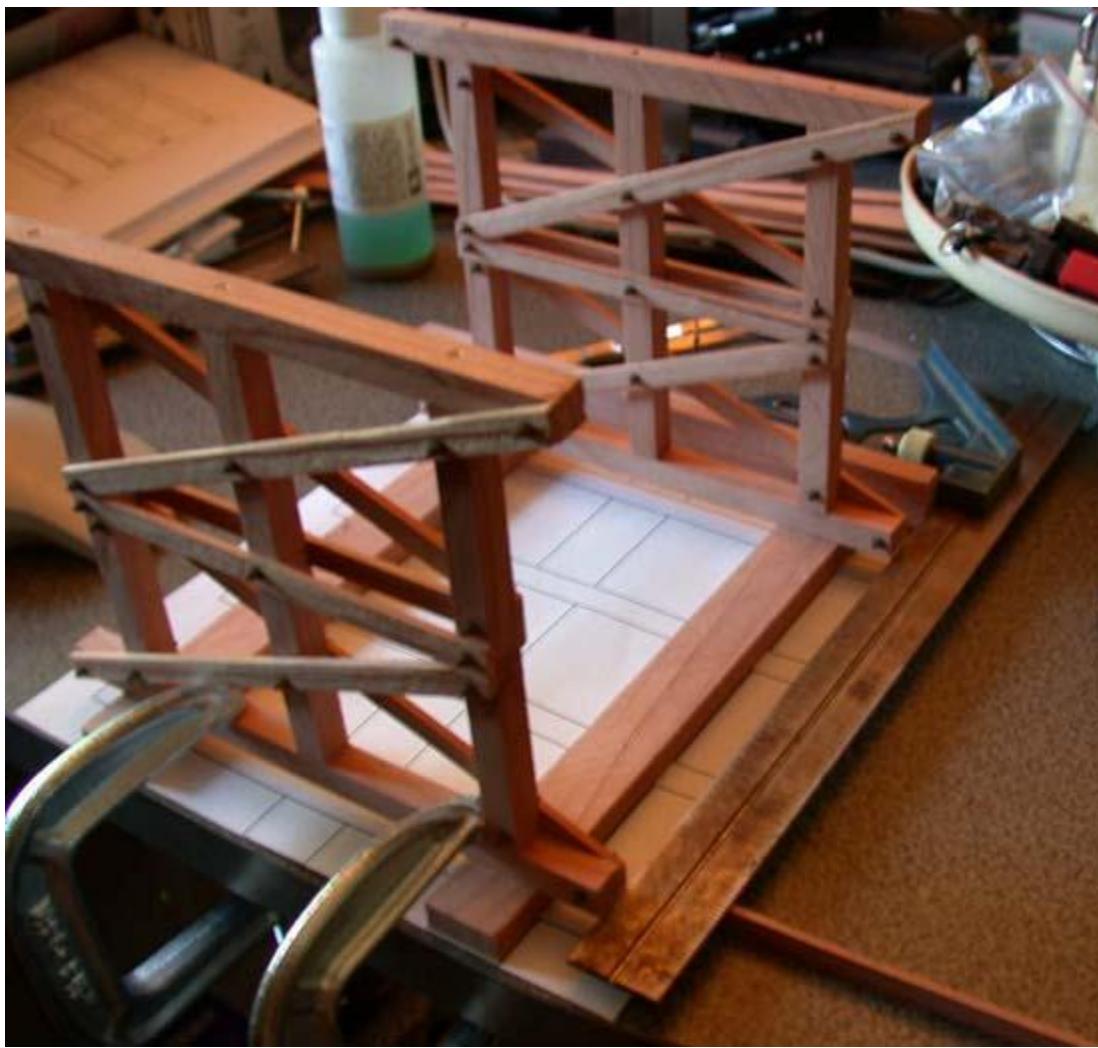
Cut some lumber that's 8 x 18 (0.40 x 0.90). From this, cut three Foundation Beams 8.30" (13.83 scale feet) long. Take two of your Foundation Beams and, measuring from one end, place a small mark at 0.70" and 2.80". Measure from the other end and place marks at the same distances along the same edge. These marks represent the front edges of the two foremost bents, and the rear edges of the two rearmost bents.

Take a copy of [Drawing Ten - Supporting Trestle Work Bottom View](#) and lay it on a flat surface that you'll be able to clamp to. Lay two of your Foundation Beams in place in the outer two positions, with the marks facing out. Don't put in the center one at this point - we'll need to glue the frost box in place first, and that doesn't come until later. Use a square to make sure the front edges are aligned properly. Position your front bent temporarily and make a mark on the bottom of the bent at each edge of each Foundation Beam to serve as glue guides. Make sure not to disturb the position of the Foundation Beams while doing this. If by chance you do, realign them and start over. Once the first bent is in place, it will hold the Foundation Beams properly aligned. Glue the front bent in place, clamp it, and allow to dry.

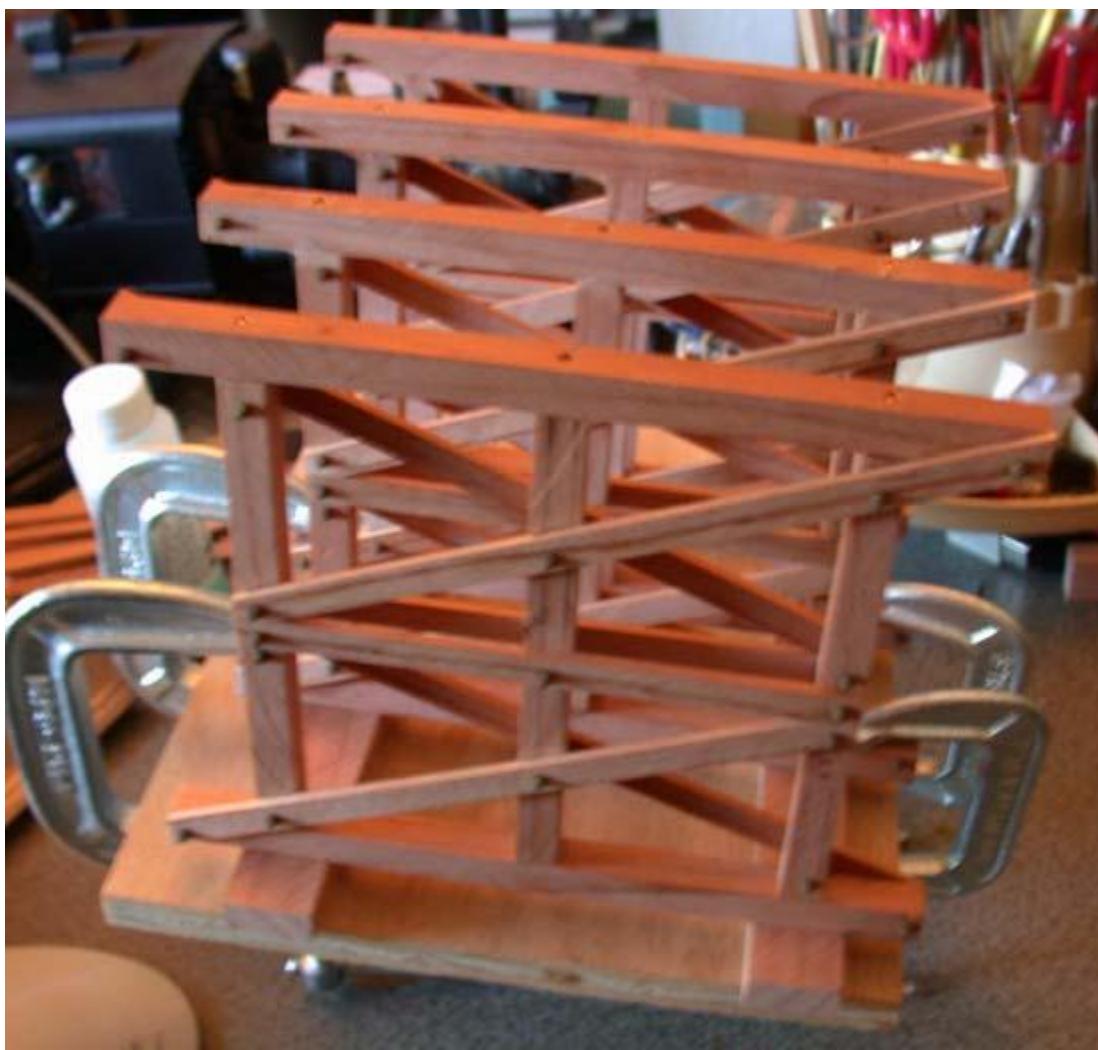


Glue the rear bent into place. While the front bent, previously glued into position, should hold everything properly aligned, confirm that this is so *before* gluing the rear bent into place. By the way, the photos show my rear bents with NBW's in the center - it was later that I realized I'd need to remove them. Take note of the point that **NOTHING** in scratchbuilding is written in concrete!! I simply pulled them out. If such proves impossible, the worst that can happen is that one needs to construct two new bents. For this reason, keep your jigs until a project is completed beyond the point where these jigs could possibly be needed again.

Also note the square against the front of one of the Foundation Beams, and aligned with an edge of the front bent. This is used to align the edge of the rear bent, ensuring that it's the same as the front bent..

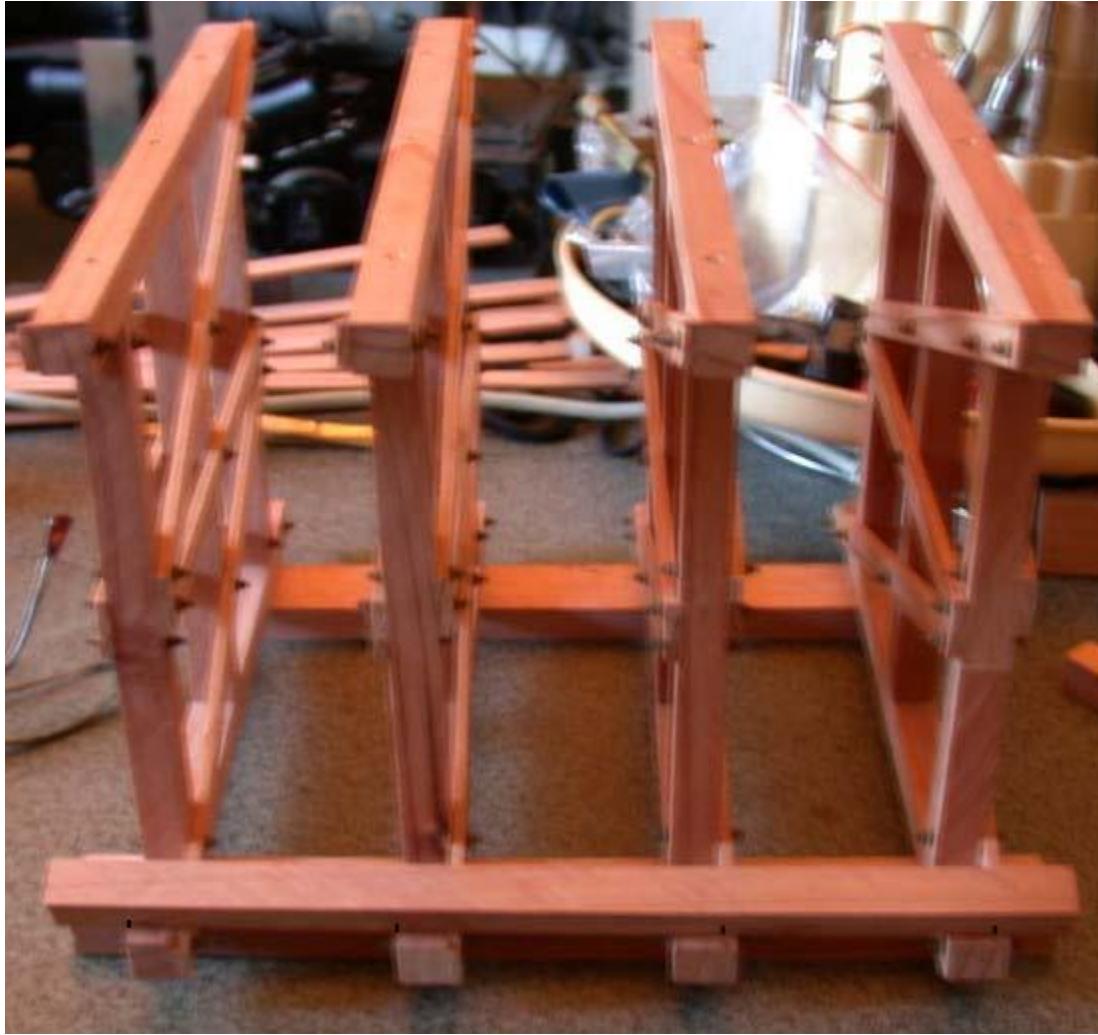


Glue the remaining bents to the Foundation Beams at the 2.80" positions previously marked. Use a square along one edge to make sure that they all line up, keeping in mind that they may not necessarily be symmetrical, and using the marks previously made to distinguish right-from-left and top-from-bottom.



The Inner and Outer Tank Support Beams

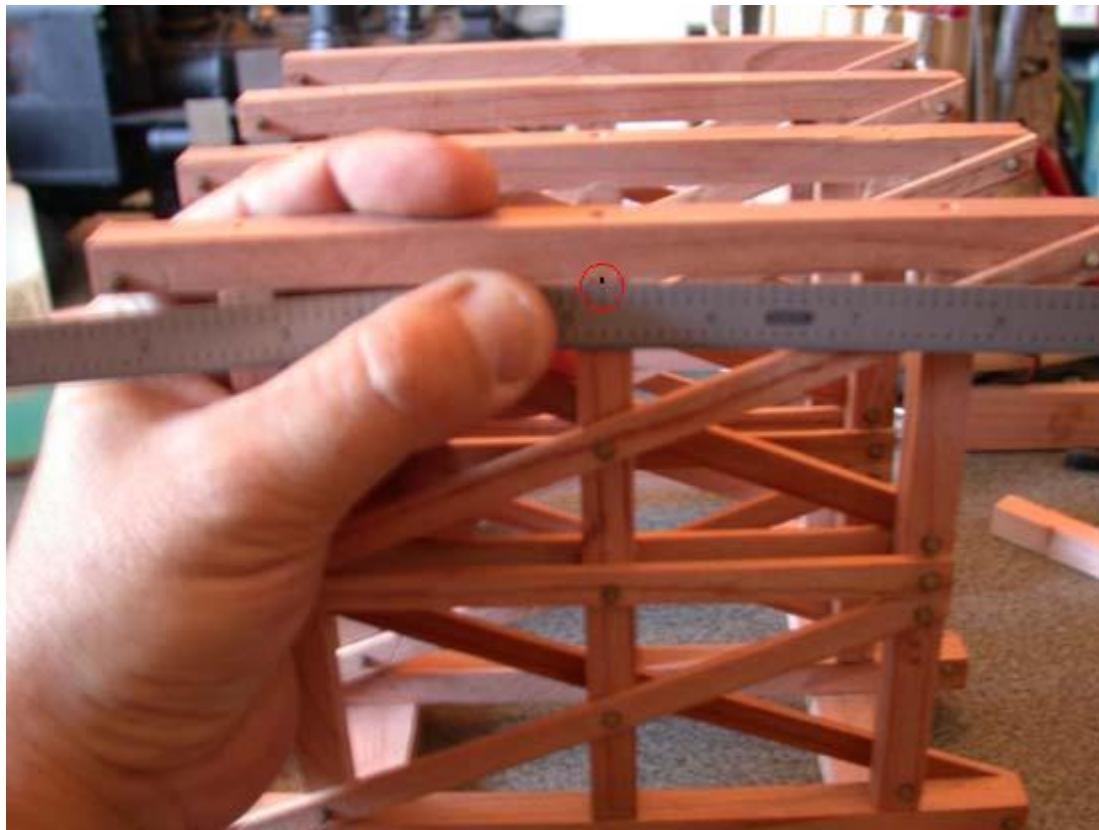
From 8 x 8 stock previously cut (0.40 x 0.40), cut two Outer Tank Support Beams beams 13'-8" (8.20) and two Inner Tank Support Beams 14'-8" (8.8) long. Make a mark on each 12" (0.60) from one end. Lay the longer two Inner Beams aside for the moment. Lay a short Outer Beam along the bottom of the bents with the 12" mark aligned with the outside edge of the rear bent's lower horizontal beam (*not* the sway brace). Make marks at the edges of the remaining bents (I made them at the back edges of the two rear bents, and the front edges of the two forward bents, but it doesn't really matter). Make sure you mark the edges of the beams or legs, and not the edges of the sway braces. Repeat with the other short Outer Beam on the opposite side.



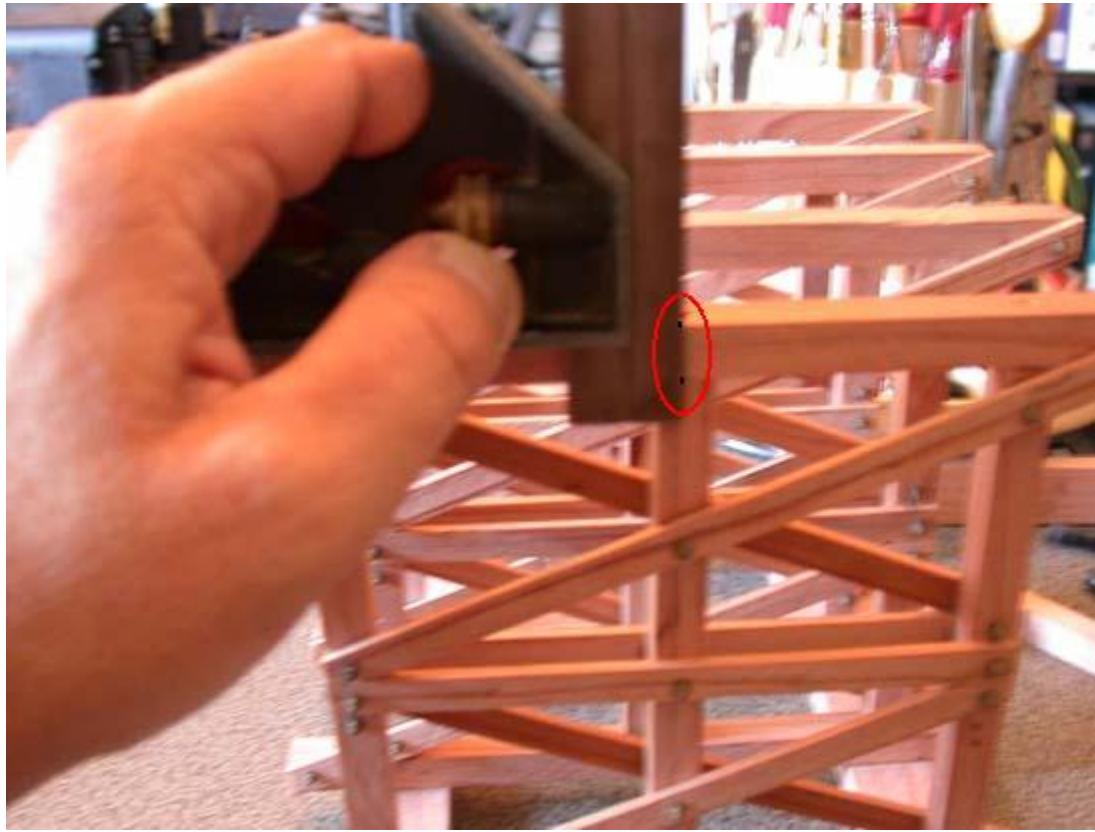
A close-up of the marks. These will be used to align the bent tops.



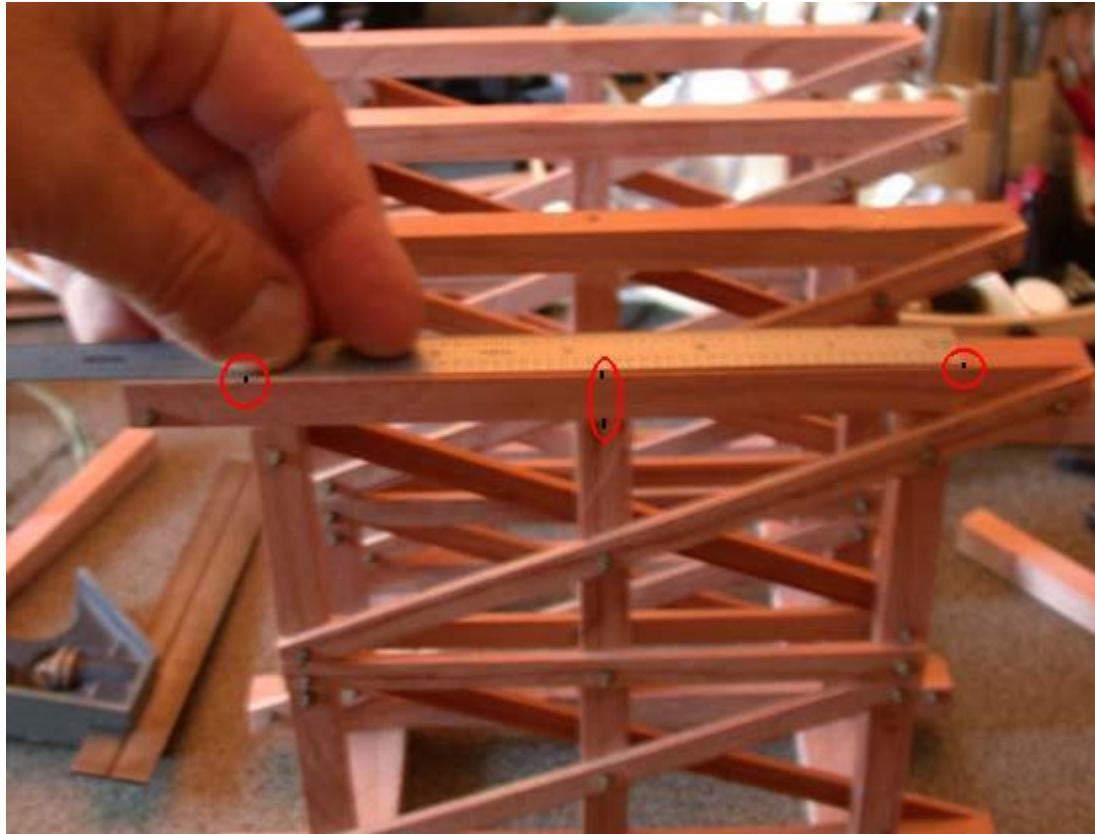
Mark the center of the center-most leg of the front and rear bents. I've enhanced the mark in the photo, but make a light mark, or better yet, scribe a line, because these will be visible later. You need to be able to see them, but you don't want them to stand out on the completed model.



Use a square and transfer the marks to the top of the front and rear top horizontal beams.



Make another mark 4'-6" (4.50) left and right of the center mark, front and rear bents.



Lay a short Outer Beam across the top bents (on the side used to mark it), with its outer edge at the locations

marked on the bent's top beams. Scribe a line on the bent's top beams at the inner and outer edges of the Outer Beam to serve as glue guides. Repeat on the other side with the other Outer Beam.



Using the glue guide lines, place glue on the four bent top beams. Lay the Outer Beams in place, aligning the rear mark with the rear bent. I needed to place a piece of scrap across the top of the Outer Beams in order to clamp them because the bent legs are directly under the glue joint.

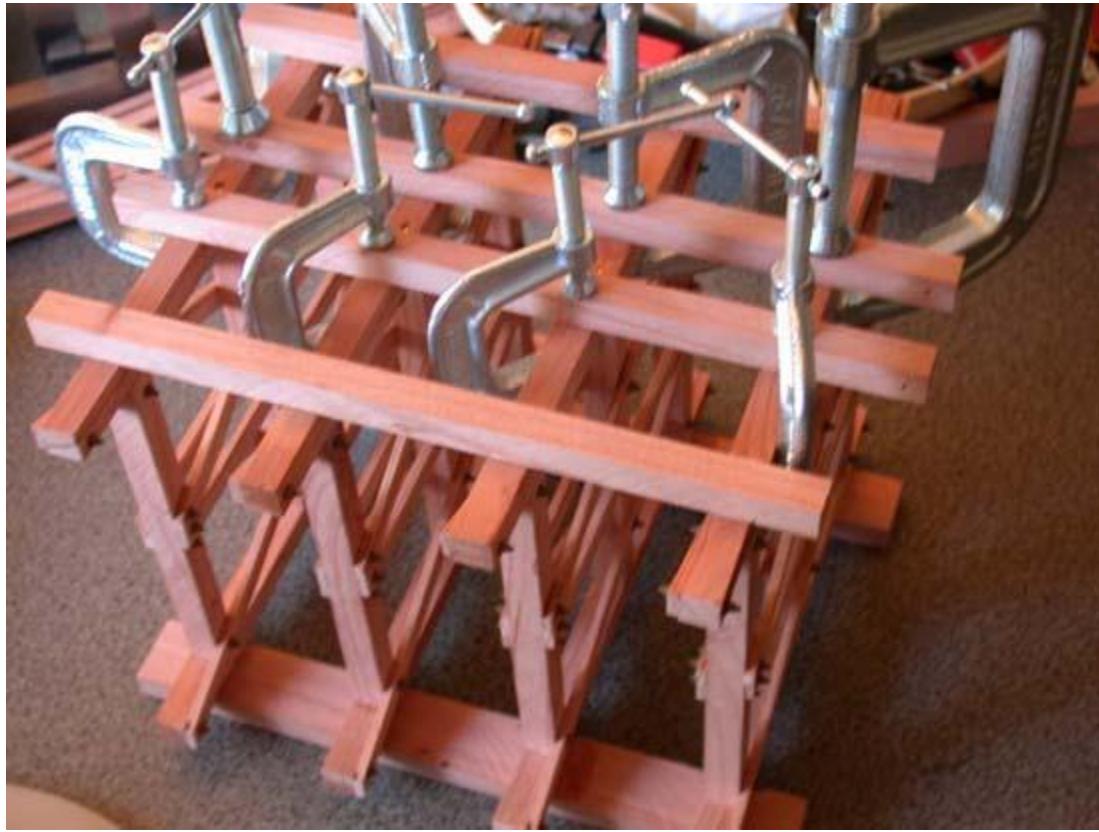


Turn the assembly on its side, and align the two central bents, then clamp top to bottom as shown in the photo. Repeat on the other side. Allow this to *thoroughly* dry.



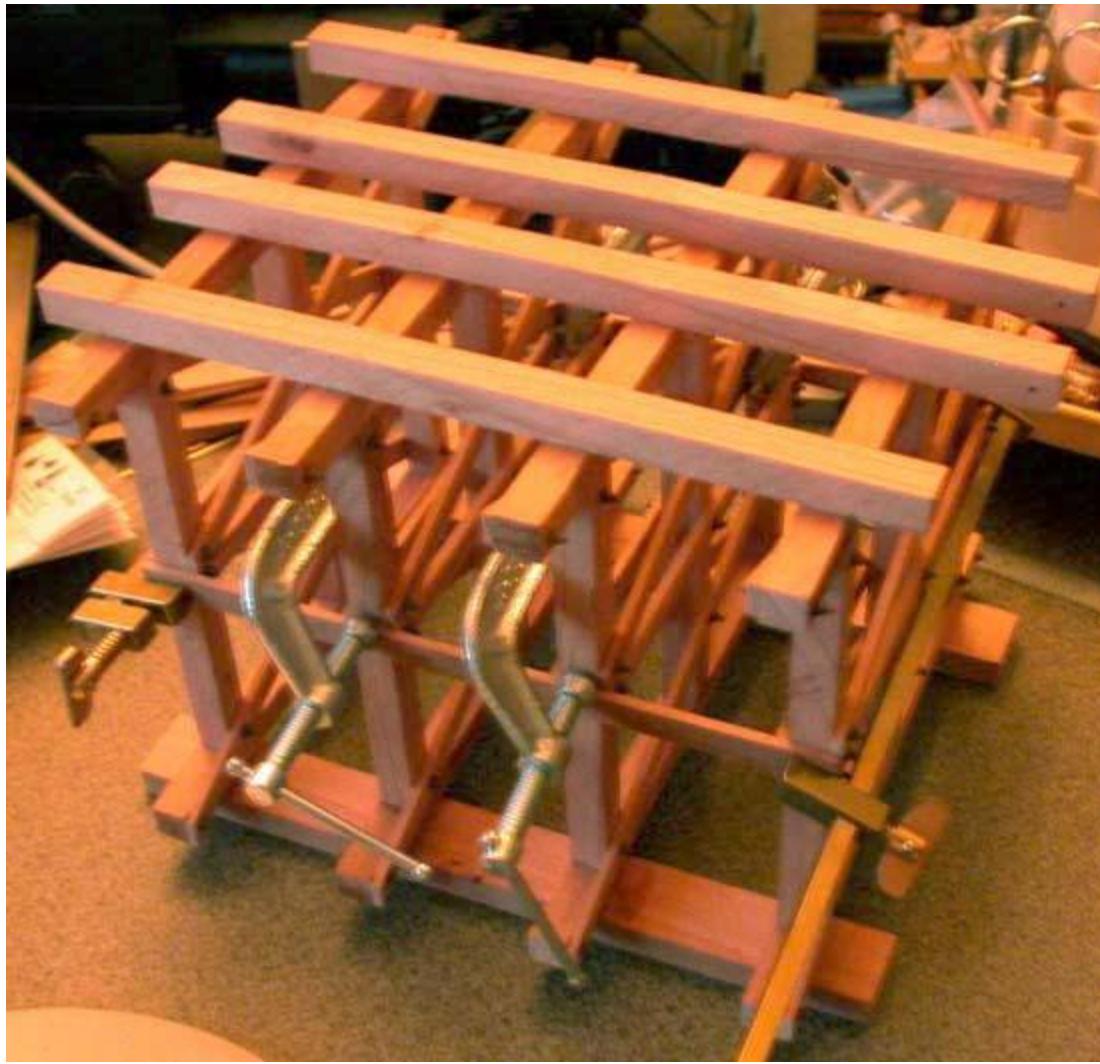
Take the two Inner Tank Support Beams (8.8), previously cut. Lay out a hole that's 4" (0.20) in from the front end (remember the rear end was marked at 12"), and 4" (0.20) from the edge. Drill a hole through each beam using a #53 (0.0595) drill bit.

From the center mark on the top beam of the front and rear bents, measure over 1'-10" (0.85). This marks the outer edges of the two Inner Beams. As before, lay the beams in place, scribe the bents, and glue the beams into position and clamp. Make sure the 12" mark is aligned with the rear bent and that the holes in the forward ends are horizontal.



Making the Sway Braces

All Sway Braces are made from 2 x 6's (0.10 x 0.30), so cut up some stock to that size. Cut two pieces that will span all four bents from the outer edges of the center sway braces of the front and rear bents (mine were exactly 7.20" long). Glue these in place aligned with the center sway braces of the bents. From this point on, I'm going to assume that you now already know to place things, scribe glue guide lines, glue and clamp, etc. so I'm not going to make a point of describing that in detail anymore unless I consider it particularly important. Just remember to perform these steps to ensure you only get glue where you want it.



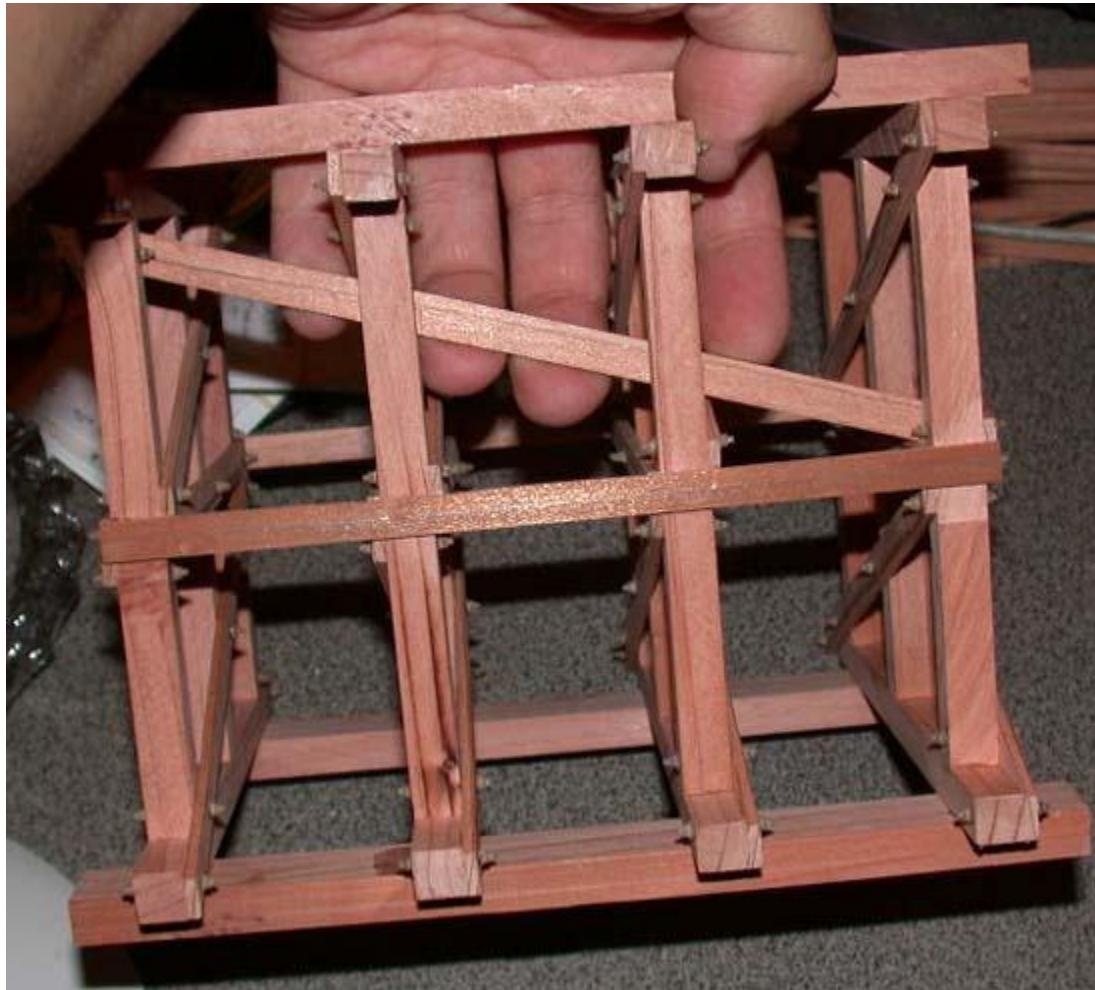
We need to make the angle cuts for the diagonal braces now. We'll begin on the **right side** of the supporting trestle work (looking from the front). Start by laying a piece in place and scribing a line parallel with the bent leg in the upper-left corner. Make the cut and test-fit the piece. If it isn't just right, sand it until it is, or make another cut. This may seem tedious, but it makes all the difference in the finished model. Don't get impatient. Rather, make it correctly, no matter how many tries it takes.

By the way, I use a razor saw here rather than a power tool. I think it gives me better control. Use whatever method works for you.

With one end cut, lay the diagonal in place and mark and cut the other end.



The diagonal brace we just made is actually for the inside, even though we used the outside to fit it. Slip it inside and test the fit now. While you have it in place, scribe the inner and outer edges of each bent leg (I know, I just said I wasn't going to mention that again, but I have my reasons). Once you've made the upper diagonal brace, repeat the process and make the lower one.



Because these diagonal braces fit on the inside, we need to drill them before installing them. Mark the center of the joints with the bent legs (the scribed lines - see my reason now?), and drill a hole with your #53 (0.0595) drill bit.



Glue these inner braces in place.



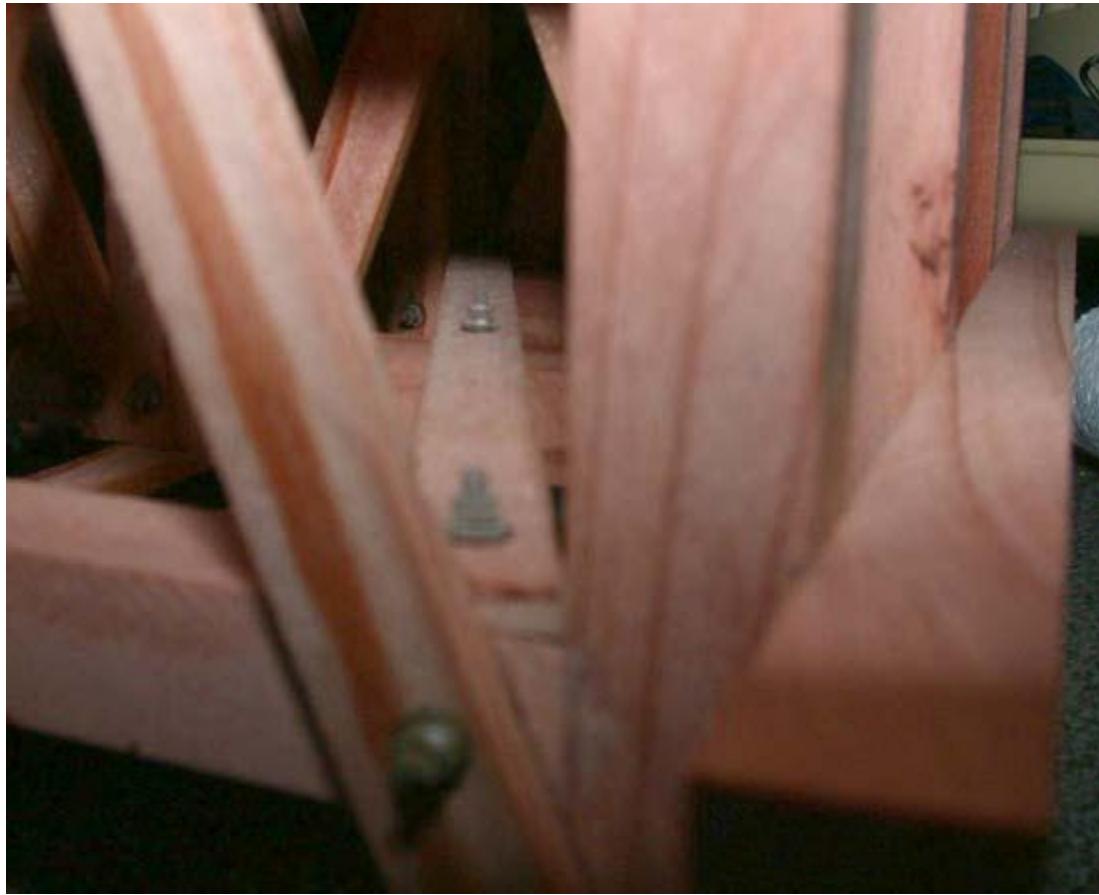
Make the outer diagonal braces now, and glue them in place. Note that they won't go all the way to the top-right corner because they hit the bent's sway braces. Here's a photo of the completed **right** side...



And here's a photo of the completed *left* side. Notice that the bottom sway braces only go to the *third* bent, with the space between the third and rear-most bent left open for frost box access.



It's time to glue the NBW castings into the hole previously drilled in the inner diagonal braces. Since the holes are in only the braces themselves, it will be necessary to cut the pins down to 0.10" or less (not too much less), in length. You might be tempted to skip this step, and I'll grant you that it sometimes isn't the easiest thing to do. However, with a good pair of curved tweezers, it's certainly doable, and I would again point out that it's this kind of detail that sets one model apart from another. So be patient and give it a go. Ultimately, you'll be glad you took the time. Even if no one ever sees them, *you'll* know they are there!

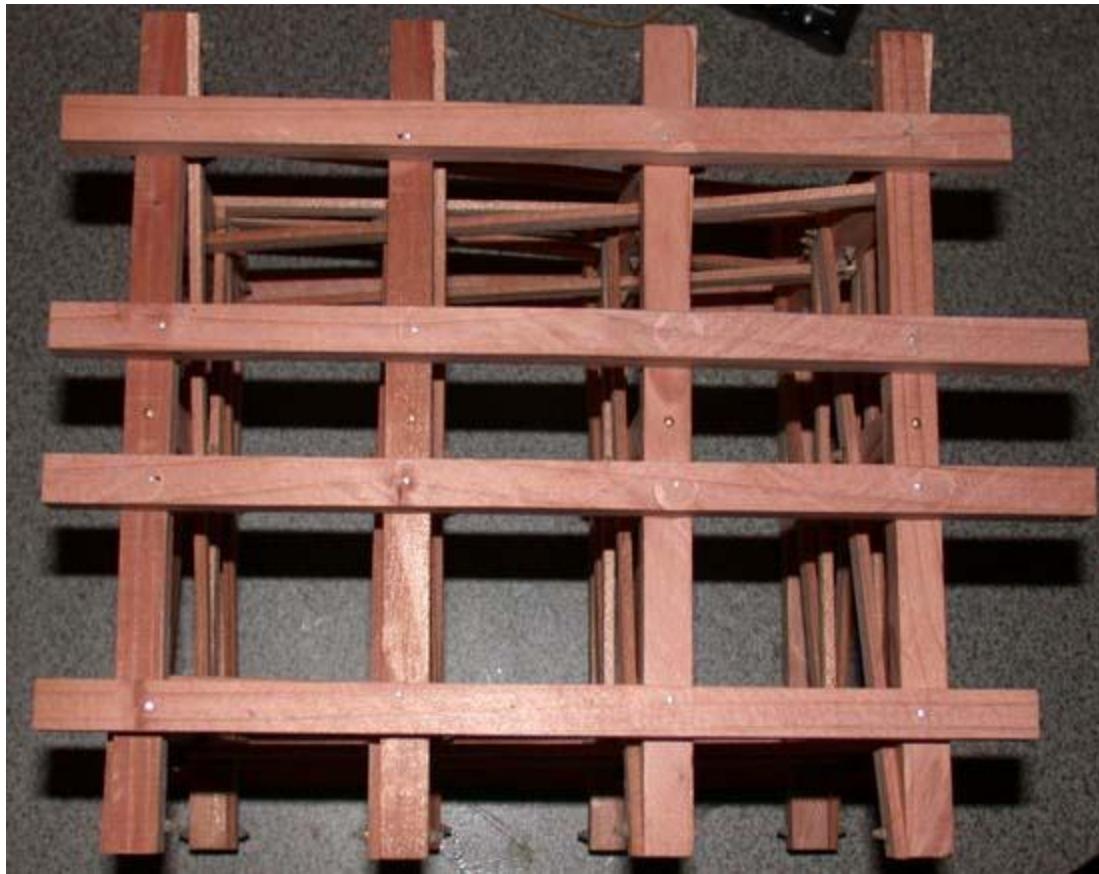


You now need to drill holes for all the other outer brace joints, and install all the NBW's. Make sure to drill all the way through the bent legs and install NBW's both outside ***and inside!*** Also drill holes to install the NBW's where the inner sway braces meet the bent legs. Don't go all the way through on these however - just drill deep enough to accept the pins on the NBW's.



Finishing Up

Nail the completed assembly together using #20 x 3/4" steel brads. Place a brad at each joint of the Water tank Support Beams and the bents. Offset the brads at the front and rear bents towards the inner edge so the tank, once mounted, will hide them. I found it unnecessary to predrill holes for the #20 brads, but use care, and if you see the wood beginning to split, stop remove the brad and predrill a hole.



Nail the Foundation Beams to the bents also.



This completes the Supporting Trestle Work.

Making the Water Pipe

Make the Water Pipe from 5/16" diameter styrene tube (Evergreen Item No. 230). You'll need to cut three pieces...

- One Piece about 1.00" long
- One Piece about 1/4" long on the short side
- One piece about 6.00" long

The cuts need to be made at a 22-1/2 degree angle. I did this on the MicroLux Table Saw, but it can also be done with a razor saw and miter box.



Glue the pieces together using either Super Glue or styrene glue - whichever you prefer.

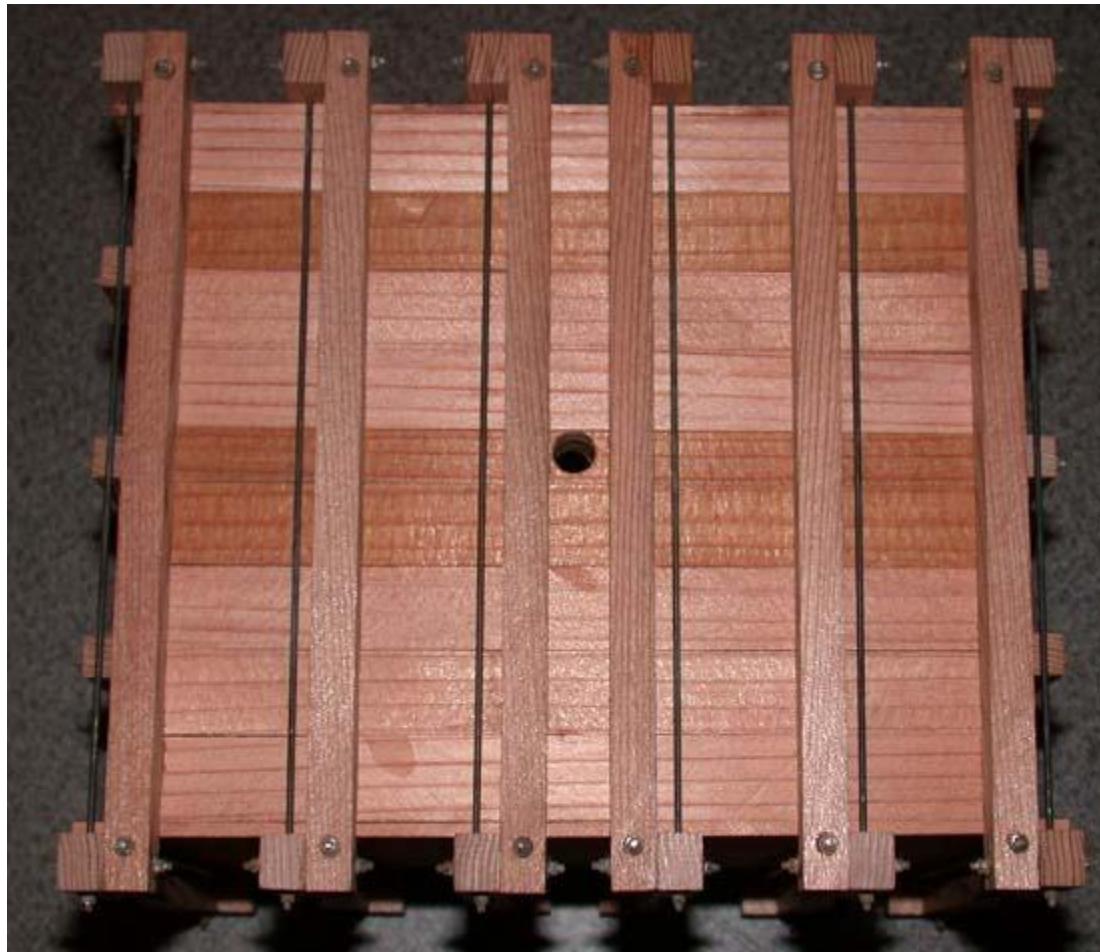


Once the pieces are dry, paint with Floquil Grimy Black and lightly overspray with Rust.

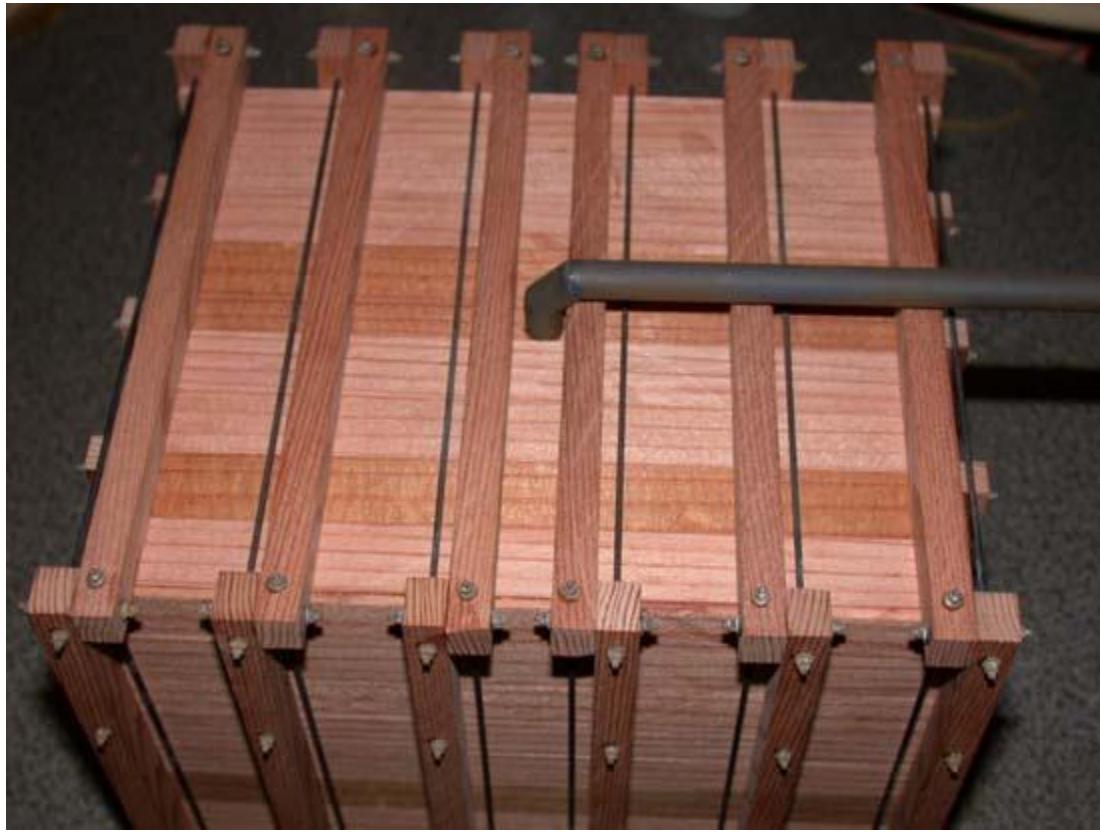


Mounting the Water Tank

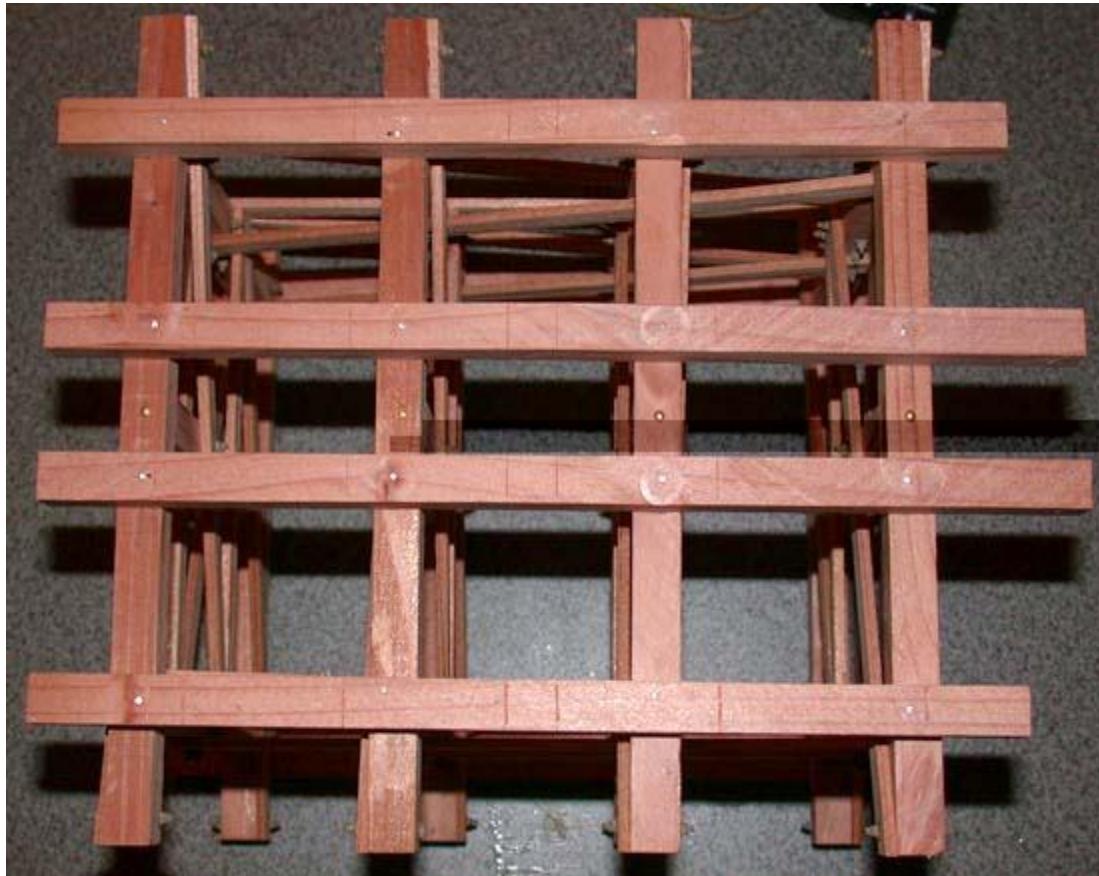
Drill a 5/16" hole centered on the bottom of the water tank.



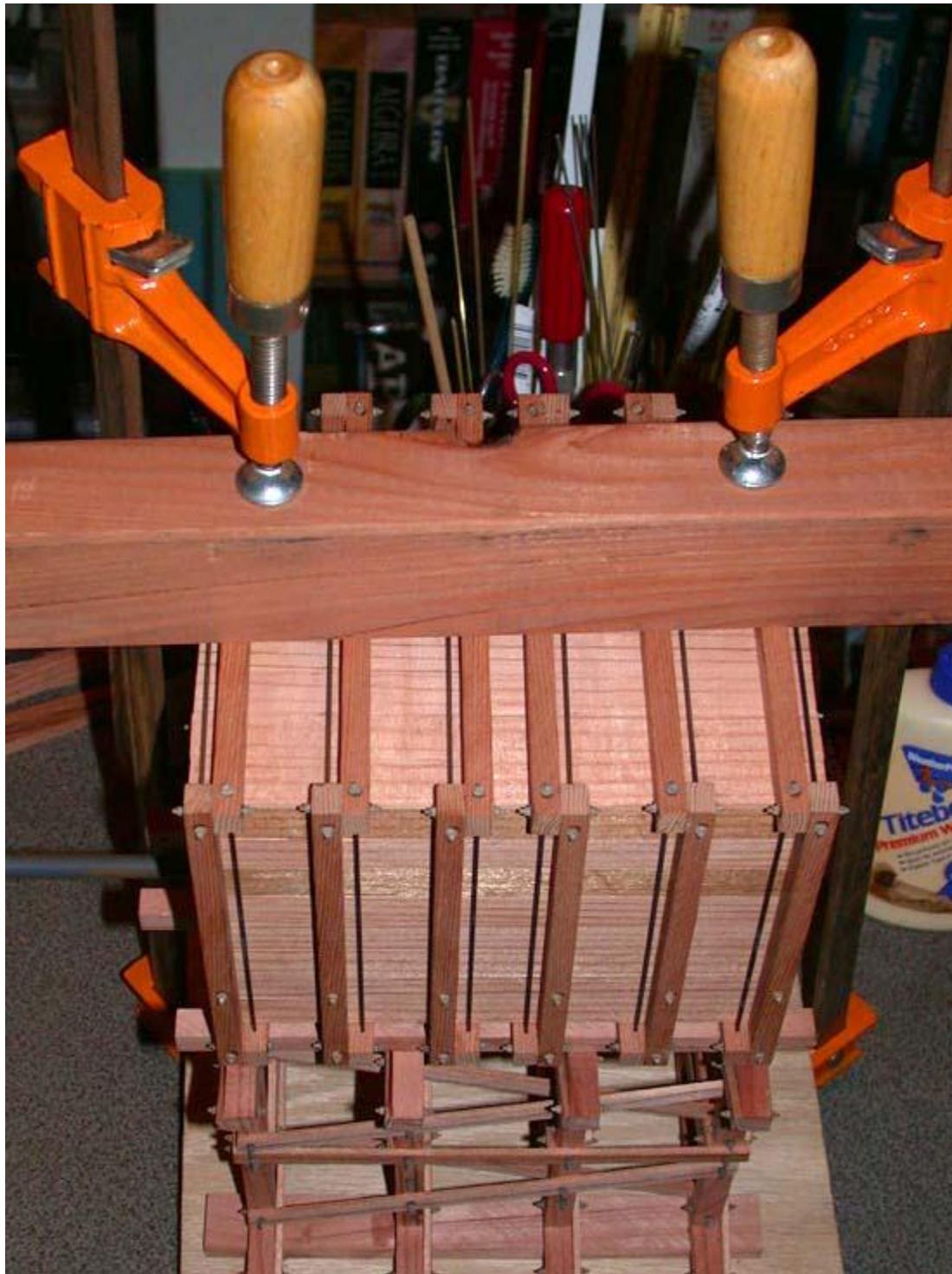
Glue the water pipe into the hole, extending towards whichever side of the water tank you've selected to be the front side (the best side appearance-wise). You may need to notch the support beam just ahead of the hole for the angled piece. The water pipe shouldn't be flush with the support beam, but rather about 1/64 to 1/32 above them.



Lay the tank in position and adjust it so that it's centered side to side and front to rear. Scribe glue lines on the tank support beams.



Carefully apply glue and set the tank into place on the supporting trestle work. I needed to use a couple of full-sized bar clamps here to hold the tank while the glue dried. I also used a block atop the tank as a base for the clamps.



Once the glue dries, and the clamps are removed, you should have something that looks like this.



It's starting to look like a water tank!! **Now** we're cooking with gas!!!

In **Part V**, we'll make the **Frost Box** and **Spout Hanger Assembly**, and we'll hang the water spout.