

# Build a Versatile Engine Carrier

This article describes the construction of a rather unique engine carrier that allows your locomotive to run out and back in using track power or battery power. Few carrier designs in the past have permitted the use of track power. The key to this feature is the use of aluminum angle as the base for the carrier. An additional benefit to any carrier is that, for steam locomotives, you don't have to disconnect or reconnect the cabling each time you want to run it.

The building of one of these carriers requires only basic carpentry skills and few tools such as saw (preferably table saw), drill, and screwdriver. The estimated cost (based on Lowes or Home Depot prices) is about \$70. Of course, the cost per carrier is actually lower since some of the remaining materials and hardware can be used on other carriers.

Critical to the construction of this carrier is the initial measurements (lengths) of the carrier side boards and the inside width of the opening for the carrier front end piece. Once these two dimensions are determined, the construction is rather straight forward.

The carrier design information described in this article will handle all 1:32, 1:29, 1:24, 1:22.5 locomotives, diesel or steam. It will also handle most 1:20.3 locomotives. Such 1:20.3 engines as found in the "K" series will require a wider carrier and 3"x3" aluminum angle pieces.

## List of Parts:

The list of parts given below are the ones I used in the construction of my carriers. You can use any equivalent parts and still achieve the same results.

### Wood:

4 – 1"x3" poplar (You can also use pine, maple or oak although some of these woods can add additional weight.)

1 – 1"x2' poplar

1"x8" poplar (Buy as little as you can find but enough to make the two end pieces. I found 1"x8"x24" poplar at Lowes which was just enough for the 2 end pieces. You may also use a good quality  $\frac{3}{4}$ " plywood.)

$\frac{1}{4}$ " plywood (This is used for the slide-in piece that holds the engine in place and the little pieces that are used to align the carrier with your track.)

1/8" plywood (Used to make carrier guides.)

### Aluminum:

2"x2" x 1/16" aluminum angle (using thicker aluminum is unnecessary and adds weight)

### Miscellaneous Parts:

4 – 2"x1 3/8" brass hinges

4 –  $\frac{1}{4}$ " x 2" steel clevis pins

Wood or deck screws (Recommend 1 5/8" x #7)

Stainless steel sheet metal screws

### Glue:

I used Titebond III in the building of my carriers and highly recommend it. You may also use 5 Minute Epoxy.

## Begin Construction:

Figure 1 below shows all of the major parts you will need to build your carrier. The parts are labeled to match the following text. The lengths of the side boards and aluminum are not shown because they are determined by your particular application. The only parts not shown are the 2 small plywood brackets (carrier guides) that go under the carrier to center it on the track. This will be explained later.

FIGURE 1

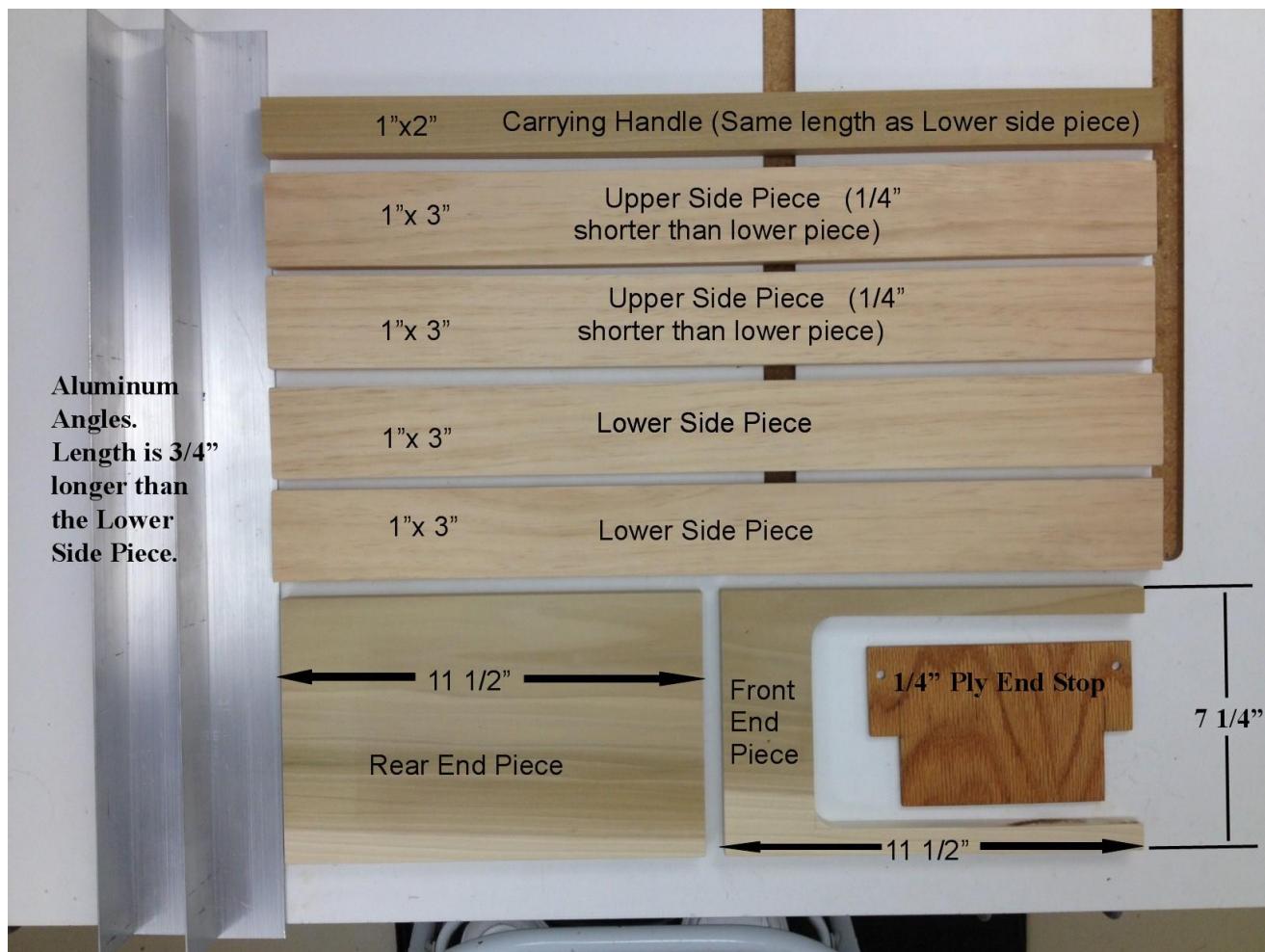
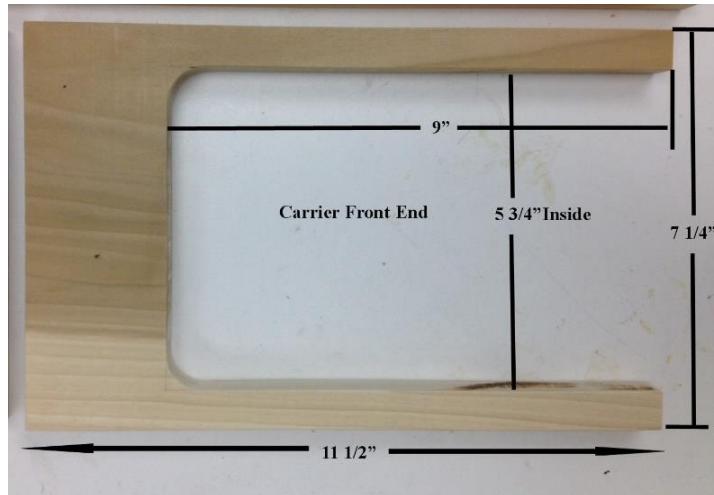


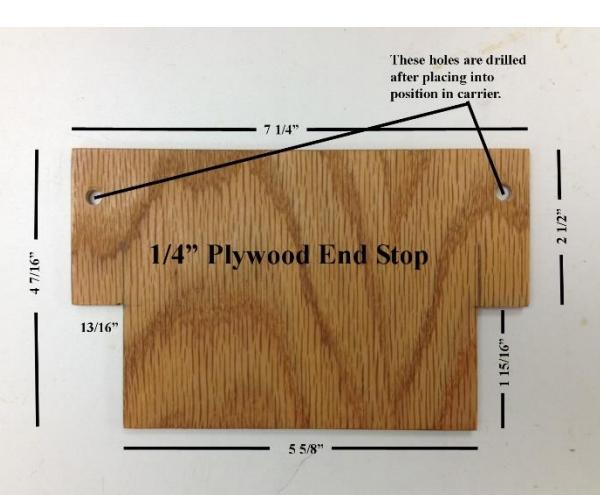
Figure 2 is a detailed photo of the Front End Piece showing the correct dimensions. The inside height of 9" is sufficient to allow for some of the largest 1:20.3 engine stacks and cabs to clear. As will be defined later, the overall width of 7 1/4" and the inside width of 5 3/4" are critical to the design. These dimensions allow the carrier to exactly fit over G gauge track.

Figure 3 shows the dimensions for the End Stop.

**FIGURE 2**



**FIGURE 3**



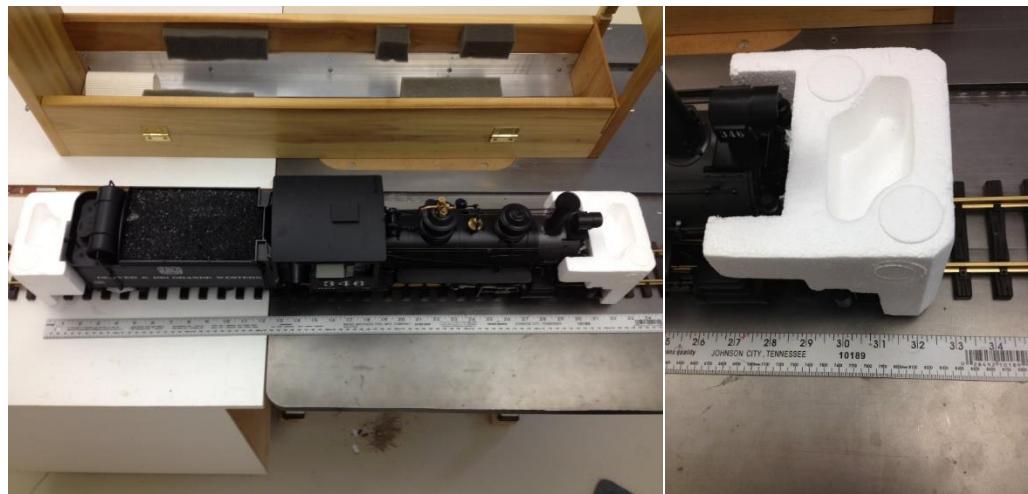
We'll start the construction with the most important measurement – the length of the lower side boards. To begin, measure the entire length of your engine (end of coupler to end of coupler). If it is steam, connect the loco and tender with the closest coupling you intend to run with.

Next, determine how much and what kind of protection (packing) you want to have at the back and in front of the engine to keep it locked in tight.

In the picture shown below on the left, I used the foam packing material that came from the original box that my Bachmann C-19 came in. This kind of stuff works really great and saves a lot of work that you would need to do to fabricate your own protective end pieces. Otherwise, you could use any type of soft foam. The photo on the right is a close-up of the front piece.

Add 1/4" to the length to accommodate the plywood Front End Stop.

**FIGURE 4**



### Cutting the Parts:

Now you have the key measurement needed to go ahead and cut the 2 Lower Side pieces and the 1"x2" handle. Subtract  $\frac{1}{4}$ " from this length and cut the 2 Upper Side pieces. Now take your End piece material and cut 2 pieces  $7\frac{1}{4}'' \times 11\frac{1}{2}''$  for the carrier ends. You can also cut the aluminum angles to the lengths based on the description in the first picture above.

For the Front End Piece, cut out the inside using the dimensions given in Figure 2. Make sure these inside cuts are accurate since the width determines how well the aluminum angles will set on the track. The height is not critical but, too high will not leave enough material to attach the handle and too low might not allow enough clearance for the locomotive stack, cab, or horns. The curves at the top inside corners are not critical either. I used a 1" diameter Forstner bit to cut mine but others have used up to 3" dia. Hole saws.

Use the dimensions shown in Figure 3 to cut the End Stop piece. These dimensions are good for all the carriers you will build no matter what the length of your carriers are. The only time you will need to adjust these dimensions is when you decide to build a carrier for a wider engine like a 1:20.3 K-27 or bigger. I have not done one of those yet but, when I do, I'll provide those numbers.

Now you have cut all the main pieces to their appropriate sizes. You might want to sand all the edges and sides of the wood pieces now and even stain them, if you wish. Later, when you glue up the pieces, the glue might seep out and that wouldn't make for a neat finish if you hold off staining until then. Of course, if you want to paint or apply a clear finish to your carrier, you could wait until it's all assembled.

### Assembling Your Carrier:

Figure 5 shows a front view of the carrier lower side pieces, the aluminum angle pieces, and the frontend piece temporarily clamped together. Notice how the aluminum angle pieces exactly align with the inside of the rails. This illustrates just how critical the inside dimension of the front cutout is.

FIGURE 5



Before we begin the assembly of the carrier, take the lower and upper side piece pairs and temporarily clamp them together for the purpose of installing the hinges. Make sure you align the back (rear) ends. Where you place the hinges is up to you and depends on the length of your carrier. Just space them equally. See Figure 6 below.

FIGURE 6

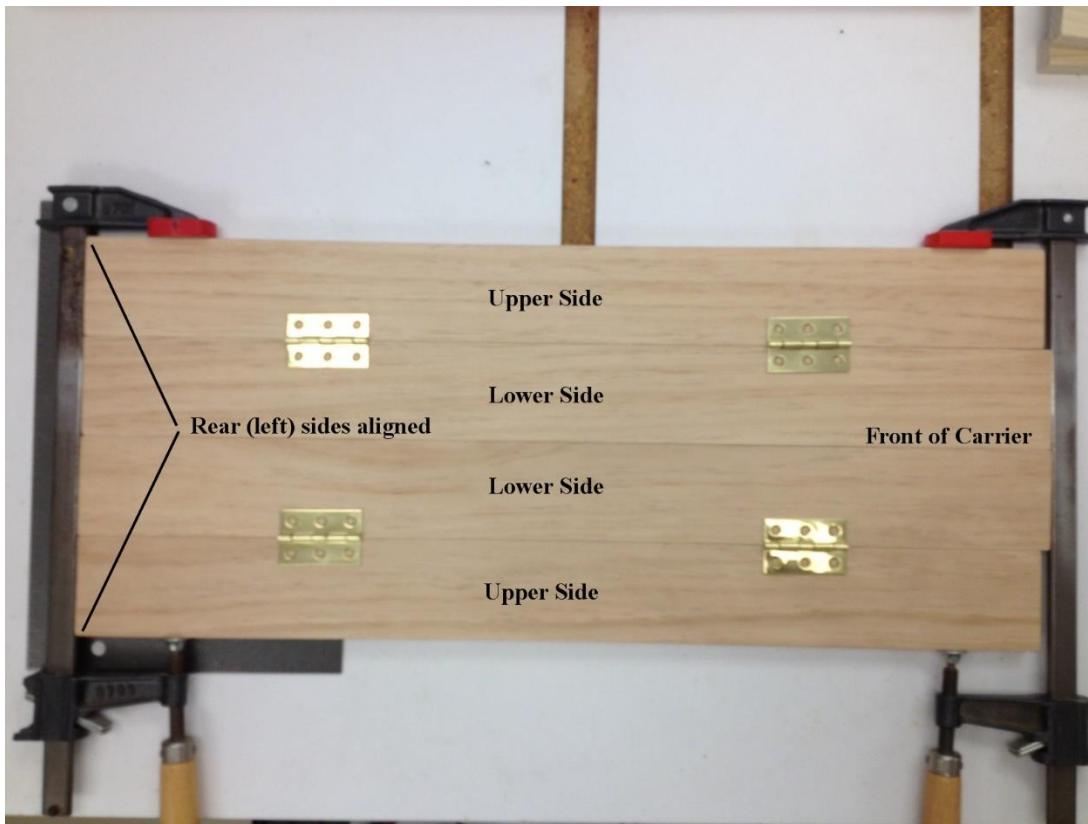


Figure 7 shows the hinges I used. They're available at Lowes and probably at Home Depot.

FIGURE 7



**(Note: One thing to remember is that you are making 2 opposite sides. Keep that thought in mind as you proceed with the assembly.)**

After installing the hinges, remove the hinge screws from the lower side pieces and leave the hinges attached to the upper side pieces. The hinges will be re-attached later.

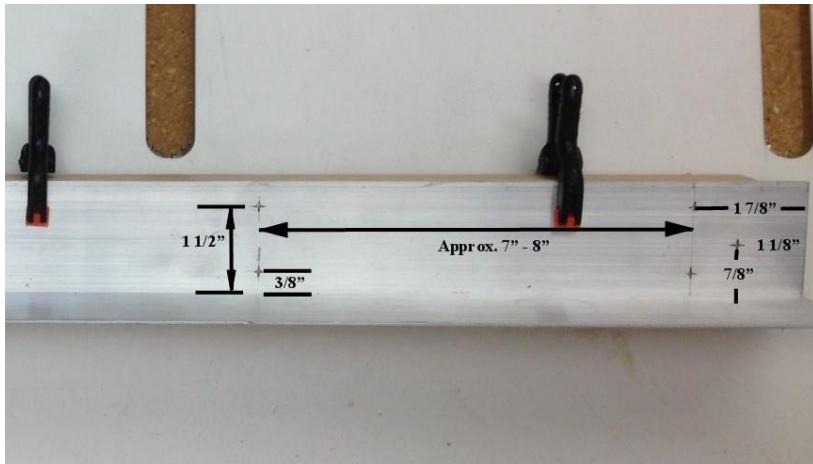
**Step 1: Attach the lower side pieces to the aluminum angles.** First you need to determine how many and what kind of screws to use. For my carriers I used what is shown in Figure 8.

FIGURE 8



Mark the places where the holes will be drilled in the aluminum angle for the screws. Figure 9 shows the front end portion of the angle where I drilled my holes. For strength, I recommend spacing your screws about every 7 - 8 inches along the length of the carrier. I used 2 rows of screws for extra strength. On the back end of the aluminum angles (not shown in this photo), I drilled the two attachment holes 3/8" in from the end

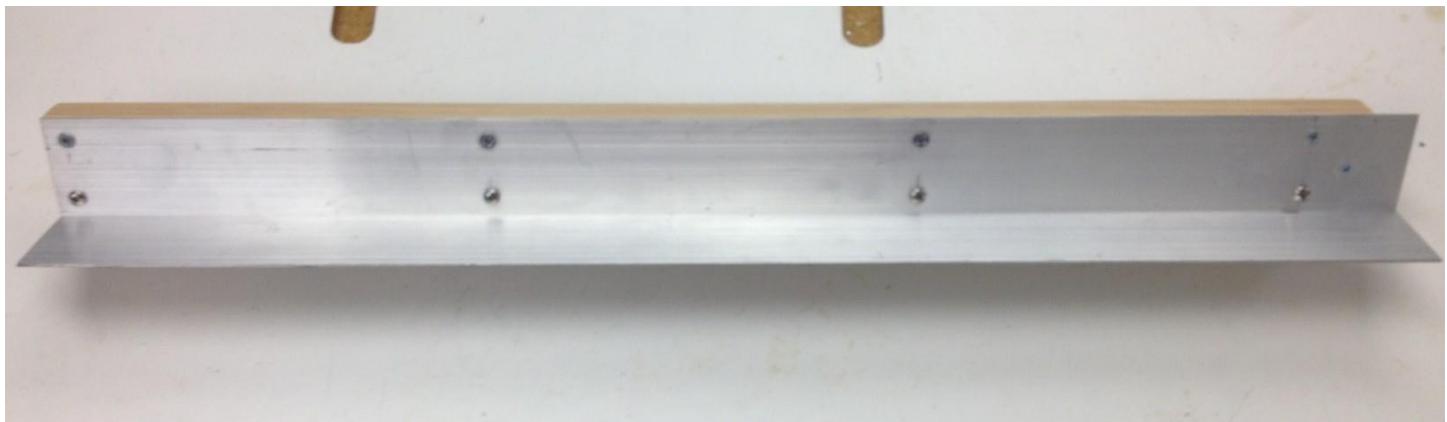
FIGURE 9



I used the pan head screws on the bottom row since they were low enough not to hit any engine parts. I would have used flat head but I couldn't countersink them because they were too close to the bottom of the angle. I used the flat head ones for the upper row and countersunk them.

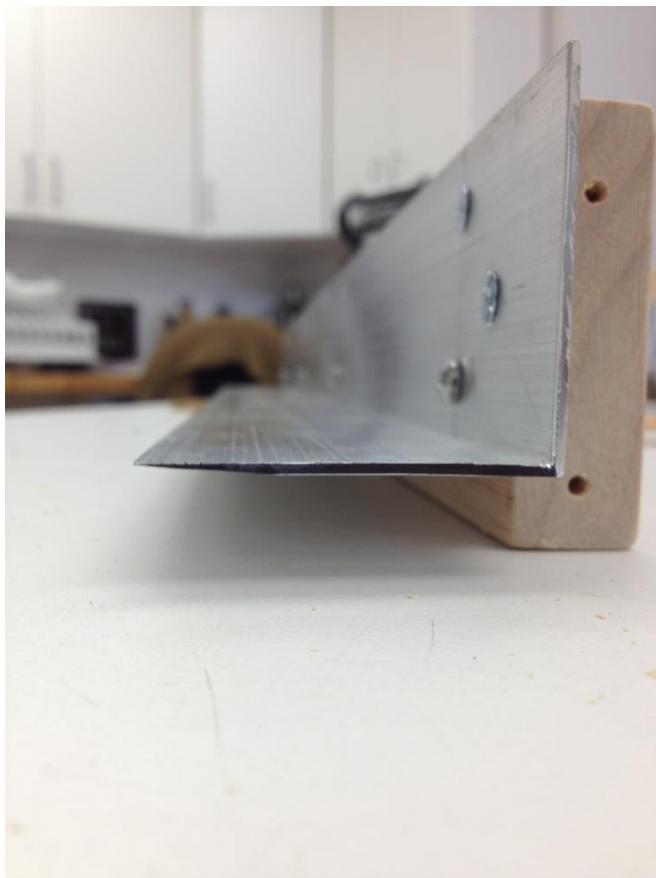
Use a small bit to drill pilot holes in the aluminum, I used a #47 drill. Then, clamp the aluminum angle to the lower side board. (**Note: The aluminum angles are attached flush with the top of the lower side pieces and are aligned with the rear or back of the sides.**) Using the pilot holes drilled in the aluminum as guides, drill into the wood side boards using the #47 drill bit being careful not to go all the way through. Repeat for the other side. (**Note: Remember these are mirrored images.**) Attach the angle pieces to the lower side boards. Figure 10 shows one of the sides with the angle mounted to the lower board.

FIGURE 10



Before moving on, now would be a good time to taper the front ends of the aluminum angles. Why do this? Well, it's to permit the engine to enter and exit the carrier easily without having to try and get over a big bump. Take a metal file or grinder and hone down the inside tips of the angle on the bottom side. I usually go back about 1" – 1 ½" for the taper. You don't have to go all the way down to a sharp point. See Figure 11 below. (**Note: Because of the design of the carrier, the back of the carrier sits on top of the rails thus giving the carrier a slight tip to the front.**)

FIGURE 11



**Step 2: Attach the lower sides to the rear end piece.** To do this, I clamped both sides of the carrier to the front end piece to help with the alignment and to keep the sides vertical they tend to tip over otherwise. Then I clamped a board behind the front board to keep things from moving. Figure 12 shows the setup for aligning the parts before drilling the holes for the deck screws.

FIGURE 12



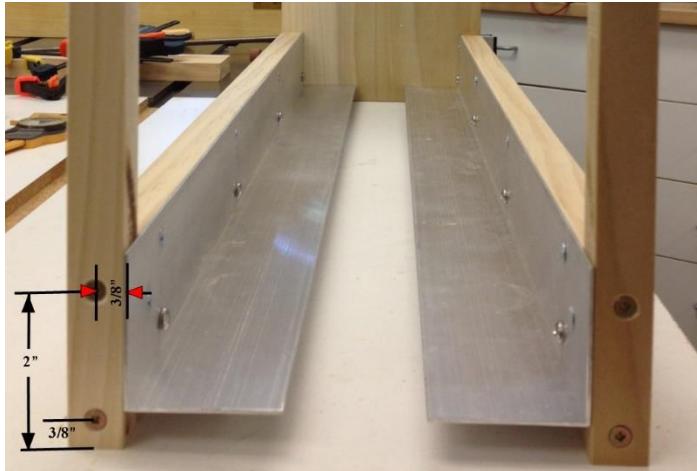
I marked the location for the two pilot holes on the back end board. Next, I drilled two pilot holes bit in the back board using the #47 bit. I used a large square to ensure the lower side board and back end piece were perpendicular, aligned the two pieces, and drilled through the pilot holes into the end of the lower side board. I then drilled out the holes in the back board using a #19 bit, re-aligned the back board and temporarily screwed the two pieces together. Repeat this step for the other side. Later, you will remove the screws and apply glue to the end of the side board and re-attach these as part of the final assembly steps. Figure 13 shows the results of this step.

FIGURE 13



**Step 3: Attach the lower sides to the front end piece.** This step is similar to Step 2. With both lower side boards already attached to the back carrier board, attaching the front board will be a little easier. Mark the locations of the 4 pilot holes in the front board, drill out the holes, clamp the front board to the side boards, and drill (using the #47 bit) through the pilot holes into the side boards. Unclamp the front board and drill out the holes using the #19 bit. I countersunk these holes so the screw heads wouldn't protrude. Temporarily attach the front board to the lower side boards. Figure 14 shows the measurements for the mounting holes and the attached front end.

FIGURE 14



**Step 4: Attach the carrier handle.** To attach the handle, hold it in place between the ends and clamp (Figure 15).

FIGURE 15



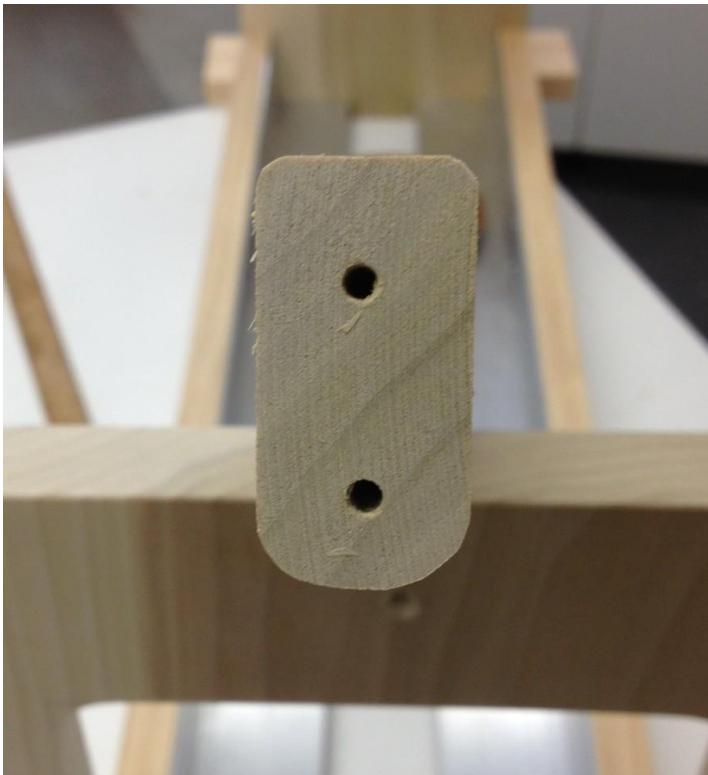
Next, mark where the holes will be drilled on each end piece. On mine, I measured down from the top  $3/8"$  and  $1\frac{1}{8}"$  respectively. I then drilled a pilot hole (using the #47 bit) all the way through the ends and about  $1"$  into the handle. See Figure 16.

**FIGURE 16**



Next, I removed the clamps and then the handle. I used the #19 bit to open up the holes in each end piece. After measuring, drilling, and attaching the handle, remove it, making sure you mark each end so it can be put back in its original position. Round off the bottom to make it more comfortable to hold on to. I used a plane but, if you have a router, you could use a round over bit to accomplish the same thing. Here's what it should look like after doing this (Fig 17).

**FIGURE 17**



Now you can re-attach the handle and the upper side boards.

**Step 5: Drilling holes for Clevis Pins:** The clevis pins are used to hold the upper side boards into position for storing and transporting the carrier. Figure 18 shows what the  $\frac{1}{4}'' \times 2''$  clevis pins look like.

FIGURE 18



I recommend drilling the holes for the clevis pins for the back end piece first. Mark where the holes will be drilled using the measurements shown in Figure 19 below. First use the #47 bit to drill the pilot holes through the back board and into the upper side piece behind. Drill to a total depth of about  $1\frac{3}{4}''$ . This will allow the pins to stick out from the back (and front) boards about  $\frac{1}{4}''$  so you can easily remove them when you need to. Use a  $\frac{1}{4}''$  drill to open the holes to accept the pin. Make sure you drill through the back and front boards all the way and into the upper side boards.

FIGURE 19

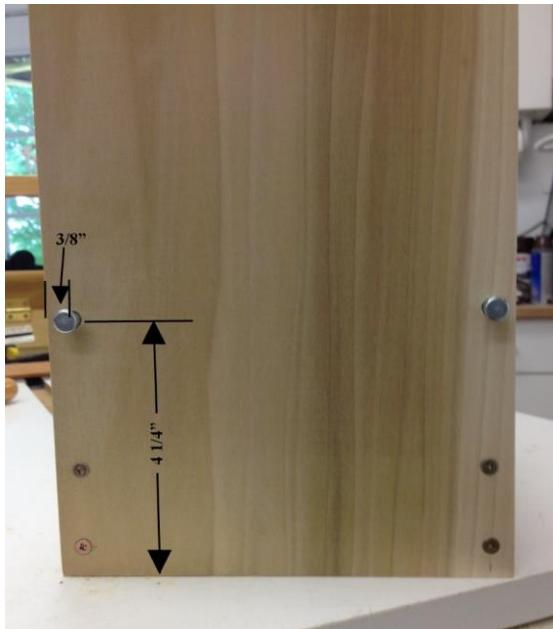


Figure 20 shows what your carrier should look like at this point.

**FIGURE 20**



**Step 6: Drilling the End Stop Piece for the Clevis Pins:**

(Note: The end stop piece actually serves two purposes; 1. it keeps the engine from rolling out of the carrier and 2: it helps keep the bottom part of the front end of the carrier from spreading apart.)

Insert the end stop into the carrier. Take the  $\frac{1}{4}$ " drill bit and, using the hole in the front end board as a guide, drill a hole through the end stop. Or, you can do what I did. I only used the drill bit to mark the location of the hole in the end stop, then I removed it and drilled out the hole on my drill press.

**Step 7: Gluing all the Wood Parts:** At this point, you have completed and assembled all the key components of your carrier, except for the rail guides which are explained below in Step 8. To finish the carrier and make it stronger and more durable, remove the screws and detach the handle, sides, front board and rear board. Leave the upper and lower side boards connected. Now you can re-assemble with glue.

First, apply glue to the back ends of the lower side boards and attach one side at a time to the back end board with your screws.

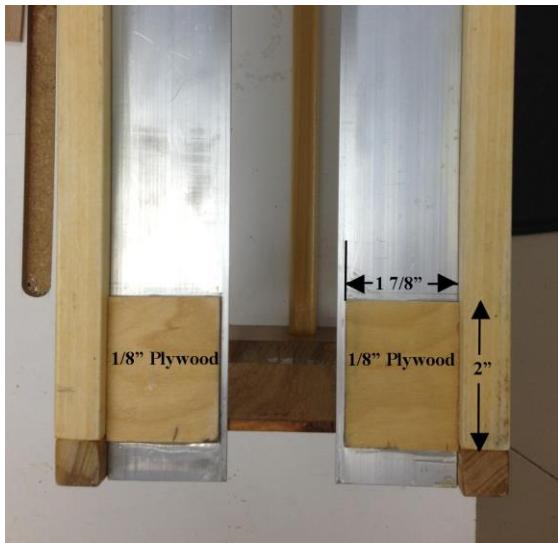
Second, apply glue to the front ends of the lower side boards and re-attach to the front end board.

Third, apply glue to both ends of the handle and re-attach the handle.

The final assembly is now complete.

**Step 8: Making and Installing the Rail Guides:** The last step in the construction process is installing rail guides on the underside of the carrier. These guides will help align the carrier with the rails. Use 1/8" plywood for these pieces. Any thicker and they might not allow the aluminum angles to sit on the rails. Cut them according to the dimensions given in Figure 21. I used epoxy to glue them to the bottom of the angles. Make sure they fit tight against the bottoms of the lower side boards.

FIGURE 21



This completes the construction of your engine carrier. Good Luck.

