# Homemade Scroll Saw – Part 2 – Power Train

*By Michael Martin*

This is the second part of the scroll saw article. Here I'll Try to get you powered up!

The first thing you must do is to find an old rear bicycle wheel that isn't froze up, and in pretty good shape. I am using a 26" wheel from an old 10 speed, but if you find an old style single speed 26", that will do also. I will show you how to pull apart the old style on a 20" wheel that I started to use. It didn't work as well as I had planned, so I switched to the 26". I am still going to have to add mass by attaching weight to the rim. Once I get it going, I would like it to continue a few strokes without pumping the pedal. I should have made a wind up one, although, I did figure out how to hook it up to a small steam engine. Now all I got to do is find a small steam engine. The modification to the saw is about a 20-minute job and involves only one part. You wouldn't even have to unhook the foot pedal. I started out trying to make it as "old fashioned" as possible, but, gave up on that idea because they had better equipment than I.

**Fig. 12** ***The perfect wheel?***

This is the wheel I am using. I had to look a while to find the right color of rust that I wanted. Pull the wheel off the frame saving the chain and all the nuts and washers. You will probably need to break a chain link to get it off, but that must be done anyway.

**Fig. 13** ***The other side***

**Wheel checkout: (all wheels)**

- Make sure that it spins on the axle fairly true and easily
    - Check for excessive looseness in the spokes
- Check the gear to make sure its not bent or missing teeth
    - Check the gear to make sure it’s attached firmly

**Fig. 14** ***Taking it apart***

The axle has double nuts for adjusting the tightness of the bearings. The one on top is easy, but to get to the bottom one (on both sides) takes a very thin wrench. I happened to have a cheapie that fit, but I broke it, so I guess I'll have to grind up another. You can take a cheap wrench and grind the faces flatter so it will fit behind the top nut. Usually it is the same size as the top nut, but that may not always be the case.

Go ahead and take it apart watching carefully where all the parts go. Dump all the sand out of it, and put the parts in a can of "cleaning fluid". (All backyard mechanics have a coffee can full of "cleaning fluid" to clean parts with.) If you have access to an air compressor, you can then blow the remaining dirt out of the bearings.

**Fig. 15** ***The Parts***

This is the wheel parts all cleaned and laid out in the order that they came apart. Most of you have probably taken apart bicycles as a kid, and they have not changed much over the years. Maybe gotten a little cheaper made like everything else.

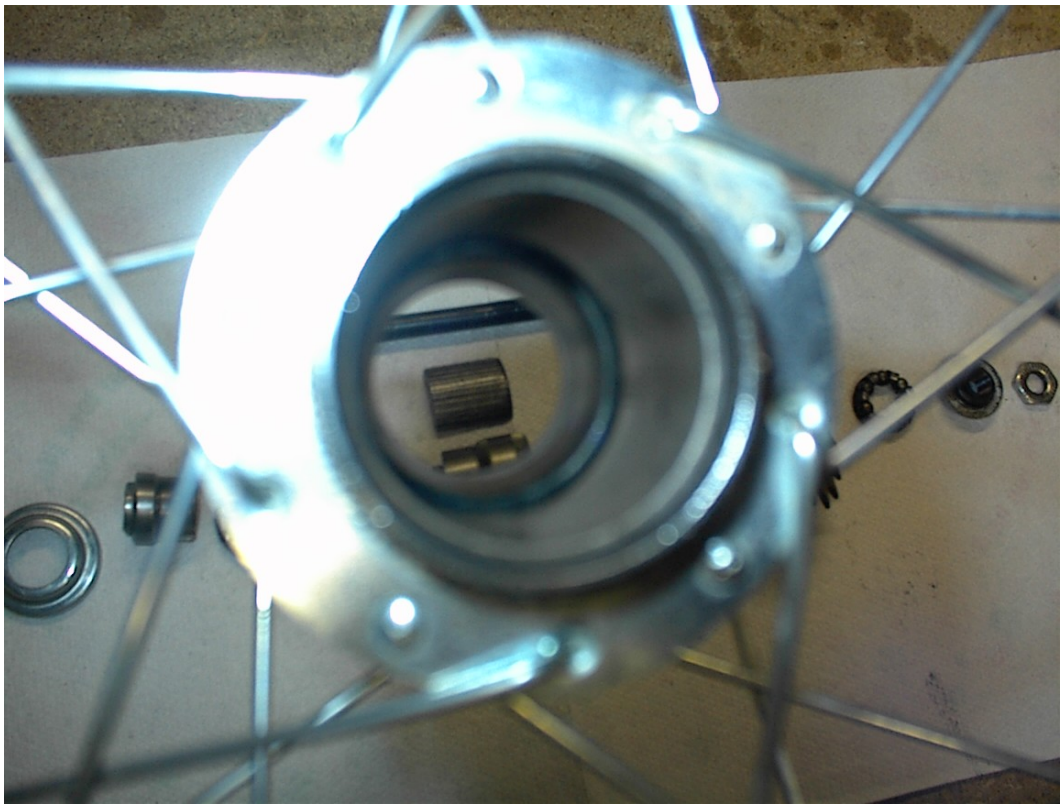

**Fig. 16** ***Hub***

Note inside the hub. One end is smaller than the other. It can only go back together one way.

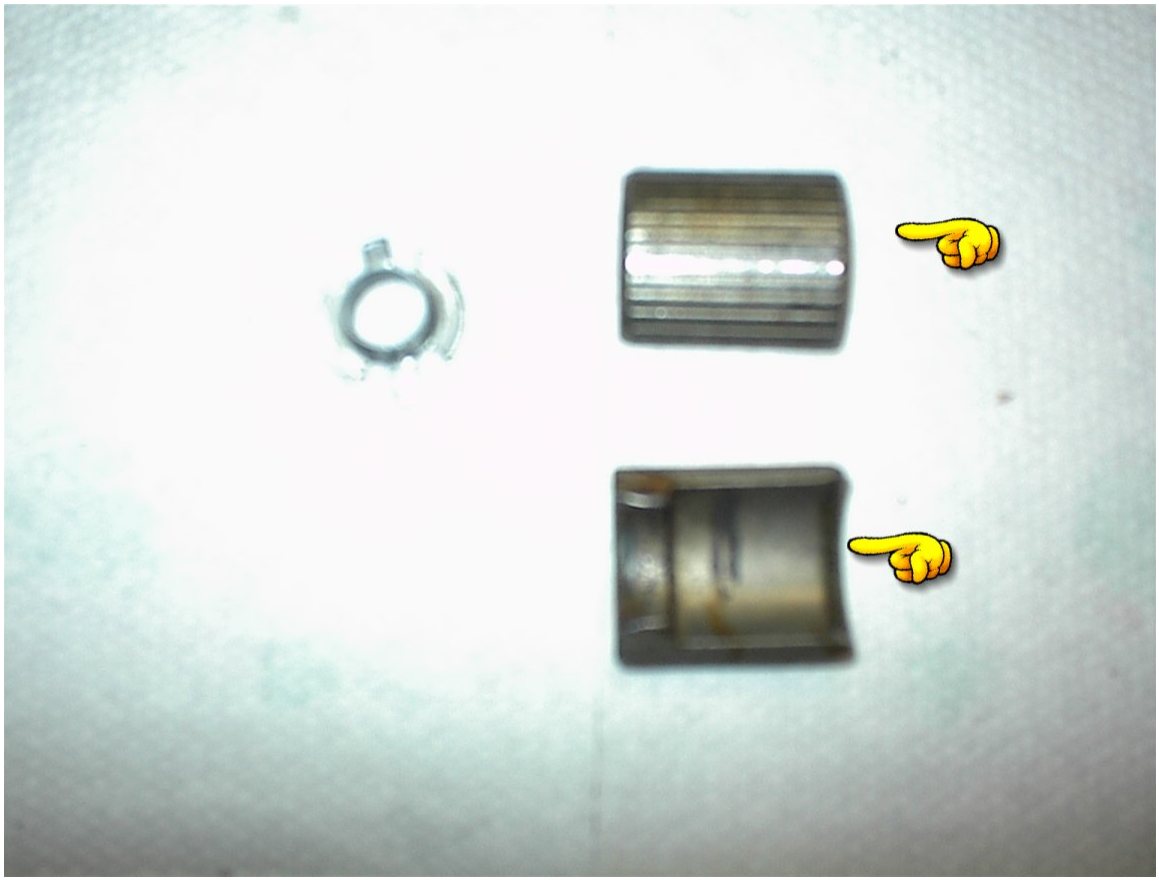

**Fig. 17** ***Parts***

Identify these parts. The ones on the right are the brakes.(With the little pointy fingers pointing to them). Throw them away. You will not need them on the saw. The part on the left came from the end of the spring. (The only one.) Keep this, but bend the tabs straight out parallel to the flange. Otherwise when the wheel spins, the tabs will spin the spring inside causing more friction and noise. We're trying to cut down on the friction.

**Fig. 18** ***Packing the bearings***

If you've never packed wheel bearings before, you're going to love this! Take a big glop of grease and put it in the palm of your hand. (Ugh!). With your other hand, take the bearing and pound it in the grease. Sort of clapping with your hands full. This forces the grease inside the bearing retainer where it is needed. Do all the bearings and lay them aside on a clean surface. Any grease left over, smear on the spiral gear.

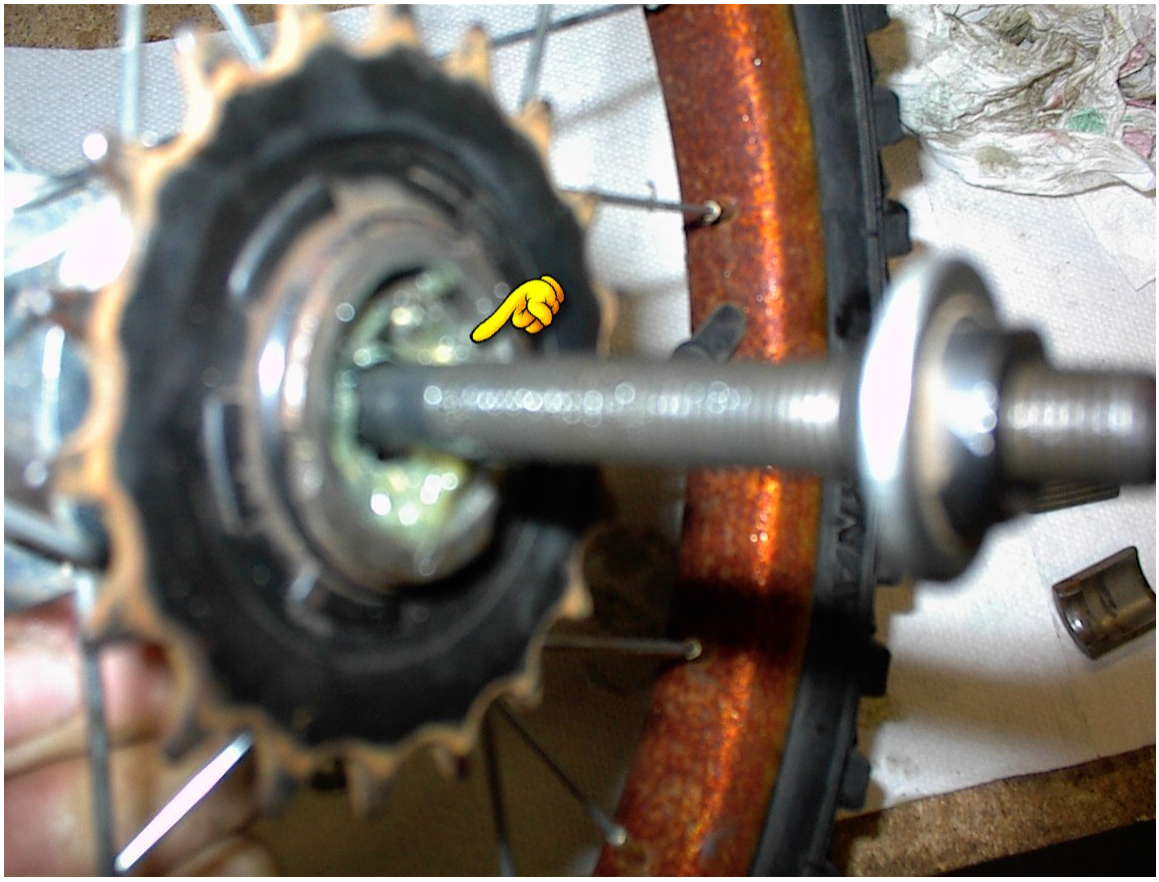

**Fig. 19** ***Assembly***

When assembling pack a little more grease into both ends. Notice (in the fuzzy picture) that the gear side nut will be run all the way up until it runs out of threads. The bearings will be adjusted from the brake side. This should leave plenty of threads for mounting to the saw.

**Fig. 20** ***Break Lever***

This is the brake lever. You will need to do some modifications to this. Since we have no brakes now, the only purpose it serves is a spacer.

**Fig. 21** ***Modified Lever***

Grind, saw, or chew the lever in two, leaving only the round special washer. Grind it as round as you can or it will rub on the inside of the hub you will be making later. (Don't ask how I know this…)

**Fig. 22** ***Tightening***

When the washer is done, the assembly can be finished. Now, the way to tighten the nut is with a pair of vice grips to hold the washer. Make sure the wheel spins freely, or loosen the nuts and retighten the lock nut until it does. Get a good grip and snug it up pretty tight or it will loosen later on.

***A short note on 10 speed wheels***

If your 10-speed wheel spins freely, it may be a good idea *not* to take it apart. The bearings in them are not captured in a retaining ring. If you do take it apart, be ready to chase little ball bearings all over the place. The good thing, however, is most axles are threaded all the way. You just loosen the nuts, and turn the axle out as far as you want, then tighten the nuts back up.

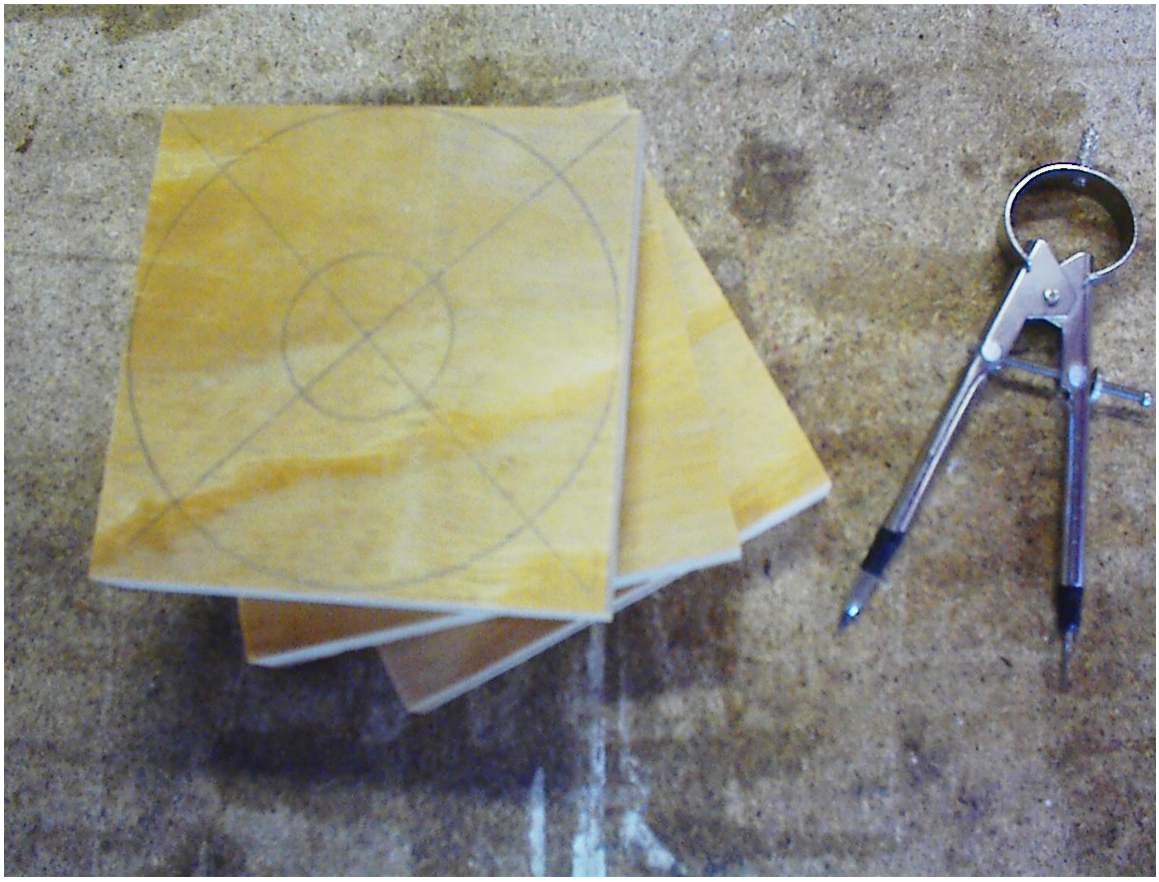

**Fig. 23** ***Starting the Hub***

Now we get to build the Hub. Start with 3 pieces of ¾” plywood cut in 4 ½” squares. The reason for plywood is that it does not have any grain weakness. We shouldn’t have to worry about it breaking in half.

Find center of the top part and draw the 4 ½” circle. Measure the outside of the brake side wheel hub closest to the spokes. Mine was 1.440” so I drew a circle with the radius of .720” We want the hole to be as close to the outside diameter as possible.

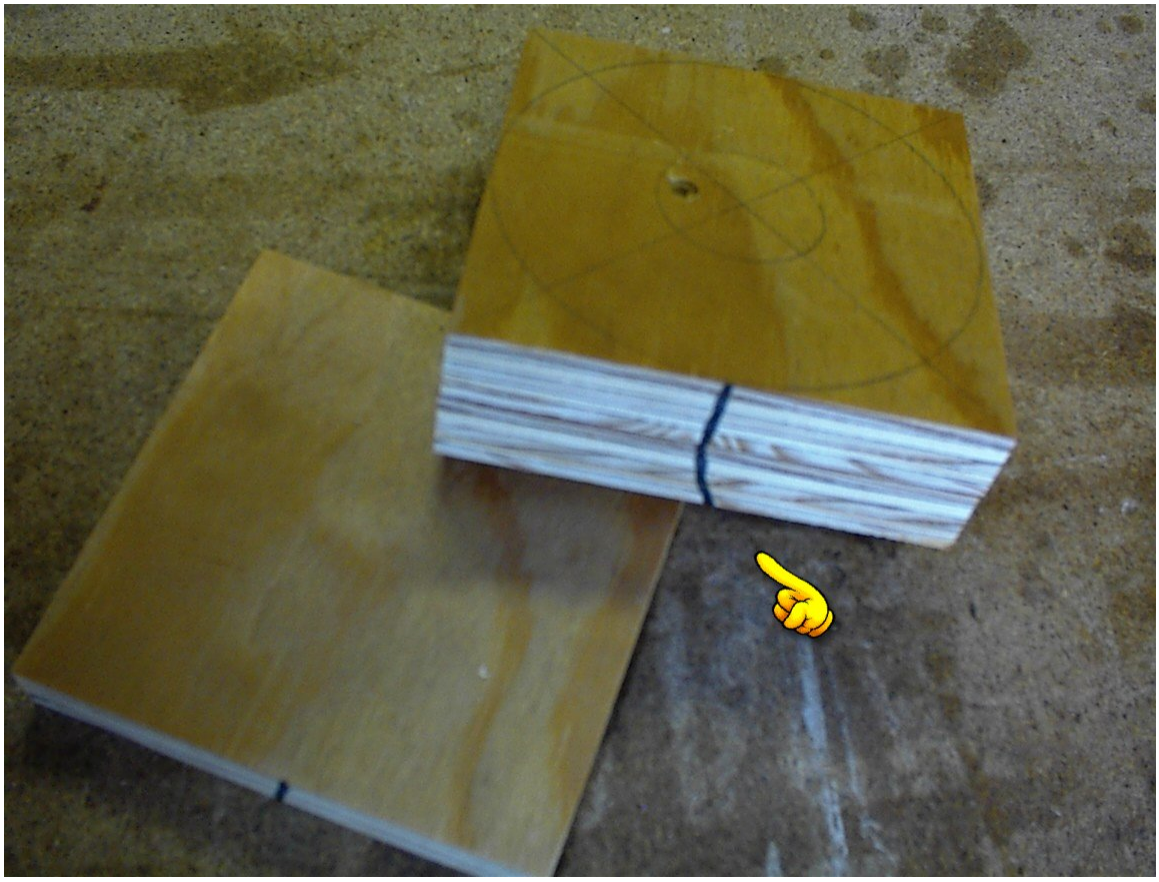

**Fig. 24** ***Stacking***

Once you have the lines drawn, draw a reference mark down the side of them to align them later. Take double-sided carpet tape and stick the top two together. Set the other single piece aside for now. Drill a hole on the inside of the inner circle and cut out. The scroll saw works really well for this. I used a #5 spiral and cut out a perfect circle. (Right…)

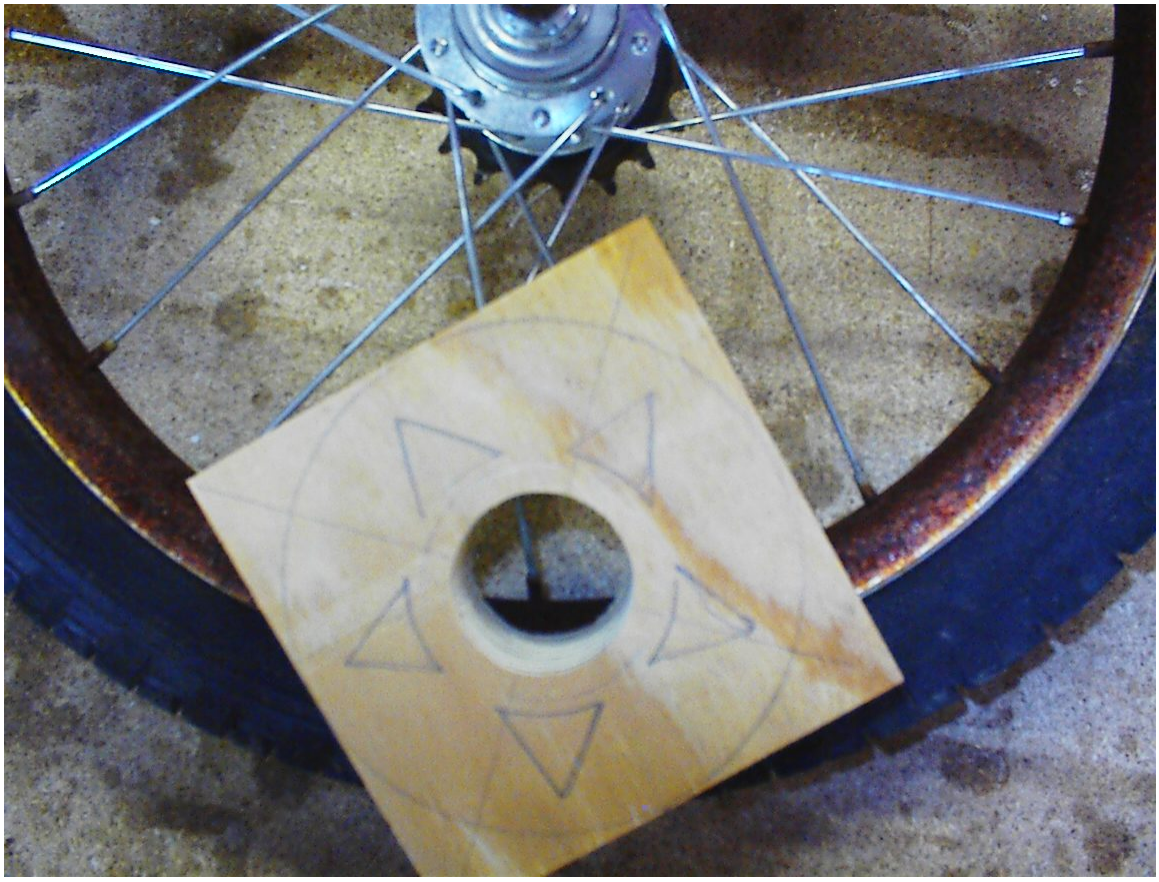

**Fig. 25** ***Spoke Marks***

This is the top two boards still taped together. After cutting the hole, try it for fit and adjust as necessary. Grind the brake washer down some more if it needs to clear. If you look at the wheel, you will see the pattern that I traced on the board is from the pattern of the spokes. This wheel just happened to have a five-pointed pattern, so I must use five bolts to tighten equally. Your pattern May be different. Try to have equal points to tighten on. If I could have only three bolts, I would have been just as happy, just as long as they were equally spaced.

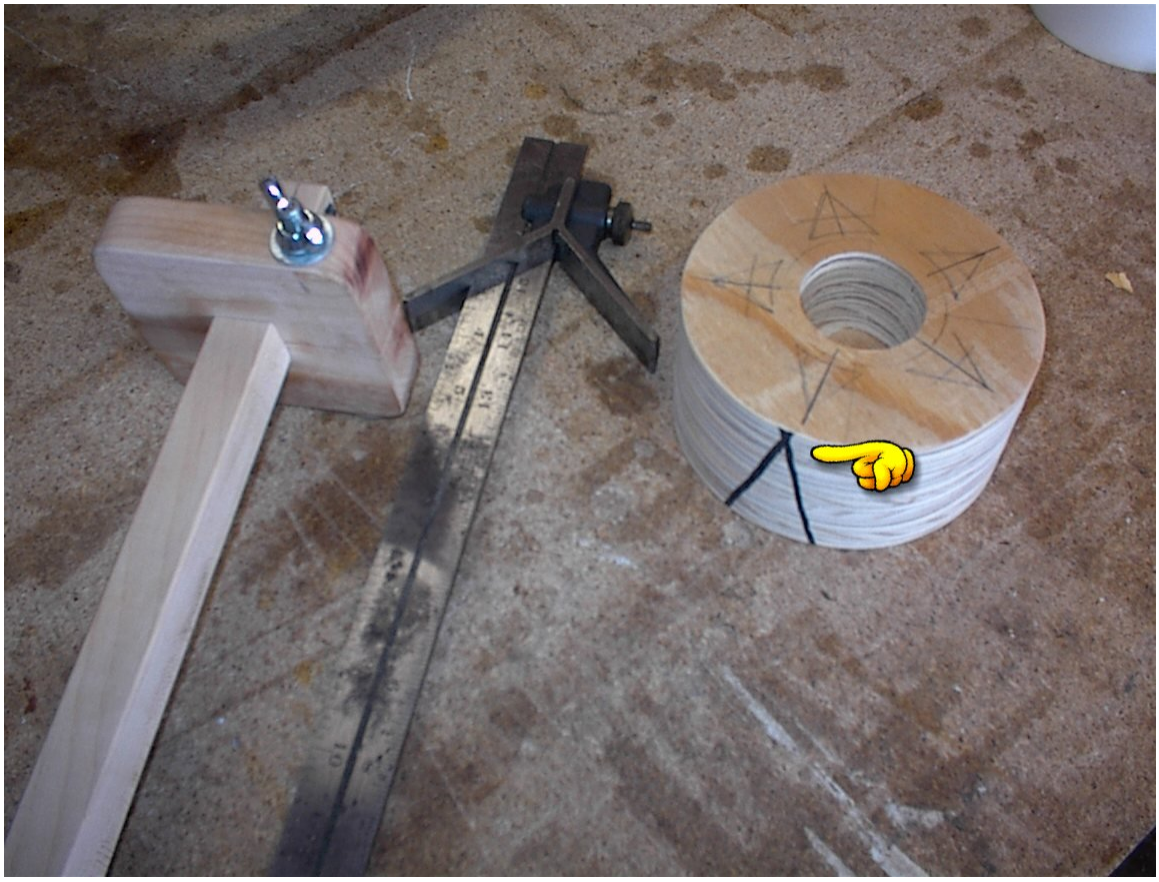

**Fig 26** ***Marking Hub***

Now, carpet tape the third piece of plywood to the other two. Band saw all three to the 4 ½" diameter. Take your marking gage and center finder and mark the center of all the triangles. (or close anyway). Note the alignment mark on the side of the parts. Unless you are really good, you will not be able to get all five ¼" holes perfect. The marks will help you line them up the same after drilling.

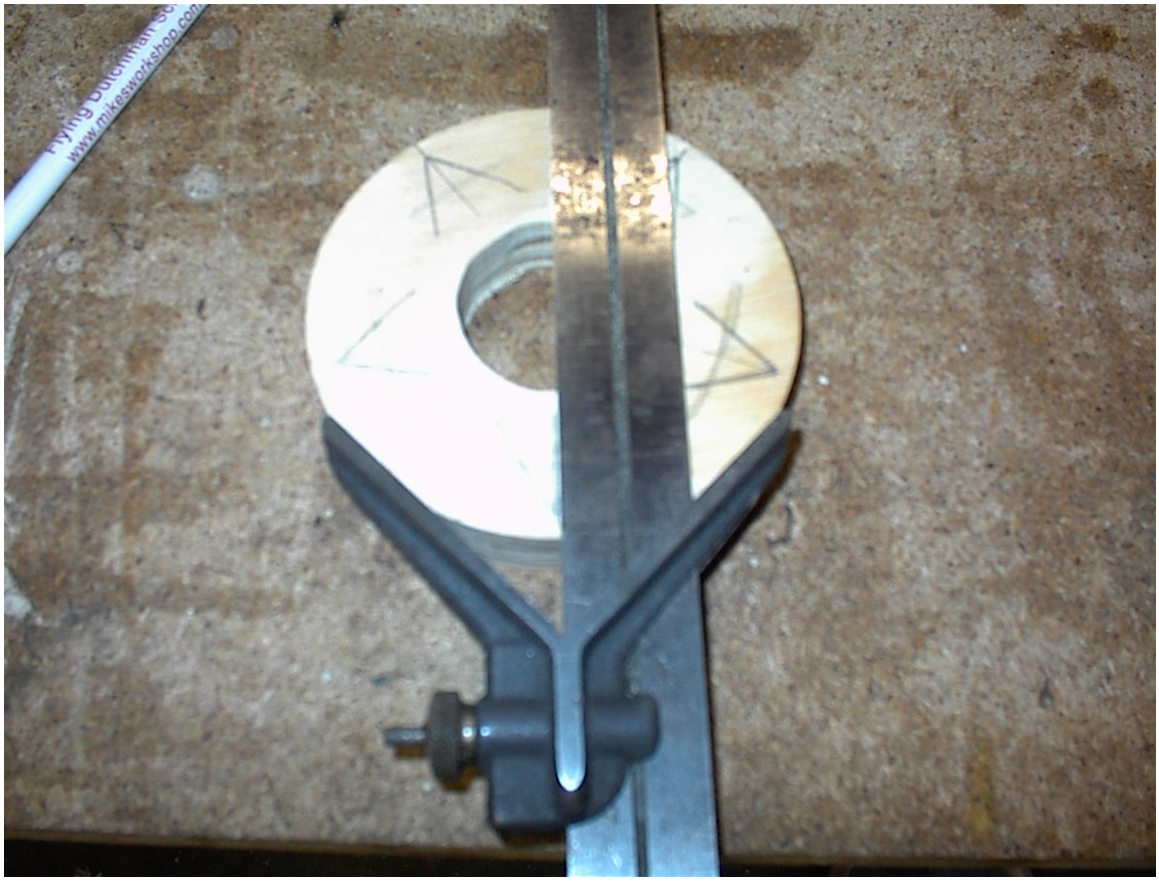

**Fig. 27** ***Center finder***

Figure 27 shows how I locate the center of the triangles. After marking the horizontal center with the marking gage, I lined up all the points of the star and drew an intersecting line.

**Fig. 28** ***Center punch***

Before drilling the ¼” holes, center punch them. This prevents the drill from wandering. Take the hub to the drill press and set the depth to drill through the first two and just dimple the third piece, not all the way through. Now peel the top one off, the one without the center hole. Put in a 1/16” drill and finish drilling thru the five holes. The dimples will locate the drill nicely.

**Fig. 29** ***Finished Holes***

The reason for drilling through with the 1/16” drill was to locate the hole pattern for a ½” Forestner bit to countersink the washers and heads of the bolts flush. After the countersinks are in place, continue drilling through with the ¼” bit. Fig 29 shows the completed top.

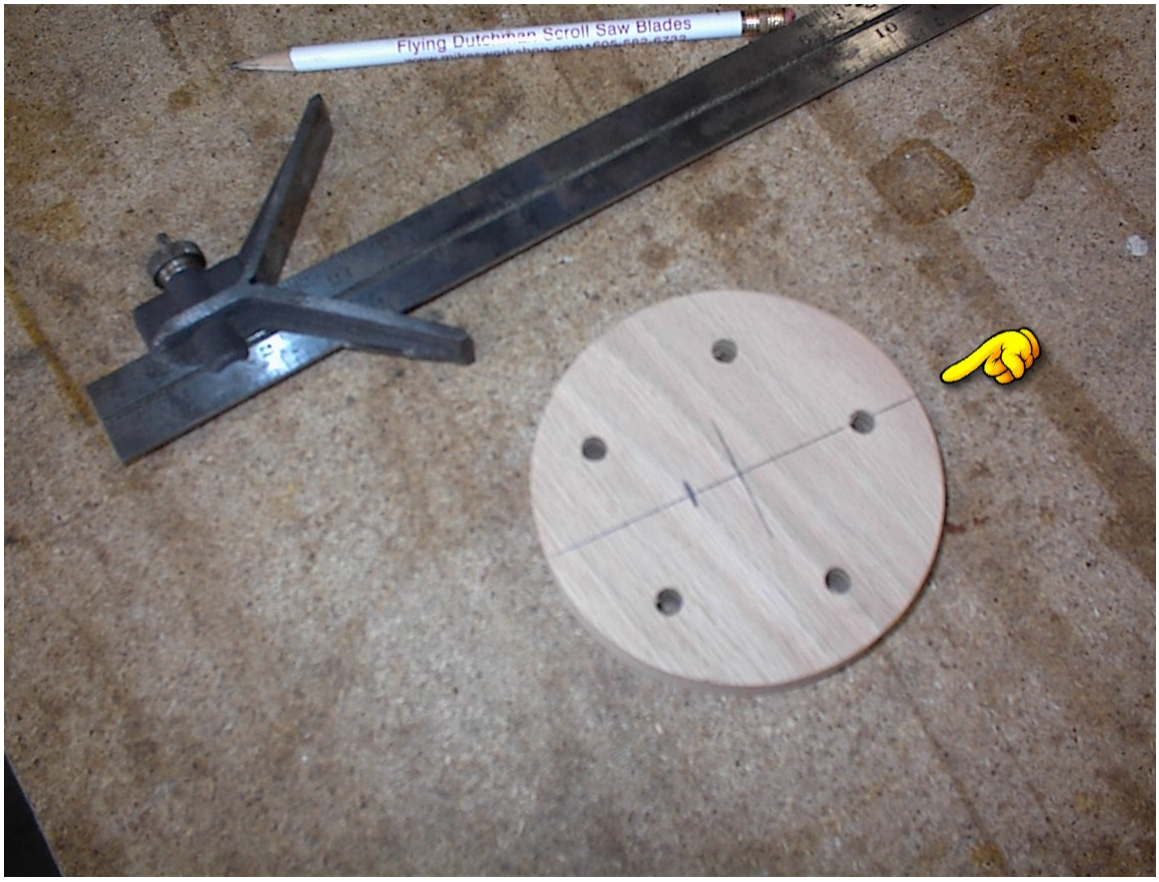


**Fig. 30** ***Top of Hub***

Flip the top over now and use your center finder to draw a line across the part and through the middle of one of the holes. Rotate the part and draw a line that crosses. This is the center of the part. Measure ½" from the center and mark and center punch. Now take the ½" Forestner bit and countersink for a ¼" bolt head and washer *from this side*. Finish drilling through with the ¼" bit. This will be the drive pin. Insert a 2 ½" long bolt with washer through. Set the part on some blocks so the pin hangs down straight. Take some 5-minute epoxy, mix it, and fill the countersink. Let it harden. The bolt will not be loose now. Some epoxy may have run down the bolt while hardening. Wire brush this off thoroughly. This is the pin that the link arm swivels on.

**Fig. 31** ***Mounting the Hub***

You are ready to mount the hub. You will need five ¼" bolts long enough to go through the hub and washers and spokes. I won't give you a length on them, because you may have a different wheel. On the backside is a ½" washer, a 5/8" washer, a ¼" washer, a ¼" lockwasher, and a nut. You could probably get away with using a ¼" 'car washer', and a lockwasher and nut. It would be a lot neater. Go around and snug them all down. Be

careful not to warp the spokes too much. I did not even try to remove all the gears. You might say that I have a ‘six speed’ scroll saw!

**Mounting the wheel**

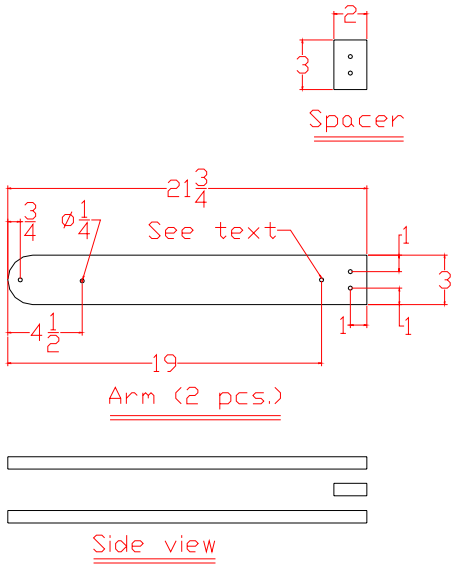


**Fig. 32** ***Arms***

This assembly is made of ¾” Oak. You could substitute pine, but there will be a lot of stress on this arm. A hard wood is preferred. The unmarked hole is where the wheel will mount. Make it the diameter of your axle. You should only need to drill on the one board, but if your axle happens to stick out farther, then drill both.

**Fig. 33** ***Lower Mount***

This is a picture of the arms assembled. Assemble the two arms and spacer. Next, mount the wheel to the arm assembly. You probably will not have a lot of threads on the wheel left over. Put a washer on both sides and the nut in the middle. You should have a washer under every bolt head, and every nut that touches the wood. The extra flat that a washer gives will help in reducing the crushing of the wood when tightened.

**Fig. 34** ***Positioning the Wheel***

This next part is up to you. There are no set measurements; it's just 'what works'. The main things to think about are:

- Get the wheel off the ground
- Position it as far back as you can (more foot room)
- Do not let it rub on the top cross member, but get it as close as possible
- Position the arm so it is below the table top

Use the cross member as a stop, and then swung it into position and raised it until you have just a little clearance on the top and back. Then C-clamp it into place and drill for the ¼" bolts.

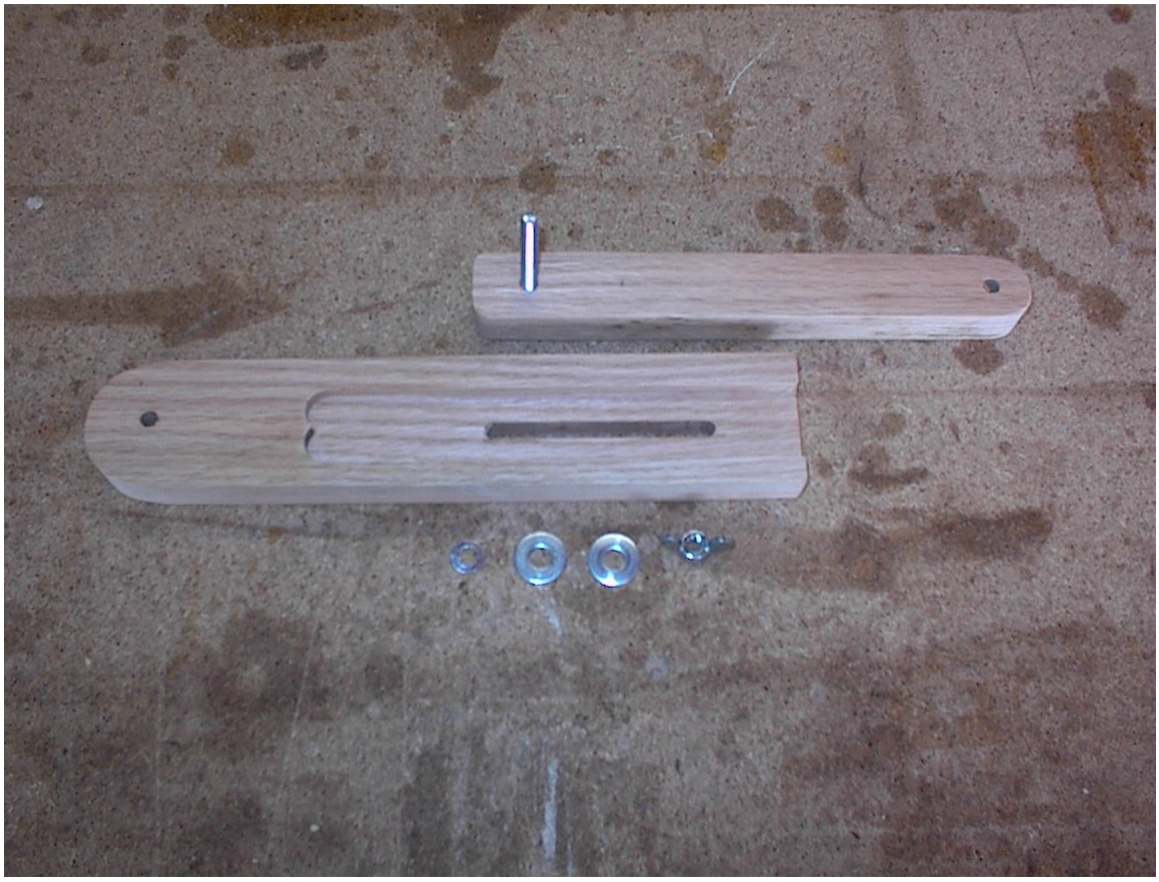

**Fig. 35** ***Link Arm***

The link arm is made of ¾" oak. (or any hardwood you choose). By being adjustable, you won't have to measure between the pins so close, and you will be able to adjust the arms up or down to suit. This will come in handy when you want to use a different part of the blade for cutting. Although, the saw, with these dimensions, have a 2 ¾" throw

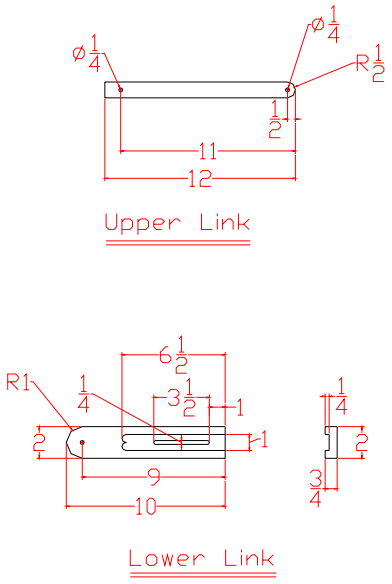


**Fig. 36** ***Link Arm drawing***

Here are plans for the link arm. The arms are pinned together with a ¼" bolt and a washer on both sides, and a wing nut. That will make it easier to adjust. The way it fits on the saw now is adjusted maybe a little too far up. The upper link could have been extended another inch and it would have put the wing nut a little closer to the middle of the slot. But then, it all depends on where the wheel is located. The farther back, it will be longer. Closer, will be shorter. When you install the link, put one washer between the hub and the link, one on the outside, and use a Nylock nut run up to the link, but not so tight it won't move. By using a locknut, it won't back off when sawing. Pin the link to the arm using spacers to align the travel. (See Fig. 37). Here, also, use a Nylock. You should now be able to spin the wheel and watch the saw arms go up and down. If you have any problems, make sure that the arm upright bolts are not tightened too tight. You should use Nylock nuts on there also.

**Fig. 37** ***Upper Link Connection***

## Building the foot petal

As you can see in Fig. 38, the foot pedal spans the legs. That's so when one foot gets tired you can switch. A brace made out of a 2 x 4 is added to the front of the legs. For the pedal itself, you could use a piece of ¾" plywood, or any other board that will clear the wheel. Here, again, no dimensions are given because it all depends on the placement of the wheel. Underneath is a 2 x 2" bolted to the pedal. It is located so when the pedal is at the top of its stroke, it will stop on the wheel's arm preventing the eyebolt from hitting the gears. Position it also so that it will clear the wheel on the down stroke. A piano hinge would be the better way, and will be changed on this one soon.

**Fig. 38** ***Pedal***

**Fig. 39** ***Spring Attachment***

In the corner of the top leg brace put a ¼” hook bolted through. Hang a medium weight screen door spring or a similar spring. Try not to make the spring too stiff. Then tie a length of cord to the other end.

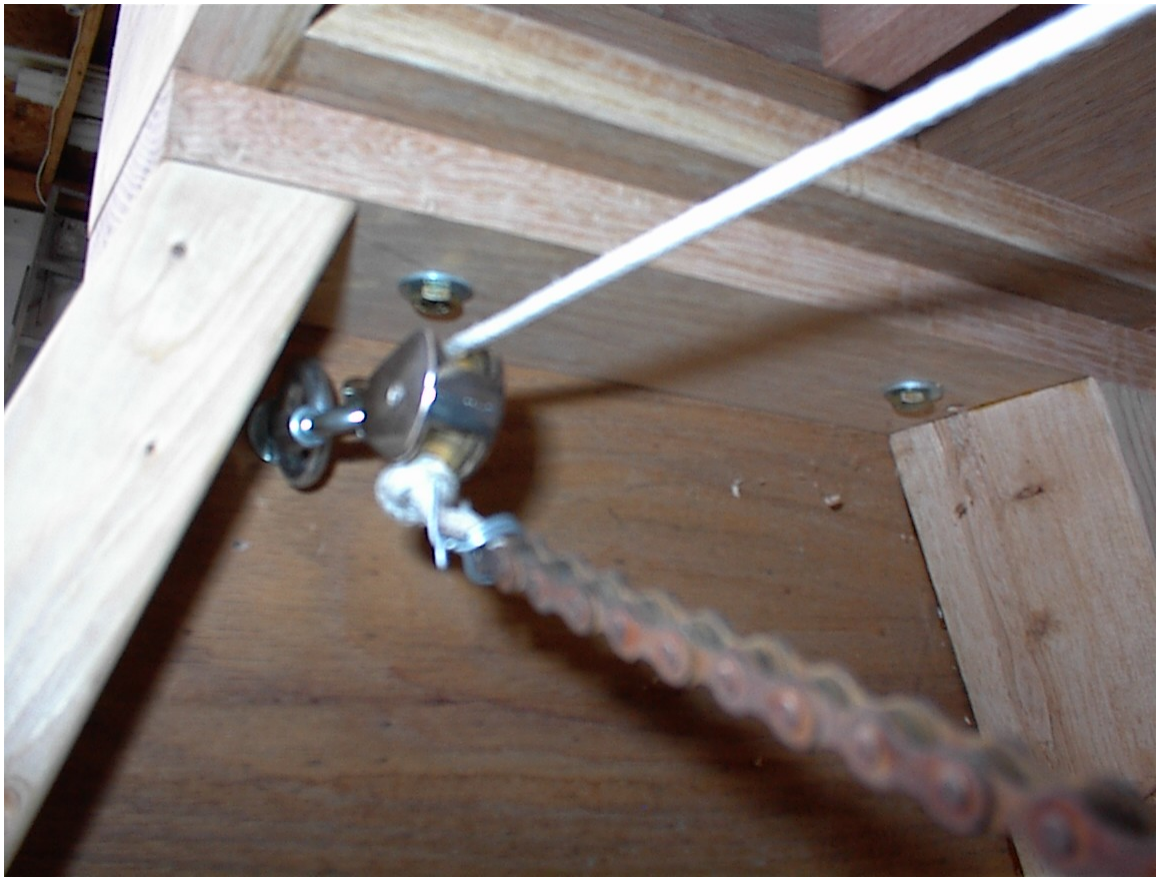

**Fig. 40** ***Front Attachment***

Drape your chain over the sprocket and lift it up to the front leg brace making sure that it is in line with the gears. Being offset too much will cause the chain to jump off the gear when you pedal. (I lined it up with the middle gear and apparently that wasn't good enough for it. It jumped to the next lower and stayed. Finicky machine…) Drill your hole there for a ¼" eyebolt. Now, hang a small single pulley and run the cord through the top and attach it to the chain.

**Fig. 41** ***Chain Attachment***

Drill a ¼" hole in the end of the 2 x 2" and put another eyebolt there. Attach the chain to it and see if it will work!

**Good luck and happy sawing!**

*Editor's Note: The one thing not shown is the blade mounting. I have plans (in plan 1) to make my own holders, but it may be just as easy to find a saw with the type of ends you need (pivoting) and look up the part number and order a set. I called Tradesman (my saw) and asked them about ordering a set. My saw isn't even supposed to be out yet, but he said they would be around $10.50 ea. And that included the knobs and everything. Once you have the ends on, run the arms level with the table and hang a weighted string (or something) to find the center of the table hole. I plan on cutting a 3" hole (in case I'm off a bit) and routing a ledge around it. Make it the depth of the ¼" plywood insert (which is not really ¼" any more). If you make your ledge step ¼" wide, your insert will be 3 ½". The ledge should be wide enough to put a small screw through the insert for a hold down if needed.*

*Any further drawings or modifications will be posted on the website as I get them as addendums. Any questions I would be happy to answer if you E-Mail me at*
*cptnmike@yahoo.com*