

Sliding Dovetail Bookends

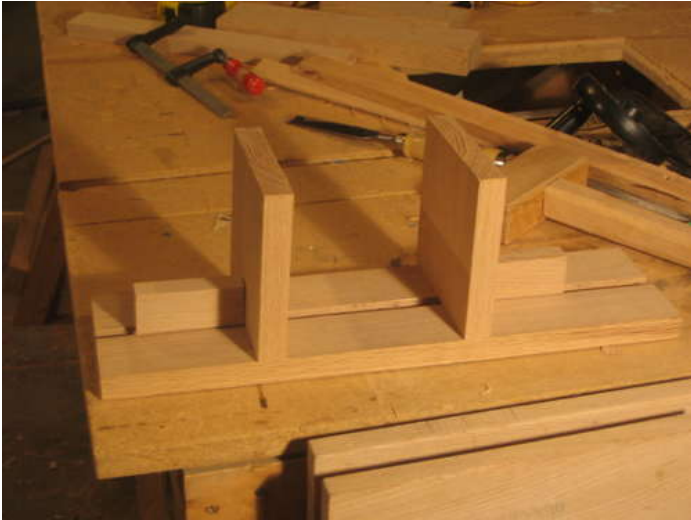
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Intro: Sliding Dovetail Bookends

Bookends are great. You can put them somewhere and then books can fit in between them. The bookends stay put and thus, due to the laws of physics, the books stay put and don't fall over. Bookends are the type of thing that people see and go "Oooo, bookends, how swanky!" Well, imagine that the bookends were adjustable on the fly and always in line with each other! Also imagine that the bookends were attached to a base that had some fancy joinery in it. Now that's the type of thing that would make a person go "Sliding dovetail bookends? Who won the freakin' lottery?!" (Also, imagine you won the lottery).

This guide will help you, the curious (and might I say attractive) reader, create a pleasing and accurate set of sliding bookends. Please note that I'm not a woodworker by trade. The instructions here are based solely on research I have done and the steps I took to construct this piece.



Step 1: Stuff you need

To make these bookends, you'll need a few things. You're going to need some wood. I used some scrap pieces of red oak I had. I would recommend a nice hardwood, such as oak or maple. Walnut might be nice too, as would iroko. Pine may frustrate you. Plywood just won't work. You can probably use MDF or other synthetic material, but you'll not want to use the tools I use here. Power tools work better for synthetic materials.

Speaking of tools, you're going to need some of those. You'll need:

- Safety glasses
- Combination square or marking gauge
- Sharp wood chisels
- Backsaw, such as a dovetail saw, gent's saw, dozuki, or ryoba (not pictured for some reason)
- Wooden or plastic hammer
- Pencil
- Table saw (optional)
- Dovetail angle guide (optional)

I made the dovetail angle guide by taking a nice straight board and ripping it with my table saw after setting the blade to about 12 degrees. That's $\pi/15$ radians, in case your table saw is marked in radians. What kind of wacky markings are on your table saw, anyhow??

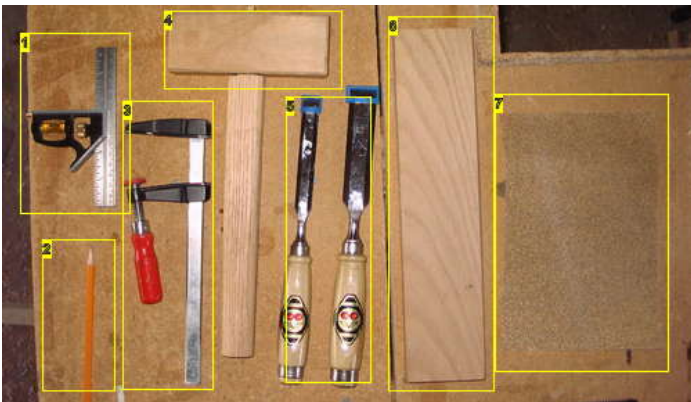


Image Notes

1. Combination square
2. Pencil
3. Clamps
4. Wooden hammer

5. Sharp chisels
6. Chisel angle guide
7. Sandpaper

Image Notes

1. Scrap red oak

Step 2: Dimension the stock

Cut the stock to the desired dimensions. I like to avoid measuring things. Using a measuring tape is exactly what they'll be expecting you to do. You need to cut the following "parts":

- Base in which the dovetail will be cut (1)
- Faces for the bookends (2)
- Guides that fit inside the dovetail and is mounted to the faces (2)

The picture shows the pieces already finished. I forgot to take a picture before I started working on it. I'm not expecting the wood to come with the pins and grooves already in them. That would be a lousy instructable.

Make the base as long as you want, but be aware that the longer it is, the more work you have ahead of you. I'm the lazy sort, so mine was about 17" long. Feel free to imagine an off color joke inserted at this point. The width of the base is about 4 3/4". Of course, unless you cut this from a sequoia, the grain is going to run along the length of the board. This is important, because this grain direction will make light work of the chiseling you'll be doing.

The faces can be made as tall as you desire. Note that if you make them too tall, your upstairs neighbor Mrs. Krakowicz will complain because whenever you adjust the bookends you knock over her knickknacks. Try to make the faces a little wider than the base, though, so you have some wiggle room for error later on and also you can use the extra width for some creativity if you desire.

The guides should be about half as long as the face is tall. This will give the face stability. It doesn't have to be too awful tall. I made mine about 2" tall and 3 1/2" long.

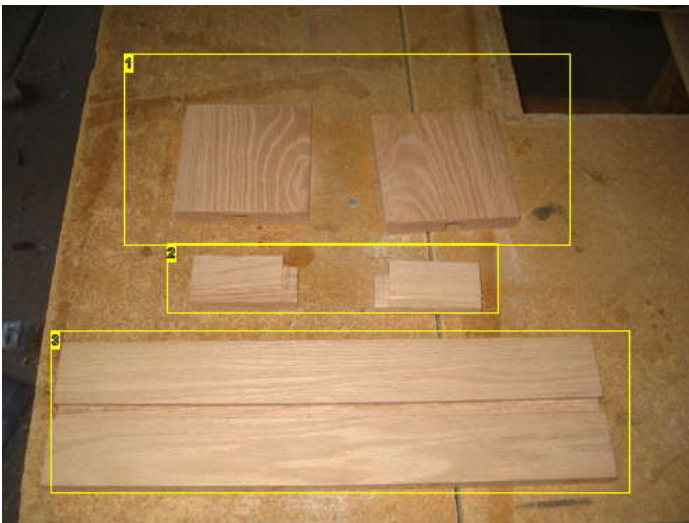


Image Notes

1. The faces of the bookends
2. The bookend guides
3. The base of the bookends

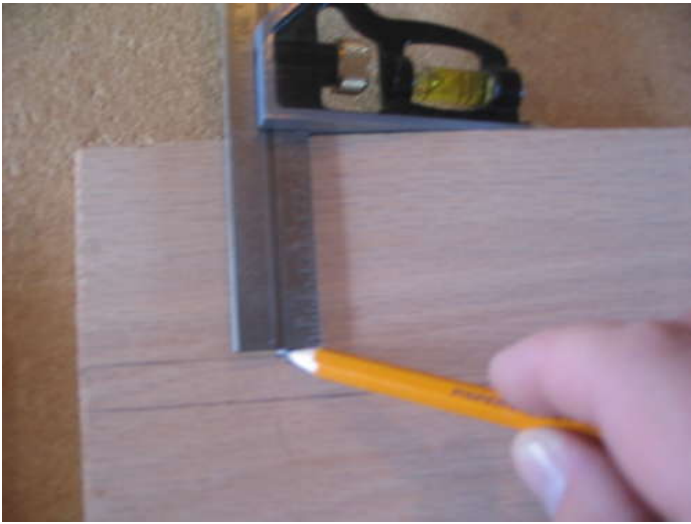
Step 3: Mark the dovetail groove

Sliding dovetail bookends would be just normal bookends if it has no dovetail in the base. We're probably going to want to make that. If you have a router and a table or a guide and a dovetail bit, then go for it. I'm sure you'll figure it out. If you don't have those things, or don't want to set up all that stuff just to make a groove, then here's what you do:

Decide how wide you want the dovetail to be. It should be narrower than the thickness of your stock, of course, especially the guide stock if you're using different lumber for different parts. Set your combination square to a distance that is just a little less than halfway across the base, place the square along one of the long edges, and make a mark. Place the square on the other edge, and make a mark. put your guide piece along the marks to see that the marks define a space narrower than the thickness of your guides. If it is, you're ready to rock. Otherwise, adjust the square and try again.

After playing with your square for a while, take it and run it along one of the long edges while holding a pencil at the top of the square. This will make a line you will use to cut the groove. Do the same thing with the other edge.

You now have two parallel lines (assuming the edges of the board are parallel) that define a centered groove. Nice job! Now extend those lines down the side of the board, set the combination square to the desired depth, and mark that on both the end sides as well.



Step 4: Cut a groove

Now comes the task of cutting the dovetail. There are a couple different ways to do this. The easiest way is to clear out as much material as possible before cutting the angles, which is basically cutting a groove. I like to use my table saw to do this, but a router will work, as well as using just chisels.

Place the base face down on the table saw and adjust the fence so that the groove line farthest from the fence is lined up to the saw blade. Adjust the blade height so that it cuts just shy of the depth line you marked on the end in the previous step. Run the board over the blade, turn the board around so that the other edge is against the fence (base is still face down!), and run over the saw again. Now adjust the fence in increments closer and closer to the center and remove the material in the groove. You could use a dado blade to do this, but why bother with the hassle? Whatever method you choose, though, use pushsticks to guide the workpiece over the blade. Even though the workpiece is covering the blade, if it suddenly splits you may find that the library of curse words you have in your head is woefully insufficient to express your regret for having lost a digit or two.



Step 5: Cutting the dovetail angle

Now that we have the groove cut, it's time to cut the angle portion so that this is a dovetail. If you have a steady hand and are brave of heart, you should be able to do this freehand. I lack such old world charm, and require a guide to help me out. As described in step 1, I made a dovetail guide by ripping a straight board with my table saw's blade set at about 12 degrees. Some might argue that 8 degrees is more appropriate. Doesn't matter to me. Spin the adjustment crank randomly and let 'er fly. Just keep your fingers safely away from the blade.

Take the dovetail guide and align it to the groove on the top of the base. Do this by taking a chisel and placing it at one end of the base, along the groove, and sliding the guide up to it, then doing the same thing at the opposite end. Keep adjusting until the guide is right in line with the groove, then clamp down. Test again after clamping, because sometimes the clamping gnomes will sneak in and move stuff around, because they're little jerks like that.

With the guide in place take your largest chisel and, starting at one end of the board, remove the waste inside the groove. Use the guide to keep the desired angle. Keep the bevel of the chisel toward the groove. Because you are chiseling with the grain, this should require little effort. However, if you come across a nasty spot in the wood, carefully use the wooden hammer to persuade the wood to come out and play.

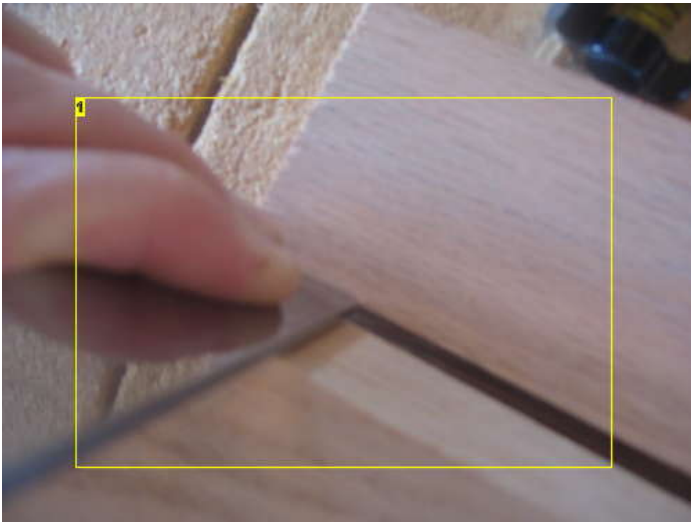


Image Notes

1. Align the chisel, bevel toward the groove, with the edge of the groove. Do this on both ends, clamp, and verify.

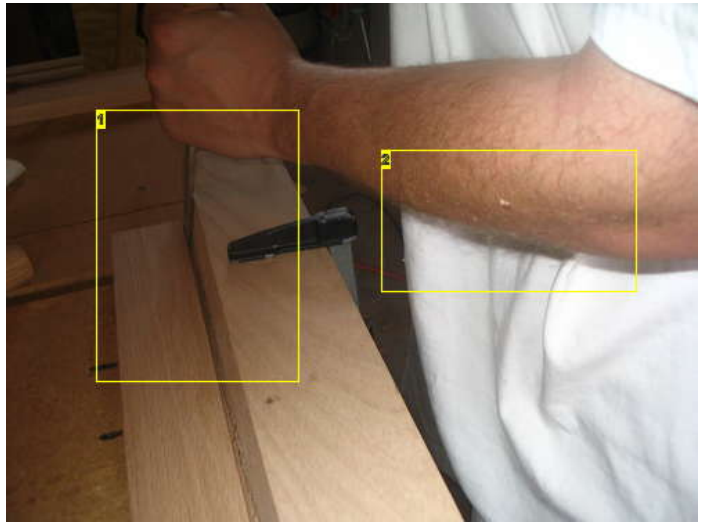


Image Notes

1. Use the guide to help make the correct angle.
2. Bits of sawdust in your arm hair make it look like you know what you're doing. Don't overdo it, though, or people will think you are some kind of wooden robot man and will burn you at the stake. Trust me.

Step 6: Clean up the dovetail

Now it's time to clean things up. Use a chisel about the width of your groove to clean up the bottom of the groove. Get the corners nice and crisp at both ends. Then look down the dovetail and clean up any areas that don't have a nice corner. That is, bits of wood might be living where the side of the dovetail meets the base of the dovetail, and you need to evict them, because those strands of wood don't pay their rent. Sure, they say they're good for it, but you never see that dough. And how is it they're rollin' in a Monte Carlo with platinum rims and you can't get them to pay up?

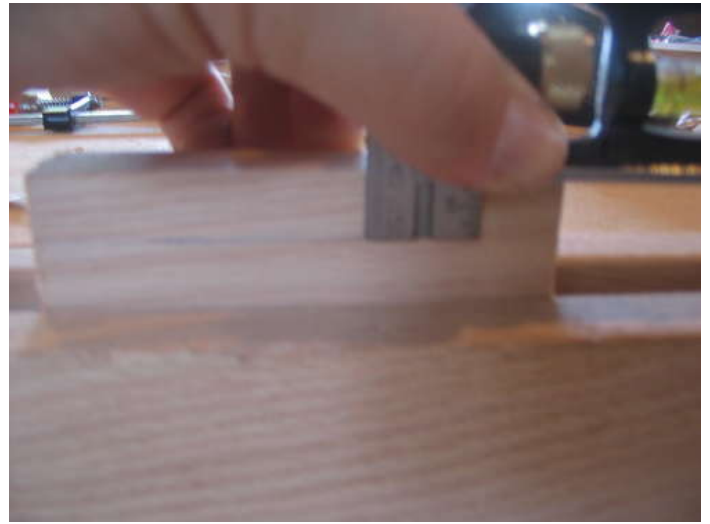
Anyway, after cleaning things up, take some 60 grit sandpaper to the sides and bottom. I like to wrap the sandpaper around a thin piece of wood. If you have a medium grade file, that should work too. Gasoline and a match will work, but only briefly.



Step 7: Mark the guides

Now that the dovetail is cleaned up, it's time to make something that goes in it. The guides run inside the dovetail, and are attached to the face. To do this, you must first trace the dovetail onto the guide.

Find the depth of your dovetail by placing the combination square on the base and dropping the rule into the dovetail. Mark this line around the guides. Then, take one of the guides, place one of the ends against the end of the base, and trace the dovetail shape with a pencil. Do the best you can. This should be a little rough, and you'll clean it up later. Do the same with the other guide.



Step 8: Cut the guides

(Sorry for the lack of photos on this step. Someone stole my electrons)

Place the guides in a vice or clamp them to your workbench, whichever way works best for you. Cut the face of the guide along the line you used to mark the depth. Using the backsaw, cut on the "short" side of the line. That is, cut within the area between the line and the edge where there is the least amount of material. Cut to the traced dovetail outline you made on the edge. Don't overcut. In fact, be sure to undercut. Cutting accurate joinery is The Price Is Right of woodworking. Except, of course, Bob Barker isn't there. Because, you know, he's retired.

After cutting the guide on one side, do the same thing to the other. After those are cut, you can use the backsaw to cut along the angle of the dovetail outline, or simply use the chisel, as you'd be going along the grain and it should require little effort. Be sure to undercut. You should now have a rough dovetail pin on the bottom of the guide. Use a chisel to clean it up. Sand the pin with 60 grit paper to really clean it up.

Cut the other guide the same way. Unless, of course, you goofed on the first guide, then cut the other guide the same way except for the goof.



Step 9: Tune the guides and dovetail

Now it's time to tune the guides and the dovetail. I usually use a diatonic tuning, but some prefer a chromatic tuning. Has anyone written an Instructable on how to be humorous? Maybe I should read it.

Slide one of the guides just into the dovetail. If it doesn't go in, then sand the guide a bit until it does. Do the same thing with the other guide.

Run one of the guides all the way through the dovetail. If it hits a sticky spot, do not try to force it, but remove it and try the other guide. If that guide makes it past the sticky spot, then the first guide has a problem and needs some sanding until it goes through. If both guides get stuck in the sticky spot, then there's a problem with the dovetail. Use sandpaper to widen the dovetail in that area until both the guides go through. Repeat this process until both guides run through the dovetail without much effort.

If the guides wobble a lot, then you overcut (or overtuned!) You can use it, sure, but then this piece would never make it on Antiques Roadshow, which would deprive your great grandson of the surprising knowledge that a collector would pay up to forty dollars for this heirloom. You don't want to do that to your great grandson, do you? Cut another piece of stock to replace the guide and try again.



Step 10: Mark up the faces to receive the guides

At this point you could easily put some wood screws through the bookend face and into the guides and you'd be done. Maybe that's where you're at with this project. Doing some of this stuff takes some patience and practice. I'll totally understand if you want to take the easy way out. But if you want to try your hand at some more hand cut joinery, then keep reading.

The guide will attach to the face using a partial mortise and tenon joint. With a mortise and tenon, one piece will have a pin on the edge, and the other piece will have a hole that receives the pin. There are several variations on this, and is one of the oldest woodworking joints.

Adjust your combination square so that it's not quite halfway across the bookend. This is going to be similar to the marking technique in step 3, where you marked the lines for the dovetail groove. Mark a line part of the way up the bookend, then put the square on the opposite edge and mark again.

Adjust the square so that it represents the height of the tenon. This should be less than the height of guide once mounted in the dovetail. mark this across the bookend, connecting the two lines you just drew.

Adjust the square so that it represents the depth of the tenon. This should be about halfway in. In the photos, I tried to shade the waste areas to make it clearer what it is you are about to cut.

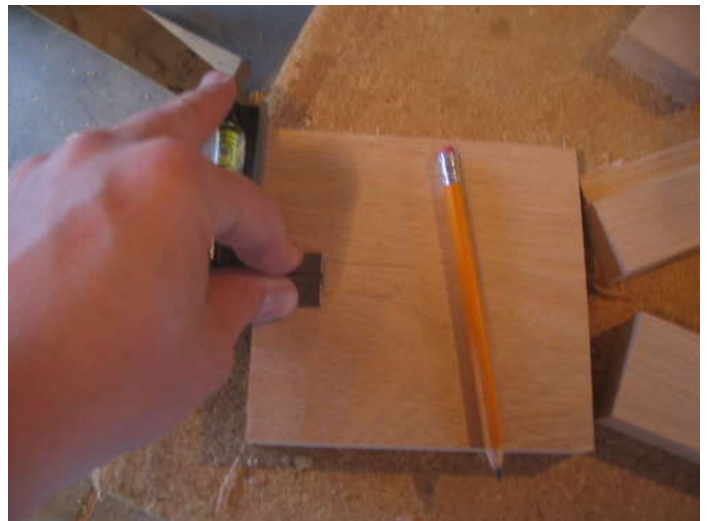
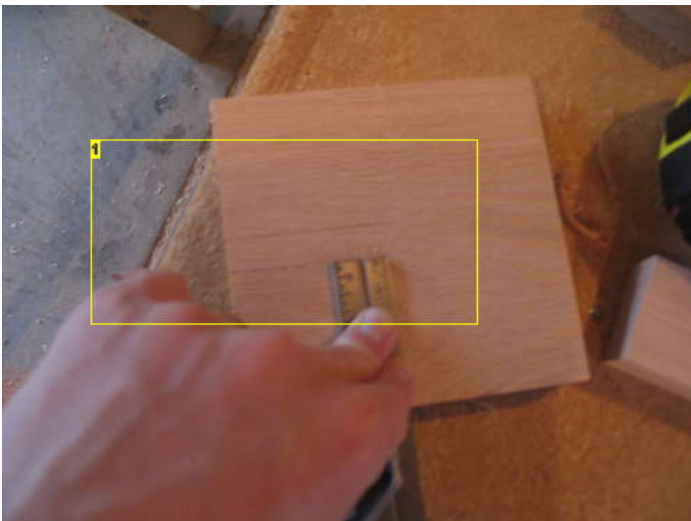


Image Notes

1. The distance between these two lines should be less than the width of the guide.



Step 11: Cut the notches in the bookends for the guides

Notch time! To cut out the notch for the bookend, we're going to borrow a method typically used for half-blind joinery. No, we're not going to wear a patch over one eye. In corner joinery, the joint is said to be "through" if the piece goes all the way through the joining piece, exposing the end grain. A joint is "half-blind" if a piece only goes part way through the joining piece, hiding the end grain of that piece.

To start, clamp the bookend to the workbench, with the waste side up and pointing toward you. Then, using the backsaw, cut the lines in the middle of the bookend just until the sawblade touches the bottom depth line and the top height line. Essentially, you're making a diagonal cut into the edge of the bookend. The pictures should help.

Once you have the lines cut, it's time to remove the rest of the waste. First, get on the other side of the piece (or turn the piece around). Place the chisel with the bevel down. This will prevent you from taking out chunks the size of Rhode Island as you perform this step. Pare down the material until you have made an incline from the the height line to the depth line. See the third photo.

Second, remove the remaining waste by starting at the height line and chiseling straight down (use the other edge of the dovetail guide, which magically becomes a square guide when you turn it around). Use the wooden hammer to drive the chisel into the wood. You're going across the grain here, so it'll take a bit of force. Do not go too deep. Instead, stop when the wood is really resisting, and then move the chisel horizontally into the waste, paring out a portion of it. Repeat this process until you make the notch as deep as it should be. This should only take a few minutes, so don't worry about spending your Saturday afternoon making some stupid notches.



Image Notes

1. The saw should not pass the height line here.
2. The saw should not pass the depth line here.

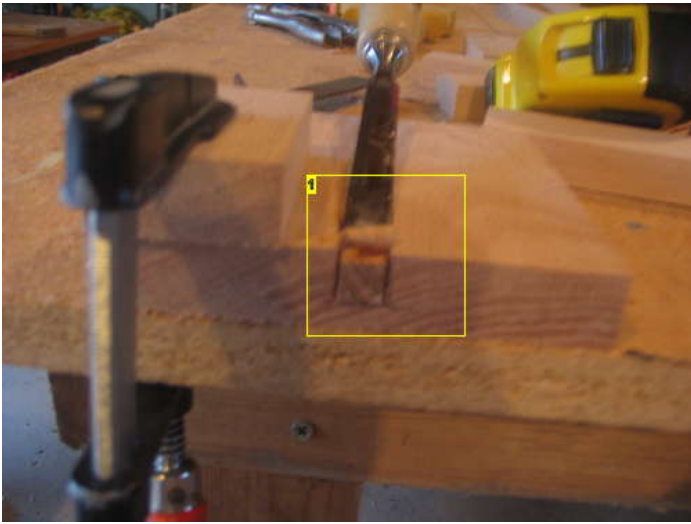
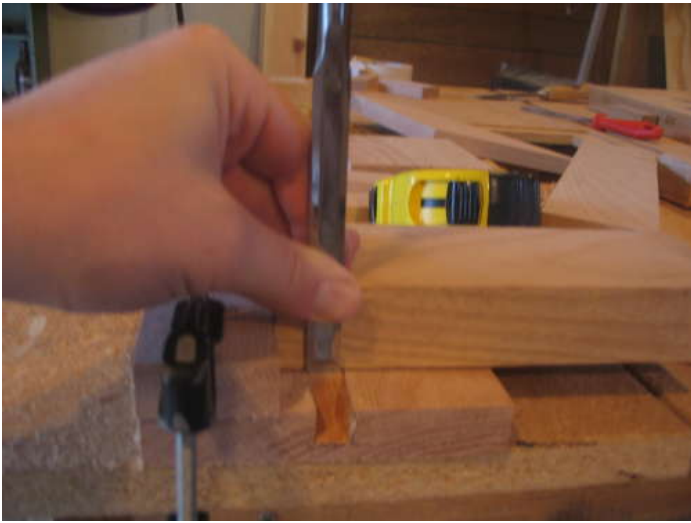


Image Notes

1. Bevel side down. DO NOT CHISEL TOWARD YOURSELF. This angle is for demonstrative purposes only.



Step 12: Mark the pins on the guides

The guides need to fit inside the holes you just made. I know, it seems silly. Why not just make the notches the same size as the guide? I have two answers for you. The first answer may be a load of male bovine feces, but the extra edges made by cutting a pin (the "cheeks") give extra support to the joint. If you're holding up some heavy books, this might make a difference. The second answer is more in the realm of reality. If you outline a notch the size of the guide and you screw it up, it's there for the whole world to see, and your great grandson will definitely NOT take this piece to Antiques Roadshow. If you cut the notch just a bit smaller, and then cut a pin in the guide to mate up with it, and you screw either of those up, it's hidden and nobody but you and the supreme being of your choice will know about it.

Anyway, since we hand cut the notches, we can guarantee that they are not exactly the same as each other. That's why I've labeled mine as "A" and "B". I also labeled each guide as either "A" or "B". The "A" guide goes in the "A" bookend, and the "B" guide goes in the "B" bookend. The label scheme isn't important here. You can use one/two, black/white, Friday/Smith, whatever.

Start with A. Lay the guide down onto the bookend and next to the notch so that the dovetail pin is below the notch. Mark the top of the notch onto the guide.

Turn the guide upside down onto the workbench and lay it next to the notch. Mark the width of the notch here. You'll need to eyeball it to be center, or you can measure the width of the notch, the width of the guide, subtract the two, divide the result, and set your combination square to that length and mark from each edge. Good luck.

Use the combination square to find the depth of the notch. Mark this across the top of the guide. You should now have marks that outline the pin that will go into the notch.

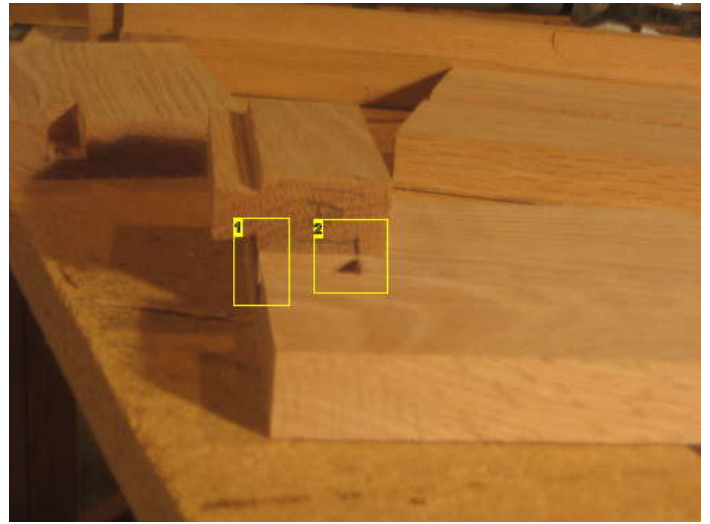


Image Notes
1. Line up these reference points.
2. Mark the top here.

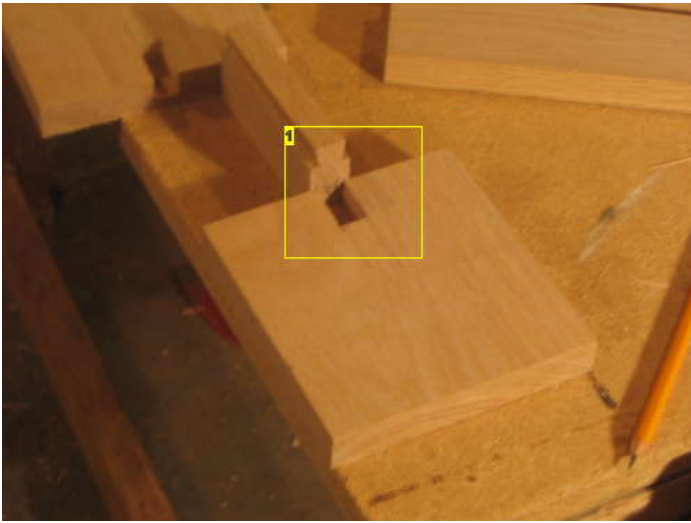


Image Notes
1. Mark the width.

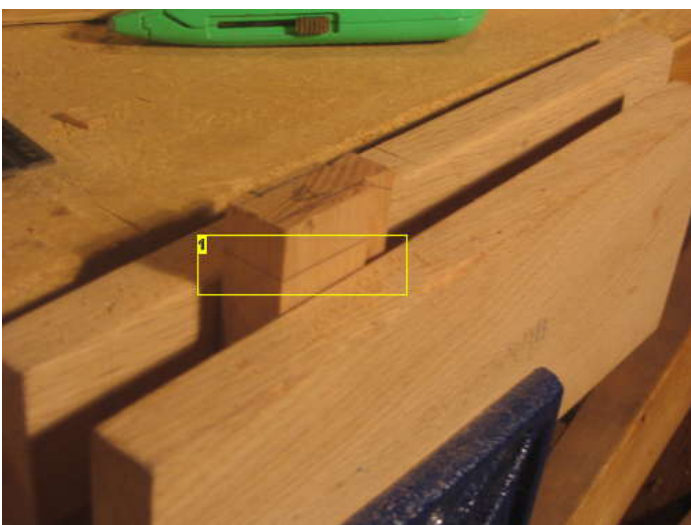


Image Notes
1. This is the depth line.

Step 13: Cut the pins on the guides

Time to do more cutting. Don't give up! We're almost done.

With the guide in a vise, cut straight down the width lines using the backsaw until the saw reaches the depth line. Then cut perpendicular to that cut, right along the depth line. This should remove a nice chunk from the guide. Don't worry about the dovetail pin. It should still function normally if you knock a little nub off the end there.

After you cut to define the width, cut along the height line down to the depth line. Then cut along the depth line toward the height line. You should have a nice little pin for the notch. Do the same thing for guide B.

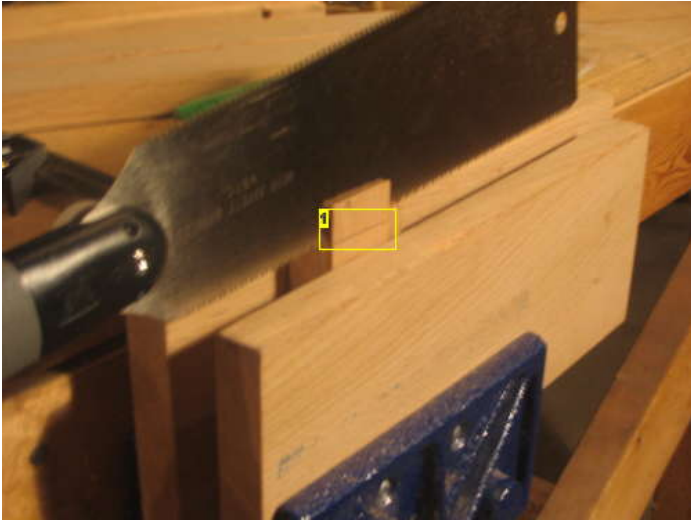


Image Notes

1. Cut to this line. Don't go past it.



Step 14: Tuning the guide pins and the bookend notch

Now that you have the notches and pins cut, it's time to fit them together. Don't try to force them together. Try to put the guide in the notch and sand the areas that seem to stick. It should fit snug, but not too snug, like a good sweater or perhaps a trepanation drill. Do the same to guide and bookend B.

Once tuned, send it on a dry run. Move the bookends up and down the dovetail. Make sure it runs smoothly. If it does, nice work. If it doesn't, try to figure out what happened. Maybe the pin that goes in the bookend is too tall. Maybe some sawdust fell in the dovetail. Maybe the dovetail was replaced with Folger's Crystals. Investigate and correct until you are satisfied.

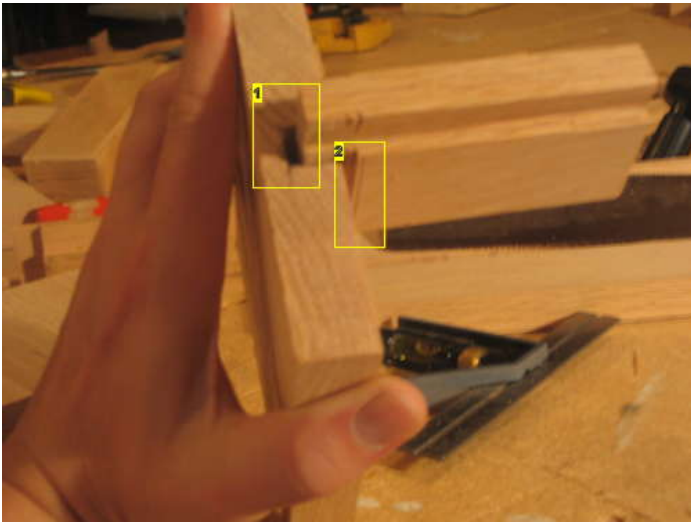


Image Notes

1. There's a bit of a gap here, which means the sides of the pin need to be sanded down or the depth of the pin is too short. Investigate and correct.
2. There's still space between the depth of the pin (the "shoulder") and the bookend, so it's likely that the width of the pin is too much and should be sanded down.

Step 15: Final assembly and comments

While there is no glue in the joints, decorate your bookends and guides in any fashion you like. Maybe you want to put a nice chamfer along the edges. Perhaps you want to round the corners. My wife wants a celtic knot cut out of the bookends. However you wish to express yourself, now is the time to do it. The functional portion of the piece is complete, and now it's time to be expressive. Once you're ready, put a bit of wood glue in the notches in the bookends, attach the guides, and clamp for a while. Be sure to use some scrap material between the clamp and the piece so you don't damage anything. Wipe off any excess glue with a damp cloth.

That's the rudimentary sequence of steps for building this bad boy. Now comes the even harder part of detailing and finishing the piece. I'm leaving that for another instructable, but here's some advice:

If you want to do something fancy with the bookends, do it before you glue up. It will make life easier.

Sand the piece down using increasing grades of sandpaper. This will bring out the grain, displaying the natural beauty of the wood.

When making meat sauce for spaghetti, brown the meat with a little salt and rosemary to give it a nice subtle flavor.

If you use a sealing finish, such as shellac, be sure to avoid getting it into the dovetail or on the dovetail pins. Doing so will change the geometry of the joint, and will probably cause the piece to stop functioning.

