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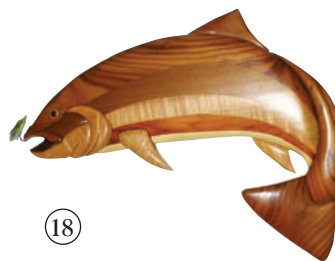
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Cover photo by Ray Pilon with assistance of
Luc Rousseau, www.CabinetMaking.com



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LINDA FULCHER

If you are looking to do something special for the crafter in your life, then the quilt rack is the perfect project. I still cherish some small display stands Paul made for me.

When the kids were young I use to paint watercolour postcards. I enjoyed that such small canvases seemed very doable amidst the hectic schedule that swung from balance sheets to refilling sippy cups.

When Paul surprised me one day with a collection of little easels, which he had made, I was thrilled. I gave many easels away along with my paintings as gifts. Paul's thoughtfulness still brings a smile to my face when I rearrange our shelves and set one of the paintings back on the easel or when I visit family and see one of my paintings on display in their home.

It is so simple to find versions of easels and quilt racks at the super stores these days, and a few have found their way into our home. But when it comes time to clear clutter, it is the commercial versions that make their way to bins destined for garage sales or the second hand stores.

This accumulation of stuff has me wondering how times change. It seems that 70 years ago people lived through The Depression and a lack of stuff, while today we have "the depression" over the sheer volume of stuff that seems to accumulate in our homes.

So my thought is to clear out the items that hold no meaning and make time and space for projects that will be cherished. Keep this in mind when you are making the quilt rack, spice holder, cane saw, key holder or recycling centre. The fact that these items were made by

you will go a long way to giving them immunity, when it comes time to clear clutter, and decide which items go out the door, and which find a place of honour in your home.



PAUL FULCHER

I watched as the happy woodworker strut past my woodshow booth, a string of uniformed men pulling various sized boxes in tow. As he passed, he turned and said with a smile, "You just saved me 500 bucks."

"What on earth could he be talking about," I wondered. And there I stood wondering, until he was out the door. Then I realized: If I don't find out now, I'll never know- so I ran and caught up with the happy shopper.

"What do you mean?" I questioned, as his purchases were being loaded into his truck. "How did I save you 500 bucks?"

"Well," he said, "before I came to this woodshow I knew that I wanted a table saw, a jointer, and a planer – I just didn't know which brands, or how much to spend.until I visited your Woodworking Forum."

"You see, I kinda get nervous around sales people" he said, as he looked sheepishly toward the guys loading boxes ... "I've even walked from a purchase because of not being able to decide. In some cases, I've resorted to buying the most expensive option, because I was afraid of buying something inferior."

"So, before I came to this show, I went to your woodworking forum and asked the guys there what their experience with those tools were. It wasn't like asking a sales person for info – these were woodworkers who use those tools regularly – and they don't have anything to gain by telling me what they like or don't like about a tool. Anyway, before I got here I already knew what to look for, and how much to pay. It was great!"

I thanked him for filling me in, and watched him pull out of the lot with a truck full of new machinery.

So, when you are reading our new Air Tools series (page 26), and you want to find out more about using air in your shop, be sure to drop by our woodworking forum and see what the woodworkers there think. They might even be able to save you some money.



CORRECTIONS:

Dec/Jan '08, Issue #51

Page 46: The Tormek wheel has a 10" diameter, not 8".

Feb/Mar '08, Issue #52

Page 36: A full range of joinery bits is also available from Woodline USA, www.Woodline.com.



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Layout Squares

I really enjoyed making Michael Kampen's layout squares (Dec/Jan '08, issue # 51). I made mine out of purple heart, white oak, and walnut, with a slight



modification. I drilled and installed 1/4" maple dowels to help with the strength of the joint.

Truly a nice easy project I'm sure many readers would enjoy. Keep up the great work!!

Kevin S., Kitchener, ON

Purpose of a Caul

In a number of your projects, you make reference to 'cauls'. What are they and what are they used for?

Francois L., Winnipeg, MB

Continued on page 44

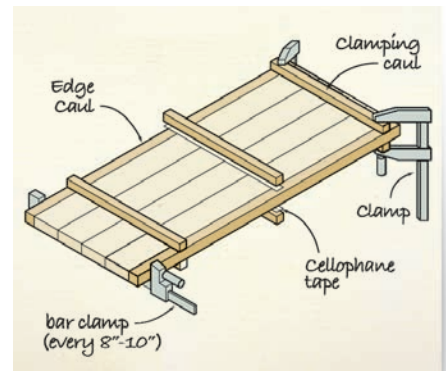


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Quilts courtesy of Rosemary Gray, Port Alberni, BC

Arts & Crafts Style Quilt Rack

What could be more comfortable than curling up on a cool evening with a nice quilt, a good book and a cup of tea? This Arts & Crafts influenced rack is the perfect place to display and store your quilts.

White oak is the traditional material associated with the Arts & Crafts style, but other woods like maple and cherry were used as well. I have not yet found an original piece made in padauk, but as I prefer to let the natural colour of the wood show through rather than using a stain to colour a piece, the beautiful padauk boards that I stumbled on at the lumber dealer seemed perfect for this project.

Construction is straightforward and there are several options available for the joinery. The rack is essentially two panels joined by a set of five rungs on which the quilts rest. I've chosen to use router cut mortises and tenons for all the joinery. Wedged through tenons would also be a desirable design element. Another option for some of the joints would be dowels. However, the width of the eight narrow slats will only allow for one dowel per joint. That would leave them free to rotate until the glue sets, and would result in misaligned slats.

Prepare the Stock

When you are beginning a project, there are many choices to be made, and as you move through the various stages, the decisions you make will narrow these choices until you have a finely crafted unique piece of furniture.



Leigh FMT

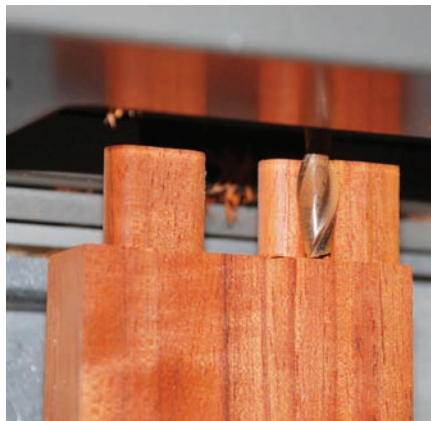
To achieve a harmonious look in the final piece, pay particular attention when laying out your parts on the rough lumber. Try to visualize what the finished part will look like in place and choose a pleasing grain pattern that will enhance and reinforce the overall appearance of the piece. When incorporating curves in your work, lay them out so that the grain pattern follows the curve rather than one where it runs counter to the curve.

After you have laid out all of the parts, break up the boards into smaller sections before milling the pieces. By breaking the pieces up, you will lose less thickness as you mill the material to its final thickness.

Earlier in my woodworking career I used a table saw and a compound mitre saw for this task but over the years I have found this process to be safer and more enjoyable when done with a hand saw (or jig saw) and a bandsaw. When using a bandsaw, the cutting force is applied downward against the table instead of back toward the operator and if the wood has internal stresses and the kerf closes on the blade, the material won't be thrown back at you. A bandsaw blade is also very short (front to back) and as such it is highly unlikely that a piece of wood could even move enough to pinch the blade.

'Breaking out' lumber refers to the process of cutting larger boards or sheet stock into smaller more manageable pieces before milling the lumber to final dimensions.

With all of the pieces broken out of the original planks, use a jointer and thickness planer to dress the stock to its final thickness and rip the pieces to



Milling tenons with Leigh FMT

their final width according to the measurements in the materials list. Do not cut them to length yet.

When building a project like this, breaking the lumber down into sections allows you to maximize accuracy by using the same machine set up to cut all pieces of the same length at one time, and will pay dividends with an easily assembled square project during the glue-up later.

Mortise and Tenon Joinery for the Panels

If you only make the occasional mortise and tenon joint, you can cut the mortises with a drill press, chisel and mallet, and the tenons with a table saw, tenoning jig, and chisel or shoulder plane. However, if you do a lot of M&T work then you might want to consider a dedicated M&T jig, like the Leigh frame mortise and tenon jig (FMT). The FMT offers woodworkers precision and speed that was unheard of in the home workshop ten years ago; adjustments of .001" are not only possible, but easy to accomplish (www.LeighJigs.com).

All the tenons for the slats are $\frac{5}{16}" \times \frac{3}{4}"$; the narrow slats have one tenon while the wider center slats have two tenons. It's important to ensure that all the slats are cut to the same length. Regardless of whether you use a cross cut sled on the table saw or a compound mitre saw to cut the pieces to length, using a stop block will ensure that every piece is exactly the same length as its neighbour. Begin by trimming one end of each slat piece to square the end, and then set up a stop block and cut all eight narrow slats (A) and the two wide ones (B) to finished length.

Repeat this process for the lower rails (C) and the middle rails (D) – note that



Trimming upper rail

these tenons are $\frac{5}{16}$ " x 1 $\frac{1}{4}$ ". Choose which side you want to face out and mark the pieces to avoid confusion later. Along the length of the narrow edges that face each other, mark the center point and then mark the centerlines for the mortises out to either side. If you are not using the Leigh FMT, then use a traditional marking gauge to define the edges of the mortises. Lay out the mortises so that the back edges of the rails and slats are flush with each other.

Cut the tenons on the ends of the slats and the rails, followed by the mortises in the rails. Test fit the two sections together and fine-tune any problems with the fit of the tenons. Cut the piece for the top rail (E) to length and cut two tenons on the lower portion of each side. Leave the top portion full width, as this will overhang the legs.

The Legs

Mill the stock for the legs (F) to dimension and then cut the four pieces to length with one set-up. If your local lumber dealer doesn't have any thick stock for the legs, glue up a blank from two pieces of 4/4 stock. Joint one side of each piece and then glue them together and mill the result to size. If you are using quarter-sawn stock, the glue line will be almost invisible.

Lay the legs on a workbench, and position the assembled slats (A, B) and rails (C, D), and the top rail (E) on the legs. Mark the locations of the four mortises on each leg, and then cut the mortises. I also counterbore a hole into the bottom of the leg to accept nylon furniture glides, leaving only $\frac{1}{8}$ " of the glide projecting past the end of the leg.

Rungs Connect the Panels

The five rungs connect the two end panels together. First cut the four upper and lower rungs (G) to length, and then cut a $\frac{5}{16}$ " x 1 $\frac{1}{4}$ " tenon on each end of the rungs. Lay out and cut the mortises on the legs so they match with the location of the mortises for the rails.

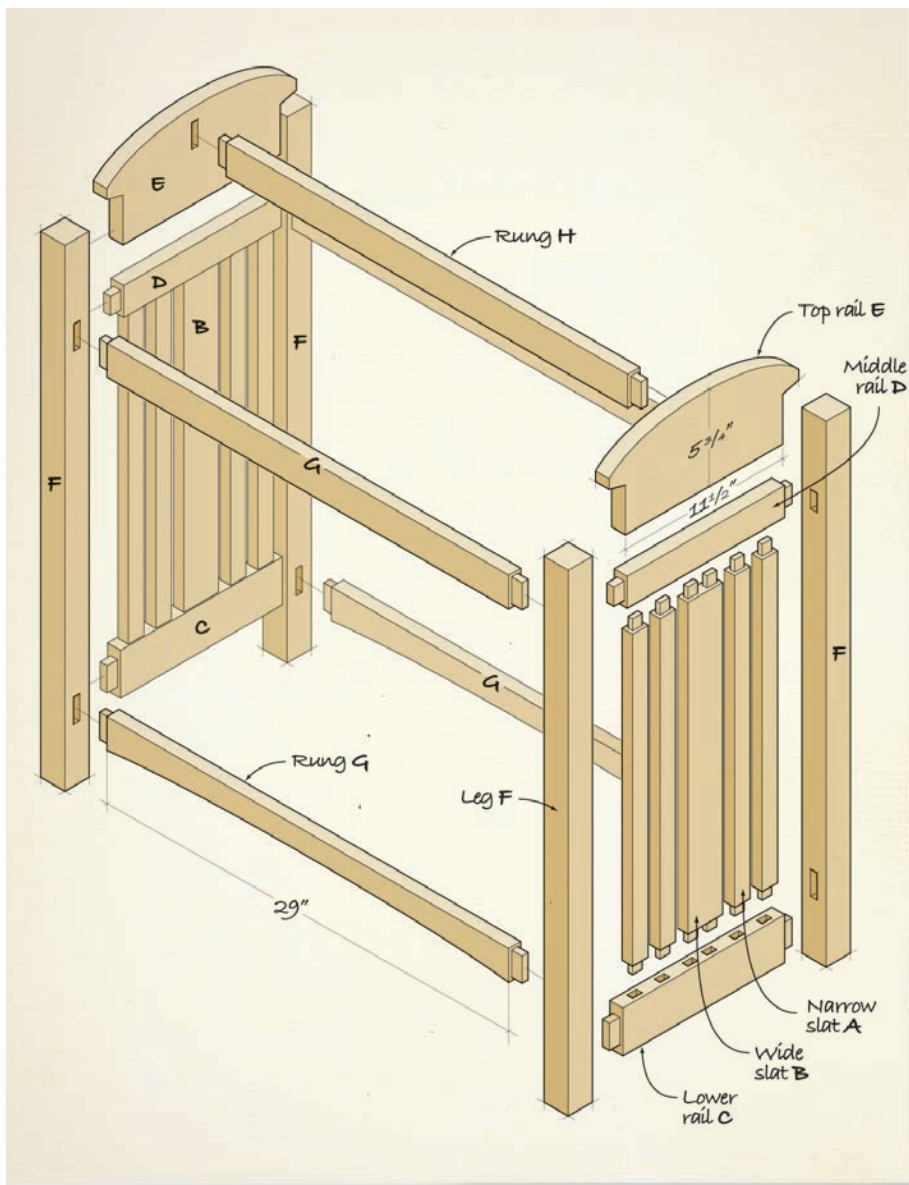
At this stage everything should fit perfectly if the components have all been machined in groups, and the assembly should be straight and square. The center rung (H) is the last piece to fit, but it is also the first whose measurement is determined by the work done so far. Assemble the rack and apply some clamps to close up the joints.

Measure the clamped up project for the final distance between the inside faces of the two top rails. Add 1 $\frac{1}{2}$ " to this length (for the two $\frac{3}{4}$ " tenons) and cut the piece to length. It's now a straight forward process to cut tenons on each end of the center rung, and then mark out and cut the mortises on the inside faces of the top rails (E).

Introduce Some Curves

Most joinery is based on wood that is straight and square; that is what makes it possible to accurately lay out and cut tight fitting joints. While our hands and brains may like to work this way, the eye and the heart perceive anything made purely of square shapes and straight lines as clunky and boring. Whether they are used to create a sense of movement or to lighten the look of a heavy piece, adding a couple of curves to a project can dramatically change the way we perceive a piece. My original concept of a fairly pronounced bump to give the center rung some additional height evolved and softened into the broader overhung arc of the top rails (E).

I positioned a one-inch wide spacer as a stop block on either side of the top rails, and on top of the legs marked the center point on the top edge of the piece. Using a flexible drawing batten and a 2B pencil I drew an arc across both top sides of each rail. I used the same method to draw a shallow arc across the bottom edge of the two front and back lower rails (G). It's quick work to cut the curves out on a band-saw and then fair (smooth) the curves with a sander or by hand with files and sandpaper.



Illustrations by: www.JamesProvost.com

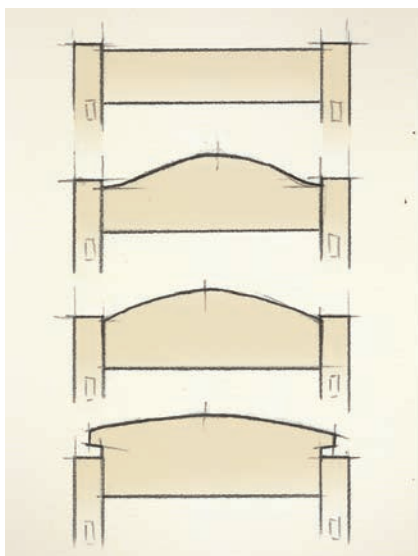
Fairing is a term that originated with boat builders. It refers to smoothing a curve until there are no noticeable bumps or transitions along the length of the curve. You can fair a curve with hand planes, spokeshaves, files, or sandpaper.

Final Touches

Set up a 45° chamfering bit in the router table and mill a 1/8" chamfer on the edges of the top and bottom of the legs and then chamfer the sides. Follow this by sanding all the surfaces up to 220 grit in preparation for the finish. As usual, I apply the finish before assembly, applying painter's tape to the tenons and over the mortises to keep the finish out. Glue will not adhere properly to a finished surface. I chose to apply a Danish Oil to bring out the beauty in the wood followed up by Antiquax English Wax (www.Circa1850.com).

Some projects can be glued up in sections, but this can sometimes cause problems. In this case, if you were to glue up the center sections for the ends first, unless you are very lucky, the four tenons will not line up properly with the four mortises on the legs. Multiply this by two sides and you may find the chance for problems too high. In this case, it is best to glue up the entire end as one piece. I find it advisable to run through a trial glue-up once before the glue hits the wood. Take this opportunity to check your timing, gather all of your materials and supplies and to work out any last assembly issues before it is too late. On mortises and tenons I find it easier to use small artists paintbrushes or acid swabs (#83K04.01, www.LeeValley.com) to apply glue.

Begin by gluing things up in the same order as the parts were made. Start with one side, assembling the slat (A) and end rail (B) section first, and then attach



Evolution of the upper rail

this section and the top rail (E) to the legs (F). Clamp and check for square. Once the glue has cured on the sides apply glue to the rung mortises and attach the rungs (H, G) to the sides. Clamp the project up and let the glue set.

As with any project presented in this magazine, you don't have to slavishly copy the design; feel free to add your own design elements. You might want to make the legs slimmer or have them rounded or curved, reduce the number of slats, or add a decorative inlay to the upper rail. After all, woodworking should be an enjoyable and fulfilling avocation.



MICHAEL KAMPEN
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SUPPLY CHECKLIST

- 12 BF lumber

MATERIALS LIST (All measurements in inches)

Part	Qty	T	W	L
A Narrow slats	8	3/4	1 1/8	22 1/4
B Wide slats	2	3/4	2 1/2	22 1/4
C Lower rails	2	15/16	3	13
D Middle rails	2	15/16	2	13
E Top rails	2	15/16	5 3/4	13
F legs	4	1 3/4	1 3/4	34 1/8
G Front & back rungs	4	7/8	2 1/8	30 1/2
H Top center rung	1	7/8	2 1/8	29 13/16

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With stories about landfill sites nearing capacity appearing regularly in the news, it's hard not to be aware of the growing need to divert some of this material by recycling whenever possible. Build this simple rolling recycling station to keep your recyclable material sorted and your garage or utility room tidy.



Recycle Centre

This is a basic project that can be completed easily in a weekend using inexpensive plywood and simple construction techniques. There are no fancy ornamentations or details to worry about – its sole purpose is to hold four bins and provide a work surface to sort your recyclables. All pieces are made using $\frac{3}{4}$ " poplar plywood. This is the least expensive grade of veneered plywood that was available locally, but I sorted through quite a few sheets to find some pleasant looking ones.



Cutting plywood with Black Jack guide and Skil saw

Lay Out the Plywood

You will need two full-size sheets of plywood for this project. Laying out the cut lines on the plywood can be a somewhat frustrating exercise. The traditional method of juggling the pieces mentally until everything fits with minimal waste takes time and doesn't guarantee you'll get everything right. Alternatively you can use a software program like CutList Plus that makes quick work of laying out sheet stock and lumber so that you make optimal use of your stock.

When you have laid out the cut lines on your plywood, the next limitation of the average home shop comes into play – a table saw capable of ripping and cross cutting a full sheet of plywood. The safest way to cut the plywood is on a cabinet saw equipped with a sliding table or one that has an outfeed table placed behind the table saw to support the plywood. Of course, manhandling a 4' by 8' sheet of material onto the top of a table saw is not only heavy work, there is always the risk of kick back. I use another method instead. I first cut the plywood down to manageable size pieces using a Black Jack Clamp & Guide fence (www.WorkshopSupply.com)

and Skil saw, (www.SkilTools.com) and then trim the pieces to final size on the table saw.

You can do this on the shop floor, or on a work table if it's large enough. I put a plywood support frame made up of 2 x 4s under the plywood and place the plywood, good side down, on the framework. Then it's just a matter of clamping the Black Jack guide to the plywood, and running a circular saw along the guide to make the cuts. I extend the saw blade for a $\frac{7}{8}$ " deep cut, which only makes a $\frac{1}{8}$ " cut into the 2 x 4s. The 2 x 4s will last a long time before needing replacement. You can make a framework like this out of 2 x 2s as well. The half-lap joints make it quick to disassemble and the pieces can be easily stored. If you buy your plywood from a building supply centre, some of them will rough trim your plywood for about a dollar a cut. Simply take them your cut list, remembering to allow for a final trim-up at home.

Edge Band the Plywood

When working with plywood the exposed edges will need to be covered, typically with a material that matches the face veneer. For surfaces that will receive minimal wear, like the

edge of a bookshelf, a veneer edge tape might be acceptable. Commercial pre-glued real wood edge banding is available in the same thickness as veneer, about $\frac{1}{16}$ ", and is applied using a clothes iron and a roller. This project is likely to see a lot of abuse as bins are balanced on, or collide with the edges of the cabinet on a regular basis. I decided to apply $\frac{5}{16}$ " wood edge banding. The process is quite simple.

- Begin with enough 4/4 (1") boards to generate the number of edge band pieces of the right length you will need for your project. Expect to get about six to eight pieces of edge banding from each 3" wide board. The longest board you will need for this project is 48". Flatten one face of the board on the jointer, and then flatten one of the adjacent edges.

- Set up a fence on the bandsaw and using a 3 tpi, $\frac{1}{2}$ " blade, cut a $\frac{3}{8}$ " slice off the jointed edge. Head back to the jointer and dress the fresh sawn face on the board. Back at the bandsaw cut off another $\frac{3}{8}$ " slice, and continue until you have enough pieces, plus a few extras.

- Run the $\frac{3}{8}$ " slices through a thickness planer to bring them to a final thickness of $\frac{5}{16}$ ". Take thin cuts, as the slices are thin, and can be easily chewed up by the planer. I find it best to run four or five slices through the planer at a time.

- Glue the banding to the edges that require them, and once the glue has set, trim the edge banding flush to the face of the plywood with a top bearing guided trim bit or a hand plane.

Join With Dowels and Pocket Holes

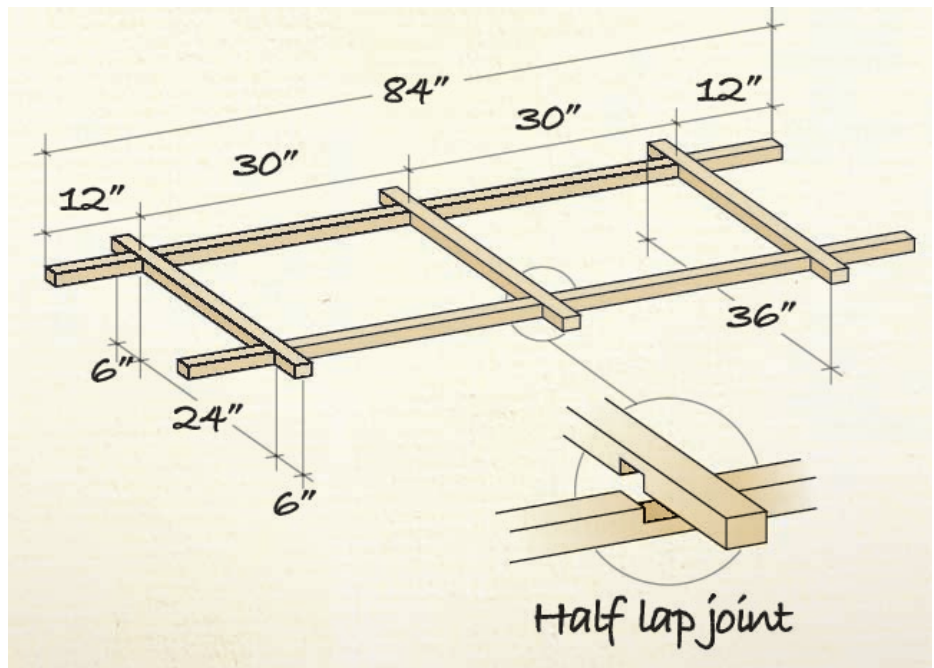
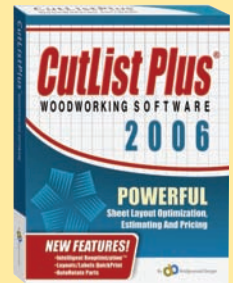
To keep things simple, without a lot of visible fasteners, I used $\frac{3}{8}$ " dowels to locate and hold the dividers (D) to the top (A), shelf (C) and bottom (D) pieces, and the shelf to the sides (B). I typically space the dowels every four inches. Dowel centers (#66J45.02 www.LeeValley.com) are a quick and easy way to accurately align stock for hole placement. Pocket holes would work as well, but wouldn't provide the self-aligning feature that the dowels do. Dados are another option,



Trimming edge banding

CutList Plus

If you find yourself spending a lot of time preparing cut lists, then it might be time for you to consider automating the process with CutList Plus. This program takes the hassle out of calculating optimized stock layouts. When you create a project in CutList Plus you have the opportunity to set certain parameters such as stock selection, costs, waste and edge banding that pertain to the specific project. You simply enter the dimensions from your materials list and CutList Plus compiles a shopping list of materials, calculates the costs, and best of all, provides layout diagrams for cutting your sheet goods. When viewing the sheet layout screen, you have the option of choosing one of five options to define the parts layout based on your preferences for rip cuts, cross cuts and off-cut sizes. There is also a standard layout option and each of these is available to view at any time. Choose the one that suits your needs, print it and take it out to the shop with you. The program will also print out labels for each part you cut to help keep things organized as well as calculating the number of feet of edge banding you will need. www.CutListPlus.ca



as are biscuits. Choose a method for which you are equipped, but remember to adjust the material dimensions as required.

- Drill a row of dowel holes all the way

through the center of the shelf from back to front and then drill a set of holes $\frac{3}{8}$ " deep in the center of the underside of the top, and the top side of the bottom piece.



Drilling pocket holes with Kreg K3 Master System



Attaching stretchers to bottom

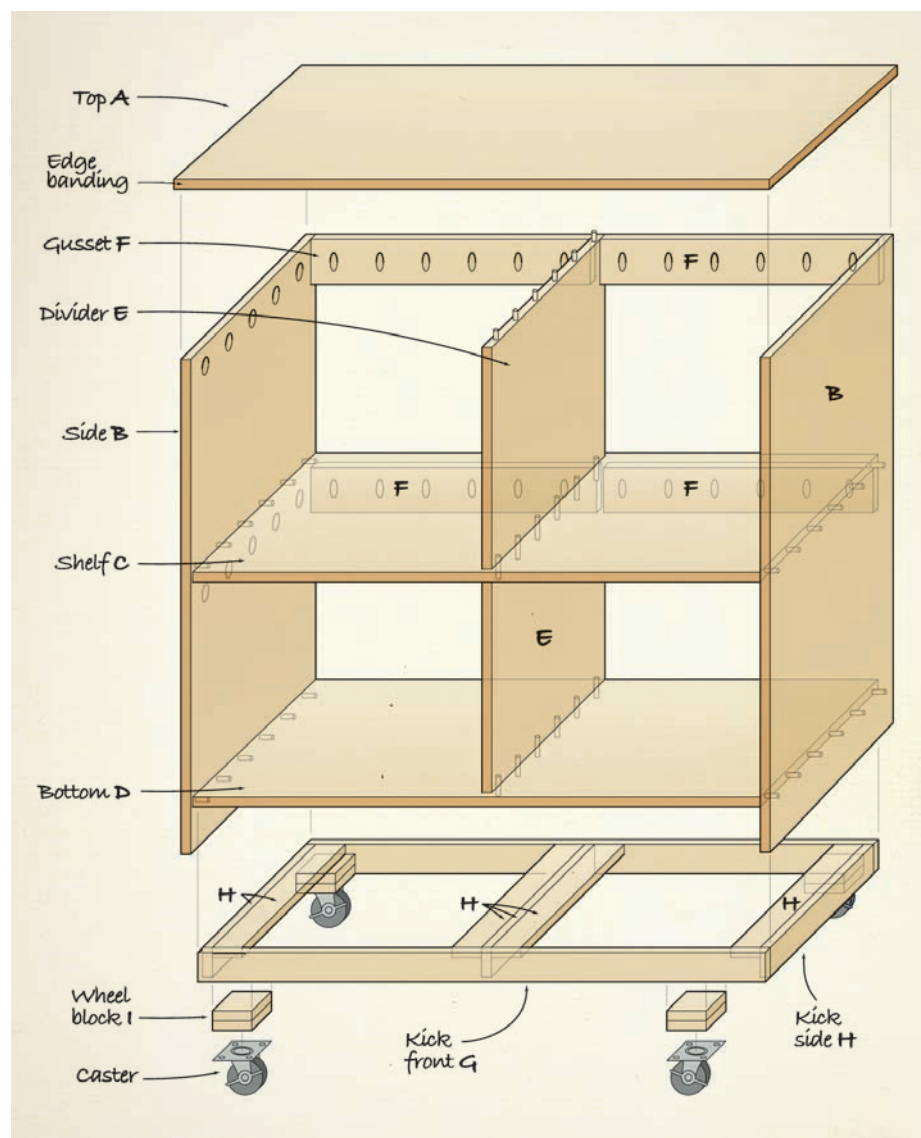
- Drill corresponding holes in the top and bottom edges of the two dividers.
- Drill dowel holes in the ends of the shelf and matching holes in the sides.

To attach the top (A) and bottom (D) to the sides (B) and the gussets (F) to the top and shelf I use the Kreg K3 Master System

(www.KregTool.com). It makes for quick and accurate pocket hole joinery. I place the pocket holes about 5 1/2" apart on the long sides with a pair on each of the narrow ends. Drill the pocket holes on the inside top edge of each side to fasten the top. You can fasten the gussets to the top and shelf from the back side. Use the same procedure to drill the pocket holes in the base.

MATERIALS LIST (All measurements in inches)

Part	Qty	T	W	L
A Top	1	3/4	19	45 3/8
B Sides	2	3/4	17 1/8	36
C Shelf	1	3/4	16 7/8	43
D Bottom	1	3/4	17 7/8	43
E Divider	2	3/4	16 7/8	16 3/8
F Gussets	4	3/4	3 7/16	21
G Kick front & back	2	3/4	2 1/4	43
H Kick stretchers & sides	7	3/4	2 1/4	15 3/4
I Wheel blocks	8	3/4	3	3



Assembly and Finish

Sand all surfaces including the faces of the edge banding in preparation for finishing. Ease the edges of the banding with a block plane or a piece of sandpaper. Remove any residual sanding dust and then, if you wish, apply a stain of your choice.

Follow this up with a tough film finish like Helmsman Spar Varnish (www.HomeHardware.ca) that will protect the surface from moisture and surface damage. Assembly is straightforward.

- Begin by putting the base frame together on a flat surface. Place the bottom face down on a table (or over a piece of cardboard on the floor) and place the base upside down on it. Fasten the base frame to the bottom using #8 flat head wood screws.

- Glue the dowels into the bottom of the lower divider and glue it into the dowel holes in the bottom piece. Place dowels in the top edge that will pass through the shelf and into the bottom of the upper divider.

- Glue dowels into the ends of the shelf. With someone else providing assistance, place the shelf on the lower divider and glue the sides to the shelf. At this point the only connection between the base, divider, and sides is the one row of dowels. Carefully apply some clamps to the sides at the base and turn the unit over.

- Fasten the sides to the base using some #8 flat head wood screws. Turn the unit over again. Fasten the two lower gussets in place with pocket screws.

- Glue dowels into the top of the upper divider and set the top piece in place. Drive pocket screws from each of the sides into the top as well.

- Fasten the upper gussets in place with pocket screws.

- Turn the cabinet over and place the wheel blocks in each corner with some glue. Use a couple of screws to hold the block in place until the glue sets. Screw the castors to the blocks and turn the unit over.

Now that your recycle centre is finished, put it to good use. Place the cabinet in the garage or car port, and stock it with blue bins.

You are now ready to do your part to recycle.



MICHAEL KAMPEN
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SUPPLY CHECKLIST

- Two sheets of 3/4" plywood
- 51 feet of 5/16" x 1" edge banding

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Tambour Spice Cabinet

Tambour doors were first employed in France during the 1600s and their use became widespread during the 1800s with the advent of roll top desks. Today you can often find them in kitchens, mounted on built-in or movable cabinets, between the countertop and the upper cabinets. Generally they are used for storing breads or small appliances.

I built this oak spice cabinet because I didn't want to use an open rack or stand. This design incorporates a tambour door over a simple cabinet that holds 27 spice bottles and a small drawer for storage of bulk spices. The cabinet leaves 15 inches of clear counter space at the front.

You can easily accommodate the number of spice bottles by increasing or decreasing the width of the cabinet. The bottles I used were 1 3/4" diameter by 4" high. If your bottles are higher than 4" you will have to increase the height of the cabinet.



You might find it convenient to mill all the project pieces first. Mill them a tad longer than finished dimensions and cut them to length just before assembly.

Route Tambour Track

The tambour door rides in a track routed on the inside of the two side pieces. Make a template to rout the track (see Tambour Tracks sidebar). Before you rout the tambour track, cut the side pieces (A) to finished dimensions. Then use a pencil to mark the location of the canister shelf mortises, the bottom shelf dado, and the drawer track on the side pieces. You will cut the mortises and dados after routing the track.

Construct the tambour track jig, and rout the track on both side pieces. If you are new to freehand routing you'll find it easier to rout the track taking two, or even three, shallow passes. Use a light, mid-power router, in the 1 3/4 to 2 1/4 HP range equipped with a sharp router bit.

Build the Cabinet

Once the track is routed you chop out the 5/16" deep mortises for the canister shelves. As there are only four of these to do I chop them out with a chisel and mallet. Pre-drill the mortises to make it a bit easier to chisel out the waste. Next, rout the 1/2" wide dado for the bottom shelf, the 1/8" dado for the drawer track, and the 1/4" rabbet for the back. Be careful when routing the dado for the drawer track where it exits the front edge of the side piece.

Mark out 2 1/2" radius curves on the top of both side pieces, cut the curves off at the band saw, and smooth the curve. I used a 1/2" round over bit to profile the inside and outside edges of the sides. You could also use a sander. However, do not round over the bottom edges of the side pieces.

Cut the back (B), bottom shelf (E) and canister shelves (F) to length and dry fit the cabinet, ensuring that all is square. At this stage you can apply a finish to these pieces, being careful not to get finish into the mortises, dado and rabbet, or on the front

edge of the bottom shelf. The easiest thing to do is apply masking tape over the areas you don't want finish on. Don't forget to apply a thin, even coat of finish in the tambour track. Once the finish is dry you can glue up the cabinet, ensuring that everything remains square.

Build the Tambour Door

To best maintain a continuity of colour and grain pattern, mill the tambour slats (I) from a single board. A 12" x 36" board should give 22 slats. Joint one side of the slat board, rip off a slat, joint the board again, and rip another slat. Continue until you have 11 slats, and then cut the long slats into half. You might want to make a couple of extras. It is not unusual when ripping narrow pieces that internal stress in the wood is released resulting in warpage which may only take place several hours after the slats are milled. Round over the edges of the slats on a router table and sand them smooth. I used a rounded over profile, but you can choose an alternate profile.

Before you use the canvas, wash it, even if the product is 'pre-shrunk'. If you can't purchase pre-dyed canvas, you can dye canvas using common vegetable dye. You will need to construct a simple jig to glue up the tambour door (see Tambour Gluing Jig sidebar).

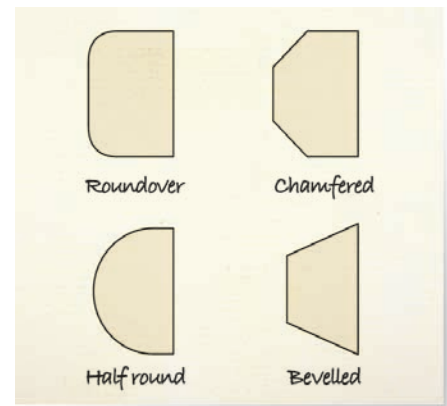
Cut the canvas one inch narrower than the finished length of the slats. Lay the canvas on the jig and cut off any excess canvas that projects beyond the bottom end of the jig.

Remove the canvas from the jig and lay wax paper on the bottom with at least 1/2" extending up over the side and the top braces. Cut the slats so they fit snugly in

between the side braces. The wax paper will provide sufficient clearance for the slats to move smoothly in the tambour track that you milled into the side pieces.

Lay all the slats in the jig, and place a center reference mark on the last slat. This is your last chance to check that the slats are laid out for optimal colour and grain pattern. Remove the slats in a sequential order, place the canvas in the jig, on top of the waxed paper, and then place the slats on the canvas. Draw a line on the canvas along the bottom edge of the last slat; don't apply glue beyond this reference line.

Now you are ready to glue up the tambour door. I used white carpenter's glue and a small foam paint roller to spread an even coat of glue on the canvas. Realign the canvas to the reference marks on the top brace, and position the slats in their sequential order. Place the end brace in between the side braces and up against the last slat. Use two bar clamps set about four inches in from the slat ends, applying just enough pressure to



Optional slat profiles

squeeze the slats together along their lengths. Place another piece of waxed paper on top of the slats and place the pressure plate on top. Put a weight on the pressure plate to force the slats down onto the canvas. I used a concrete building block. While the glue is curing, mill the handle (J), and round over the front corner.

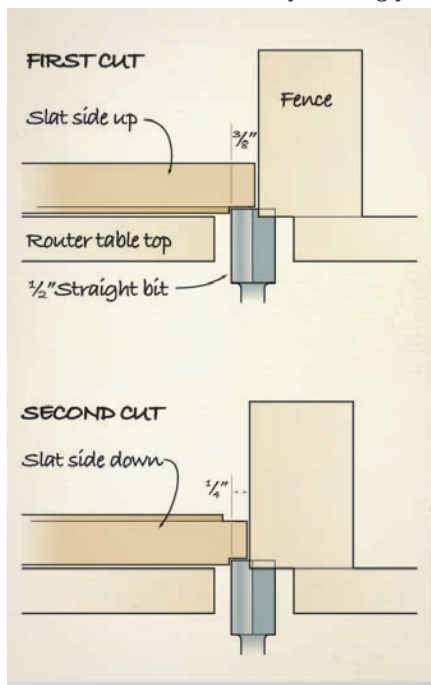
Tambour Track

Cut a piece of 3/4" MDF 5 5/16" wide and 12 1/4" long, and draw 2" radius curves on three of the corners. Use a bandsaw or jig saw to cut off the corners, keeping about 1/16" outside the cut lines. Then smooth over the curves.

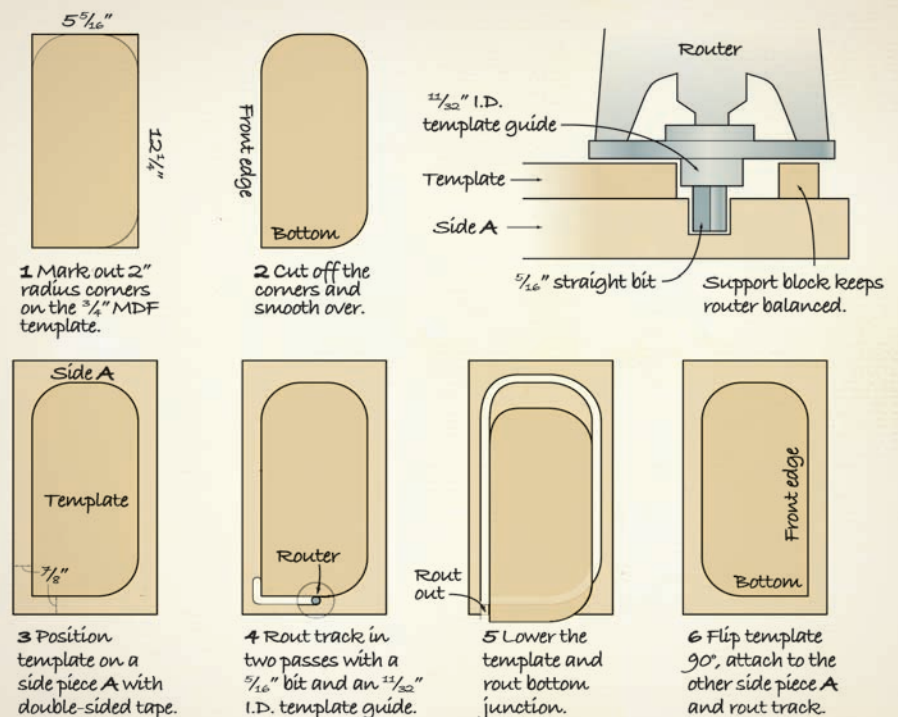
Using double sided tape, attach the template to one side piece (A), positioning the template 7/8" above the bottom, and 7/8" from the front edge, of the side piece.

Install a 1 1/32" inside diameter (i.d.)

template guide and 5/16" straight bit in your router, and use double sided tape to attach a 3/4" thick support block on one edge of the router base. Now rout the 5/16" deep track; do so in two shallow passes, moving in a clockwise fashion, rather than taking one full cut. Once the track is routed remove the template and position it over the bottom edge of the side piece, and then rout the bottom junction. Flip the template 90°, attach it to the other side piece, and rout the track.



Trimming the tambour



blocks at these junctions following final assembly to cushion the tambour when it comes to a stop.

Finishing the Cabinet

To make it easier to apply a finish to the tambour, use the band saw to cut two 6 1/2" to 7" diameter discs from a piece of 2 x 8 softwood. Wrap a piece of double sided tape around each disc. Placing a disc at each end of the tambour, wrap it, slat side out, around the discs. This will expose the edges of the slats for finishing. Several coats of a thinned varnish applied by brush will go on easier than a single heavy coat.

Apply a finish to the remainder of the cabinet components, install the tambour door, the face board assembly (C, D),

SUPPLY CHECKLIST

- 3/4", 1/2" and 3/8" oak
- 1/2" and 1/4" oak plywood
- 3/4" x 5 1/2" x 12 1/2" (template)
- Two handles, 1/2 metre of 10 oz canvas and four bumper feet
- Finish, wax

face board support blocks (G), bumper blocks, and bumper feet. Finally, apply a coat of wax on the drawer slides.

For the final, and crucial installation of the spice bottles, it's a good idea to involve the person who will be the

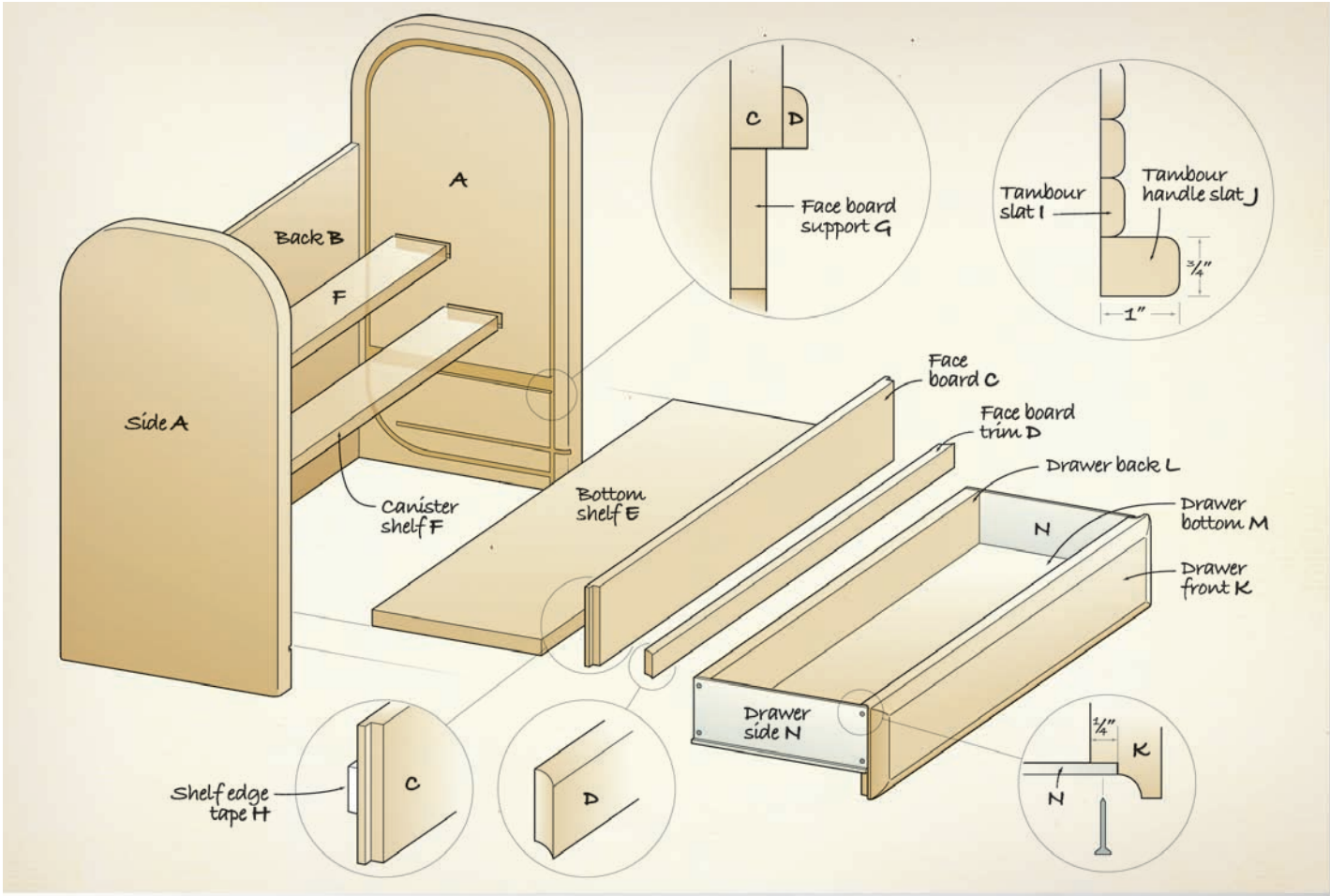
primary user of the spice cabinet. Now, where is that leg of lamb that I had in mind for Sunday's dinner?

LEE BRUBAKER
owen3@telusplanet.net



MATERIALS LIST (All measurements in inches)				
Part	Qty	T	W	L
A Sides	2	3/4	7 1/16	14
B Back (ply)	1	1/4	9 7/8	16 1/2
C Face board	1	3/8	2 1/2	16 5/8
D Face board trim	1	3/8	3/4	16 1/4
E Bottom shelf (ply)	1	1/2	5 1/2	16 5/8
F Canister shelves	2	7/16	1 3/4	16 5/8
G Face board supports	2	5/16	5/16	1 3/4
H Shelf edge tape	2	1/16	3/4	16
I Tambour slats	22	3/8	3/4	16 5/8
J Tambour handle slat	1	3/4	1	15 15/16
K Drawer front	1	3/4	3	16 5/8
L Drawer back	1	1/2	1 13/16	15 7/8
M Drawer bottom (ply)	1	1/4	5 1/2	15 7/8
N Drawer sides*	2	-	2	5 1/2

* Lee Valley Tools Item #12K78.02



Tangrams

There is nothing like a simple puzzle to occupy a lazy afternoon. The best types of puzzles are those that are hard to put away, and this project is definitely one of those.

The origin of the tangram has been lost to time, but the first written record appeared in a Chinese publication in 1813. The game, unchanged since its conception, was predominantly played by women and children and as such was not considered important or serious enough to be written about and studied, so little is known of its origins.

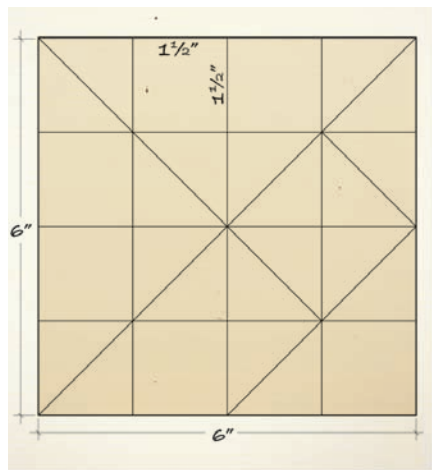
A tangram consists of seven small boards, called tans, which can be fitted together to form a myriad of shapes, including birds, animals, flowers, people,

and geometric designs. Simple in concept, but devilishly complex in execution. You can create your own puzzles, or download lots from the internet (www.Tangrams.ca is an excellent site). Note that some tangram puzzles require that you use two sets (14 tans).

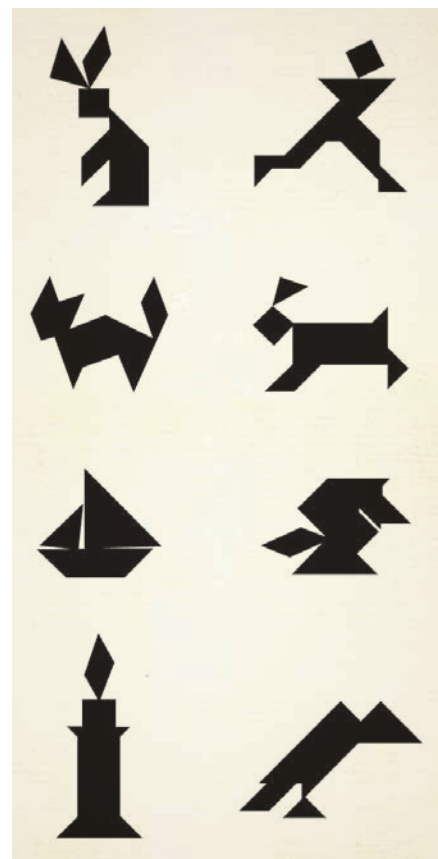
The basic tangram is made by dividing a square into 16 equal squares and then drawing in diagonal lines to define the shapes of the seven tans. The size of the puzzle is a matter of personal preference, but bear in mind that the smaller the pieces, the more difficult it will be to rout them safely. This little game is addictive and you will soon find yourself with requests for additional sets. So it's best to prepare for the inevitable request by making a set of accurate patterns in Baltic birch plywood and then using the templates, in combination with a flush trim bit and a special fence on the router table, to make the tans. This version is based on a 6" square.

- Draw the grid for the tangram on a piece of graph paper and use a pair of scissors to cut the tans shapes out. Using a spray adhesive or double sided tape, glue the individual pieces to some $\frac{3}{8}$ " Baltic birch plywood.

- With the patterns glued to the stock, use a scroll saw or fret saw to cut up to



Illustrations by: www.JamesProvost.com



the edge of the patterns, and then use a disc or belt sander to sand right up to the edges. Repeat this for all of the parts until they fit together without any gaps; keep the edges clean and smooth, as every imperfection will be transferred faithfully when you rout the tans. You may want to mount a small knob in the center of each template to make it easier to hold them.

This is a great project to reduce the clutter in your scrap bin. Like most woodworkers, I find it hard to throw out small pieces of wood, and so have amassed a collection of various off-cuts from past projects. That is what I used for this project. If you don't have enough pieces on hand, this project is a great way to experiment with new exotic woods; you can make three tangrams from one board foot of material, so try an exotic species that you have never used before.

- Sand the two faces of the stock while it is still larger as this prevents the edges of the individual pieces from being feathered and rounded over excessively.

- Fasten the templates to the stock with double sided tape, and using a scroll saw or fret saw, cut out the individual tan shapes. Try to stay as close to the guide piece as possible; leaving a minimum of material to trim off will greatly reduce the number of pieces lost to excessive chipping or tear-out.

To safely rout these small pieces on the router table you will need to use a custom fence. These pieces are small and awkward to handle without this fence, so **DO NOT ROUT THE PIECES FREEHAND**. The fence is simply a straight edged piece of wood with a rabbet cut on the underside and a notch cut out for the router bit. Place a shim slightly thicker than the stock under your router fence and close up the fence on the bit. Then place a clear guard over the bit. That way, there will be no cutting edge exposed (which might pose a danger to fingers) when you trim the pieces flush.



Use auxiliary fence for safe routing



With the fence set up, take a look at each piece before you trim it. Every piece will have at least one corner where the short grain runs diagonally across a point and this is where the majority of your pieces will chip and be ruined. I chipped several pieces until I replaced my old two-cutter flush trim bit with a three-cutter version from Freud, and used a slower feed rate.

Once all the tans are trimmed, ease the edges with some sandpaper. You can leave the tans natural or apply a finish. For a solid colour set, apply a coat of milk paint and wax.

If you wish to let the natural beauty of the grain show through, simply give them a coat of wax. I found that there was no way to avoid burning some of the edges as the pieces were trimmed. Any sanding to remove the burn marks would have altered the shape of the piece, so I opted to 'ebonize' the edges using a felt tip pen.

This presented a bit of a problem as the wax applied afterwards acted as a solvent for the pigment from the pen. To avoid getting black fingerprints on a light coloured wood, use paper towels to wipe off the wax without cross-contaminating the two areas.

With the tangram complete, clear off your desk, brew yourself a cup of tea and explore some of the many shapes you can make with this simple game that has captivated people for hundreds of years.



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SUPPLY CHECKLIST

- 1/2" x 7" x 7" Baltic birch plywood
- 1 square foot of 1/4" wood
- Double sided tape
- Flush trim bit
- Wax

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Leaping Trout

This is an enjoyable intarsia project that uses the trace method for pattern transfer.

Begin by selecting wood for all the project pieces, and then transfer the pattern onto tracing paper. Tracing paper allows you to see the grain direction through the pattern. Make sure that you include the grain direction and alignment marks on the body pieces. The final

dimensions of the trout are approximately 6 ½" x 9 ½".

Mark out piece (A) using the tracing paper pattern. Remember to include the alignment marks, as they will help you fit the pieces of the body together. Cut out piece (A) and then sand the bottom edge to

remove any burr. This allows the piece to sit flat and makes it easier to trace edges. If you have an oscillating spindle sander or a drum sander mounted in a drill press, sand the edges square; this will allow for very tight seams between the pieces.

Orient the pattern over piece (B) and slide



Use first piece to align second piece



Fit second piece to first piece



Continue cutting and fitting rest of pieces



Sand the gill area

the transfer paper under the pattern. Place piece (A) into position and using its edge as a guide, mark piece (B). Any inaccuracy in the first cut can be fixed when you mark the second piece. Cut, sand and fit piece (B) to piece (A). When you are satisfied with the fit, glue the pieces together. As the pieces for the body are cut and fitted they can be glued together because the body is shaped as a single unit.

Continue marking, cutting, fitting and gluing the remaining body pieces using the same method outlined above. Once the glue has cured, sand the gill area smooth with an oscillating spindle sander or a drum sander in a drill press. Then drill a $\frac{3}{8}$ " hole for the eye. If you have plug cutters you can make the eye out of any type of wood, or you can use a $\frac{3}{8}$ " dowel. For final shaping and smoothing of the body I used a bow sander.

To finish the trout I applied five coats of polyurethane, sanding lightly between coats. Once the finish has cured attach your favourite fly or lure by drilling a $\frac{1}{16}$ " hole and epoxying it in place, attach a hanger to the back, and hang it over your fireplace!



FRED MARTIN
www.intarsiadesigns.com

SUPPLY CHECKLIST

- Scroll saw with #5 or #7 blade or bandsaw with $\frac{1}{8}$ " or $\frac{1}{4}$ " blade
- Oscillating spindle sander or sanding drum in a drill press
Pneumatic drum sander (optional)
- Bow sander
- $\frac{1}{16}$ " and $\frac{3}{8}$ " drill bits
- Tracing paper, transfer paper, glue, duct tape, hanger
- Finish

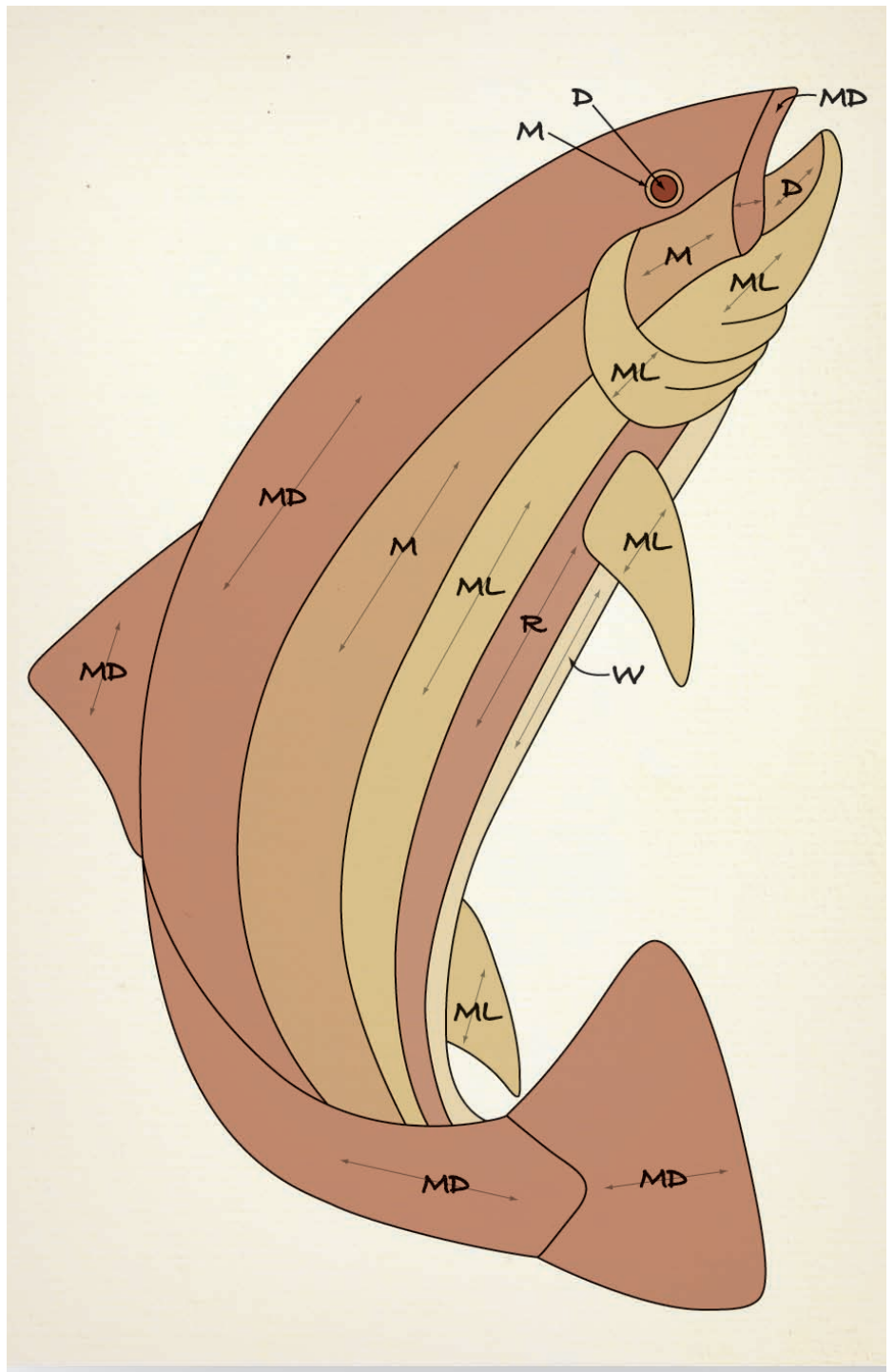
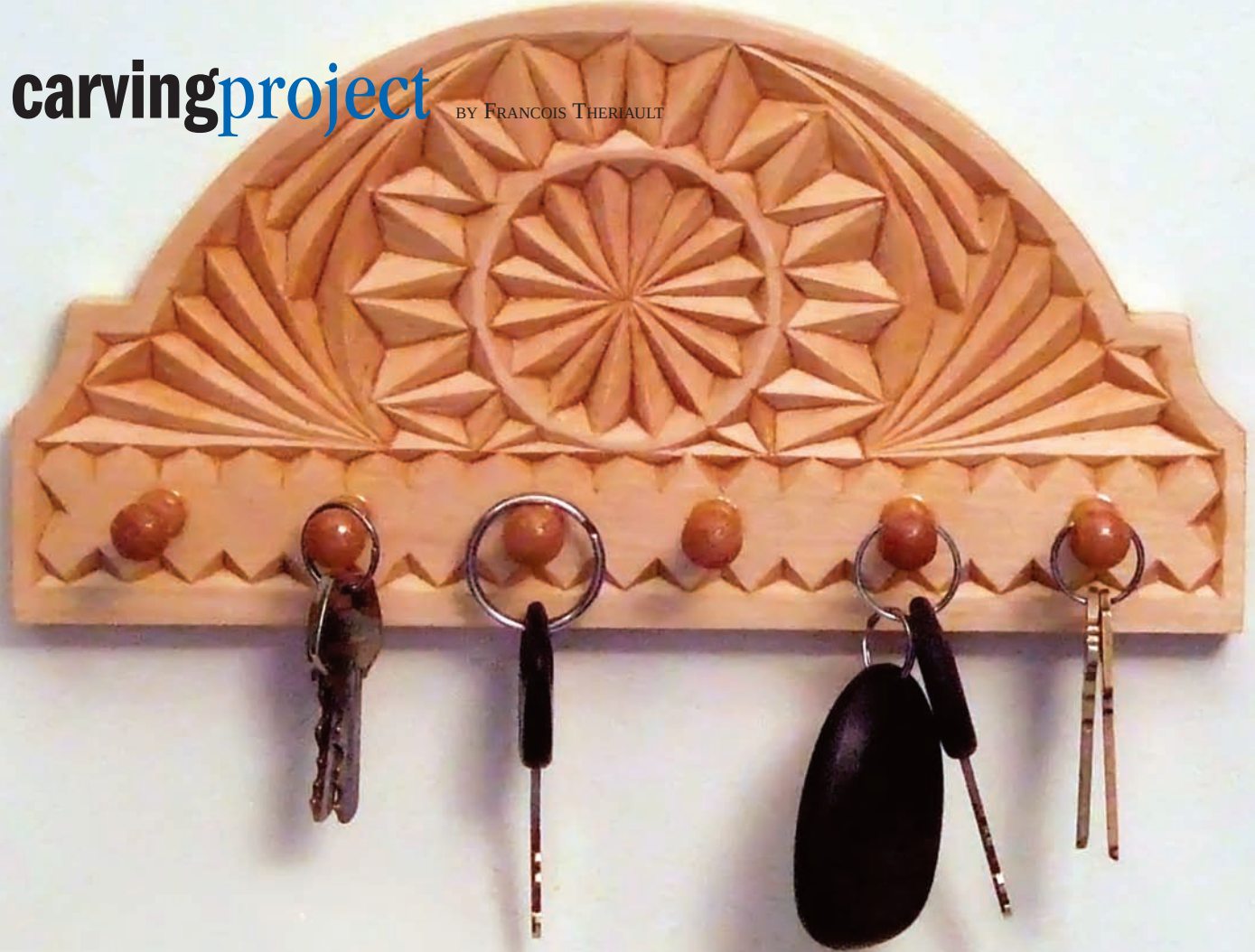


Photo enlarge pattern to 160%

MATERIALS LIST (All measurements in inches)

Part	Qty	T	W	L
A Upper body and tail (Russian olive wood)	1	$\frac{3}{4}$	6	12
B Body and cheek (yellow poplar)	1	$\frac{3}{4}$	4	12
C Eye and mouth (black walnut)	1	$\frac{3}{4}$	2	4
D Belly (aspen)	1	$\frac{3}{4}$	3	10
E Body, fins, gill and lower jaw (curly maple)	1	$\frac{3}{4}$	4	12
F Lower body (aromatic cedar)	1	$\frac{3}{4}$	2	10



Key Holder

Give anybody a knife and a piece of wood and their natural instinct is to start making notches. The art of chip carving is a natural progression of this tendency, and has been used by most cultures to decorate everyday objects effectively with a few, simple tools.

This carving project is a practical and fun little piece that will appeal to the beginner woodcarver. The technique is fairly simple, consisting of mostly straight cuts with some simple curves. I recommend that you use a soft wood such as pine or basswood for this project as they are best suited for chip carving.

Pattern Transfer

For this project you will need a piece of softwood $\frac{5}{8}$ " x 5" x 10". If your stock is $\frac{3}{4}$ " thick, thickness plane or hand plane it down to $\frac{5}{8}$ ". To transfer the pattern to your stock you will need a clothes iron.

- Photocopy the pattern.
- Place it face down on the wood.
- Heat the backside of the pattern with the clothes iron. The heat will cause the carbon powder from the photocopy to adhere to the wood.

Prepare the Board

This is a single-board project. As such there is no heavy construction involved.

- Using a band saw, scroll saw or a simple jig saw, cut out the shape of the key holder.
- Sand the edges smooth. A block of scrap wood with a piece of sanding paper wrapped

around it does the job quite effectively. For the curved surfaces, use a piece of dowel as the support for the sanding paper. Begin with 100 grit sandpaper, working your way up to 220 grit. Take care to keep the sanding block perpendicular to the board. Of course, be careful not to sand over the pattern.

Cut the Triangles

Chip carving is a very straightforward craft. No fancy tools are required. As a matter of fact, for lack of a better tool, I spent many years carving with a utility knife with snap-off blades.

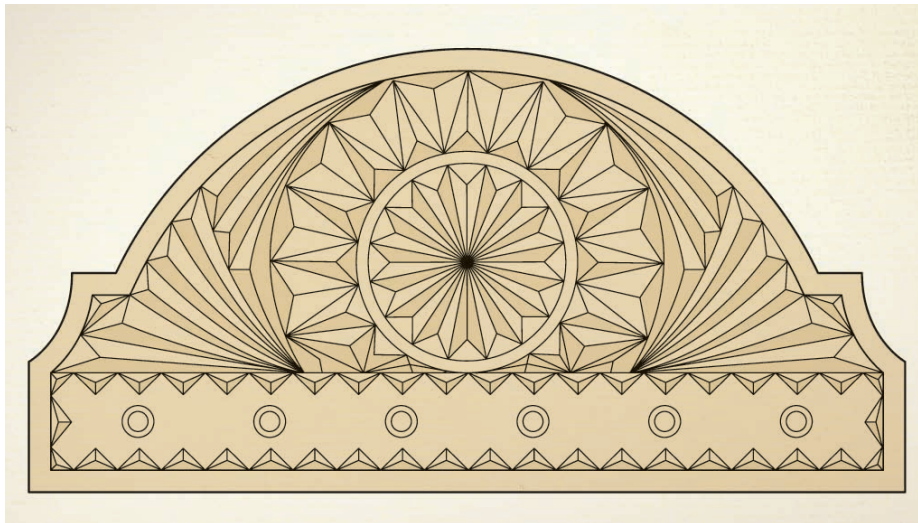


Photo enlarge pattern to 220%

You'll find that chip carving knives come in a variety of styles and prices.

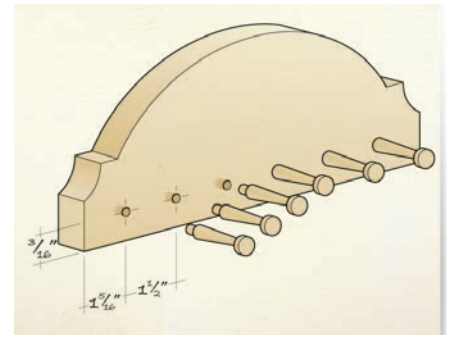
Chip carving essentially involves cutting a series of small chips out of a wood surface in a triangular fashion. While the triangles are often equilateral (all sides are of equal length), they can be isosceles (two sides of equal length) or scalene (all sides are of different lengths). As well, the triangles can have straight or curved sides.

- Hold the knife blade at approximately 60° to the wood surface and cut the first

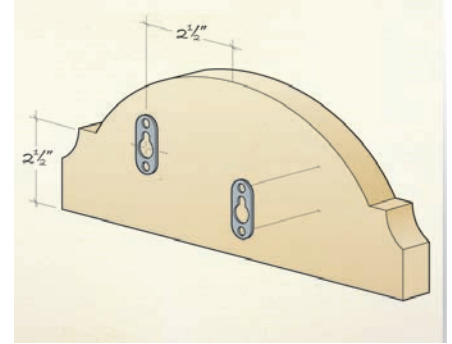
side of the triangle. Repeat this on the second side, and then on the third side, ensuring that the knife points meet on all cuts at the same spot. The wood chip should then pop right out.

- For chips with longer sides, such as the central rosette of the pattern, take care to ease up on the pressure exerted on your knife as you approach the point, or you run the risk of cutting through the ridge.

- Always pay close attention to the direction of the grain. Cutting with the grain will give you a nice clean cut.



Peg layout



Hanger layout

Illustrations by: www.JamesProvost.com

TIP

Be careful when running a short piece of wood through a thickness planer. It's best to ensure that the shortest piece you use is about 4" longer than the distance between the two pressure rollers, located in front and behind the cutter head. Measure this distance and write it on the side of your planer with a permanent marker. An alternate approach is to temporarily glue long strips of waste stock to either side of the piece, and then run the glued-up piece through the planer. These braces can be removed after the required thickness is achieved.



Iron pattern onto work piece



Pattern transferred to work piece



Cut first side of triangle



Cut other sides of triangle



Chip removed



Moor style chip knives



German style chip knives

Mount the Pegs and the Hangers

Once the pattern is fully carved, drill the six holes to receive the pegs. I found the mini-pegs at my local hardware store. They are the right proportions for the overall project and are small enough to accept most sizes of key rings.

- Mark out the location of the drill holes.
- Using an appropriately sized drill bit, drill down a little more than the length of the shank on the mini-pegs. I drilled the $\frac{1}{4}$ " holes $\frac{5}{16}$ " deep.
- Apply a dab of glue and insert the pegs. Use a wet paper towel to clean up the surplus glue.

The final step involves installing the hangers. These come in a variety of sizes and configurations. For this project, I used a two-hole hanger with a central keyhole for the hanging screw. Since the key holder is better installed flush with the wall, the hangers need to be recessed into the back. It's best to install two hangers – if you use only one the key holder will have a tendency to sway.

- A fast and easy way to do this is to trace the outline of the hanger onto the wood with a sharp knife. Holding the knife at 90° go over the outline several times with the same knife to sharply

define the edge of the outline.

- Using a $\frac{1}{4}$ " flat chisel remove the wood within the outline. Several passes might be required to work down to the thickness of the hanger. Use the hanger to check depth and fit from time to time to ensure you do not dig down too deep.

Apply a Finish

A final sanding of the carved surface is not required, as it would ruin the crispness of the design. You may however want to clean up any carbon from the photocopy transfer that shows on the surface. For this use a fine grit sandpaper (500 grit or higher). A couple of coats of varnish will give you a durable finish that will also make it easier for dusting and occasional cleaning.

FRANCOIS THERIAULT
ftheriau@nbnet.nb.ca



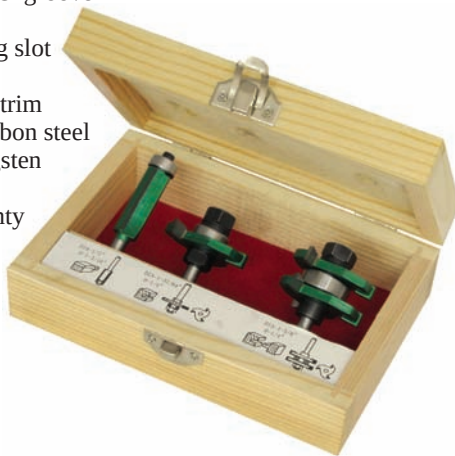
SUPPLY CHECKLIST

- One piece of softwood, $\frac{5}{8}$ " x 5" x 10"
- Six $\frac{3}{8}$ " mini-pegs
- Two $\frac{1}{16}$ " x $\frac{9}{16}$ " x 1 $\frac{5}{8}$ " hangers

toolpicks BY THE EDITORS

Samona Tongue & Groove Set (38024)

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Cane Saw

While canes (or walking sticks) aren't as trendy or as prevalent as they once were, the dapper woodworker can still be the envy of the neighborhood with this unique and stylish 'cane saw'.

The cane saw was so named by my wife. Being an avid woodworker, I had decided to incorporate a handsaw grip in the design of my cane.

The handle that we most likely associate with a handsaw was designed by Disston in the 19th century. It appears that all the Disston saw handles are of the same design and size.

Perhaps when it comes to handsaws, one size suits all hands. On the other hand, handles for canes should be customized to fit the hand of the user – to provide maximum stability in use and to suit individual comfort and style.

I began by tracing the handle on a piece of 1" x 6" x 36" select pine, and then rough-cut the shape on the bandsaw. I cut a 1 1/4" x 3 1/4" sized finger hole using a 1 1/4" rotary drill saw bit, but you could also use a drill press and a 1 1/4" hole saw. Round over the edges with a 1/2" rounding over bit or with

files and sandpaper. Apply some stain and varnish, and the job is complete.

You can change the size of the handle to better suit your needs. A larger hand may require a longer saddle or a larger finger hole. It's a good idea to make the cane shaft longer than the finished length, and then cut to size.

For a bit of extra purchase on slippery surfaces, and just to protect the cane, you can cover the end with a rubber tip. The more adventure-some woodworker may want to carve or paint a unique design along the shaft.

When shopping, the horns are a great place to hang grocery bags while you fish in your pocket for your car keys. You'll also find it a steady influence on the way home from the local pub on Saturday night, helpful in re-directing wayward dogs, and essential for pointing out the obvious to unperceptive bystanders.



TOM WEST
twest@golden.net

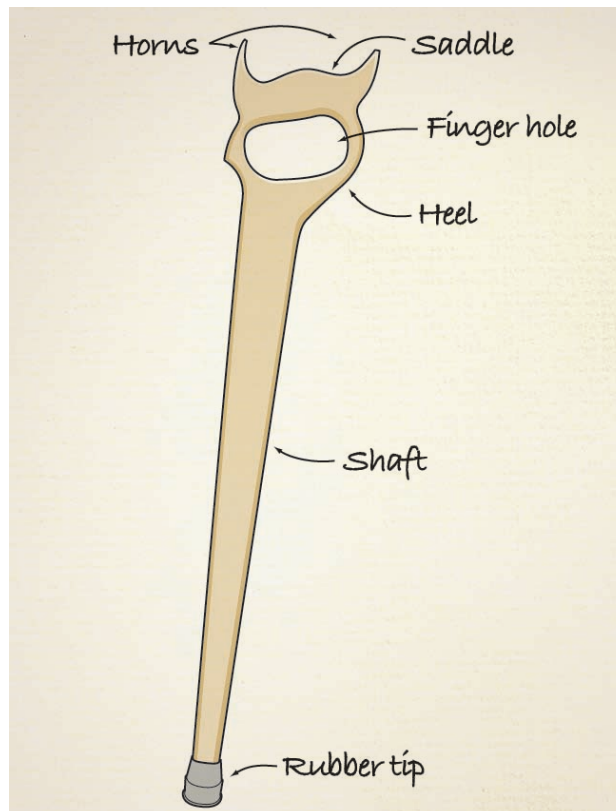


Illustration by: www.JamesProvost.com

toolpicks

BY THE EDITORS

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Compressors

From framing a wall, to using tiny headless pins on a fine piece of furniture, compressed air drives a multitude of tools that make these tasks a breeze.

I recall many trips to the corner service station as a kid to fill my bicycle tires or to top-up my basketball before a game. These days, compressors are everywhere and in every size, from the behemoth at the local garage that runs all day, to the small emergency units that plug into the cigarette lighter in your car.

There has never been a greater selection of compressors for the woodworker to choose from. All compressors accomplish the same basic operation; they compress free air into a tank to a preset pressure, which is then dispensed to the air driven tools via a regulator and a hose. As you may expect, there are several variations on compressor design, and these will determine which type and style of compressor would suit the work you intend to do with it.

Compressors have evolved to suit the

needs of the trades' people. Some situations, such as a service station or production shop, would need a large capacity of high-pressure air. Other situations require portability for working remotely at a jobsite. Different applications call for different compressor designs.

The tank on a compressor, which holds the compressed air, can be mounted either horizontally or vertically. A horizontally mounted tank has a lower center of gravity, so is preferable if the unit is going to be moved occasionally. A vertical orientation uses less floor space, which can be a great advantage in a smaller shop. It is also easier to drain completely. The names of various styles of portable compressors are based on the storage tank's shape and orientation. The smallest of these is the pancake compressor (Porter Cable C2002,

www.DeltaPorterCable.com). As you might guess from the name, the tank is a small round flattened disc that has the motor mounted on top. A horizontal (or hotdog) compressor (Porter Cable CPF4515), has a longer cylindrical tank, usually mounted on rubber feet, with the motor and handle on top side. The twin (or side) stack compressor, (King 8488, www.KingCanada.com) has two horizontal tanks beside each other to provide additional storage capacity. An upright compressor (King Canada 8498) is similar to the horizontal version, with the motor located on the top end of the tank. A wheelbarrow style compressor (DeWalt D55570, www.DeWalt.com) is usually gas powered, and typically used on construction sites. Industrial compressors (Porter Cable C7550) are the largest and most powerful

compressors available, suited for continuous high air consumption applications.

When looking at a portable compressor, keep in mind that gauges facing up are much easier to read than ones that force you to squat down to look at them head on. If your compressor will be moved about in vehicles, choose one that has adequate protection for the gauges and fittings in the event it should be a roll over.

It's All About Air Pressure

If you want a compressor that will serve your needs for many years to come, there are several important ratings that you must carefully evaluate when choosing the right model for the work you expect to do. In addition to the horsepower values we normally look at when selecting tools, there are additional values for PSI and CFM to consider. PSI refers to the pressure in pounds per square inch to which the air is compressed for the tool to do its work. While most compressors deliver air at anywhere from 0 to 200 PSI, most air tools require 90 PSI. CFM refers to the volume of air the pump can deliver in cubic feet per minute. Because air pressure varies with temperature, humidity and atmospheric pressure, manufacturers report a 'standardized' level of air pressure, SCFM, which takes these variables into account. To properly size a compressor to the job at hand, you will first need to make a list of all of the air tools you will be likely to use.

Manufacturers will state how much air (SCFM) that a tool will consume at a certain pressure (PSI) needed for the tool to do its job. For example, a finish nailer may consume 3 SCFM at 90 PSI. When selecting a compressor, first choose the tool that has the highest demand, and to allow you a slight margin for comfort, add 25% to this value. So if the tool with the highest demand is an impact wrench at 6 SCFM, then you should be looking for a compressor that can deliver at least 7.5 SCFM at 90 PSI. If you will be running more than one tool at a time, for example, two roofing nailers, add the requirements of both tools and then add a 10 to 15% margin for safety. Using a compressor with a lower rating means you will need to use the tool intermittently to let the pump recharge the reservoir.

Tank Size

With the need of the various tools established, the next consideration would be tank size. Compressors come in a wide range of sizes, ranging from the 1 to 3 gallon pancake compressors, 4 to 6 gallon twin stack and small portable (horizontal and upright) compressors, 6 to 35 gallon horizontal and upright portables, and larger 40 gallon and over, stationary industrial models.

Having a larger tank gives you the ability to store a greater reserve of air, and will reduce the amount of time your pump must cycle to keep up your working pressure. As the maximum storage pressure increases for a given tank size, the volume of stored air increases as well. A compressor that is set to a maximum pressure of 135 PSI will store more air than a compressor that shuts off at 120 PSI.

The Pump

The heart of any compressor is the pump that does the actual work of compressing

the air. Here you will find the greatest variation in design. Compressor pumps fall into two categories; either oil-less or oil lubricated. Again, the use of the compressor will determine the type of pump that is best suited to your needs. When weight is not a concern, cast iron is the material of choice for the pump. This hard-wearing material will stand up to constant use and it is very efficient at dissipating the heat generated as the air is compressed in the cylinder. The pump functions much like the engine in your car; the air is pulled into the piston and it is then compressed into the tank for



Pancake: Porter Cable C2002



Twin stack: King 8488



Horizontal: Porter Cable CPF4515



Upright: King 8498



Wheelbarrow: DeWalt D55570



Industrial: Porter Cable C7550



Clean the air filter regularly



Remember to keep the oil topped up



Hoses come in many styles

storage. Cast iron pumps come in either single or two-stage systems. With a single-stage system, one cylinder is responsible for the entire compressing operation. A two-stage system will use a larger primary cylinder to compress the air to a certain level, after which it is passed on to a smaller cylinder that finishes compressing it the rest of the way. In operation, two-stage oil bath compressors are the quietest of all the available designs. These pumps run at the lowest RPM and the mass of the cast iron helps reduce noise to a bare minimum.

Cast iron pumps filled with oil are a great solution for a stationary shop compressor,



Left to right: tank pressure gauge, regulator knob, air pressure gauge, two air hose fittings

but when portability is required, some compromises have to be made. Both the 20-gallon horizontal and the 20-gallon vertical compressors on wheels can have a full cast iron pump. Although the wheels make them somewhat portable, they are not very light. To reduce the weight of the compressor aluminum is often substituted for the body of the pump. Aluminum is a softer material, which will wear faster than cast iron, so manufacturers will often insert a cast iron sleeve into the cylinder for additional wear resistance. The compressor in the 'Air filter' photo has an aluminum pump, cast iron cylinder section and an aluminum head. These run at a slightly higher RPM with the result that these compressors are not as quiet as the ones with the solid cast iron pumps, but they are still pretty tolerable in the enclosed environment of a shop.

If ease of portability and compact size is the key issue when it comes to a compressor, then the small portable pancake or hotdog style units win hands down. Pump construction plays a large part in the small size and light weight of these portable units. Manufacturers have substituted lighter weight plastic and aluminum parts for the iron, and they use Teflon coated piston rings and lubricated bearings to make them oil-less. These compressors typically have smaller pistons that operate at much higher speeds than the oil bath models, making them the noisiest class of compressor. Using one of these will require the use of hearing protection if the compressor is in the immediate area; if possible, place the compressor in another room away from your workspace to reduce the noise.

Duty Cycle

Unlike purchasing a table saw, which will happily cut wood all day long non-stop, compressors normally come with a duty cycle. This refers to the percentage of time the compressor can run in a given length of time without damaging itself. As mentioned earlier, as the air is compressed it heats up, and this causes the pump, motor and associated piping to heat up. With the motor correctly sized and protected with thermal overload de-

vices, there is no need to worry about damaging the motor. If the motor exceeds its maximum operating temperature it will automatically shut off. The large cast iron compressors are the most robust of the various models and can dissipate the heat built up. As the pumps become lighter in weight and the RPMs increase, the heat will build up faster than it can be dissipated. To avoid damaging the piston rings and bearings the manufacturer will have determined an acceptable duty cycle that will keep the heat below critical levels. A duty cycle of 30% means that in every hour the compressor can run for 18 minutes, a 50% duty cycle would allow 30 minutes of operation per hour. Exceeding the duty cycle will cause excessive wear and premature failure of the pump. The interval of time can vary between manufacturers. Some use an hour while other average the use over 30 minutes. Check to see which time frame the manufacturer specifies in the owners manual.

Moisture

Moisture is a problem with compressors. As the air is compressed it is warmed and then it is blown into a tank. When this air hits the cold outer walls of the tank, it condenses and forms water droplets, which then collect at the bottom of the tank. With a larger tank there is a greater distance that the air will travel before it hits the cold steel of the tank, and in the process it will cool off, resulting in less condensation in the tank. With a twin tank compressor such as the King 8488, the air is pumped into the bottom tank and removed from the upper tank. This creates additional separation between any pooled water in the bottom of the tank and the air outlet. As a percentage of its volume, a small tank will fill up faster with water than a large one, and the confined space of a small tank will mean that more of this moisture is then picked up in the turbulence and sent on to the tools through the air hose. Moisture in the supply air can cause contamination and corrosion in the tools, resulting in a loss in safety and efficiency. If you are using your compressor to drive a spray gun for finishing, moisture in the line will become atomized with the finish resulting in serious problems when

using oil-based finishes. If you routinely use a shop compressor to spray finishes, add a drier to remove water and a filter to separate any oil from the air stream, to prevent any contamination of your coatings.

Hoses

Once the air has been compressed and stored in the tank, it is ready to make your life easier. The only downside is that you still need to get it to the tools to use it, and this can be a frustrating experience. If you have a stationary compressor, a distribution system using copper pipe and providing outlets at each of your workstations might be your best option, but if you have a portable unit, an air hose of some description is in order. Just as there is a range of compressors to choose from, there are a number of different hoses that you can choose from. Hoses come in ¼", ⅜" and ½" internal diameters. A hose with a larger internal diameter will pose less of a restriction to the flow of air from the compressor and result in less of a drop in pressure when using longer runs of hoses. Air hoses are typically made with three layers of material, a smooth inner core that is covered by a layer of reinforcing material which is then in turn covered with a protective outer jacket. As with most products, there are several different levels of quality to consider, and buying the least expensive hose will leave you frustrated in no time.

Inexpensive hoses are made of vinyl, and while they may be cheap (\$20 for a 50 foot length) they are not very flexible. Using this type of hose in a cool shop will leave you with a stiff tangled mess every time. At the other end of the scale are the professional rubber hoses. These are of a heavy-duty construction designed to withstand job-site abuse and remain flexible in all but the coldest temperature conditions. Bostitch introduced a new hose when

they brought their TrimAir compressor to market several years ago and this has quickly become the favourite in our shop. The compressor is made of a translucent yellow material that stays flexible across a wide range of temperatures and allows you to see any contaminants in the line. It has a set of ridges that run the length of the hose and these keep the hose from hanging up on objects and getting tangled as the hose is dragged around the shop, job site or finished interior. The outer jacket of this hose is also non-marking so it won't leave scuff marks on trim or furniture as it slides by.

Short vinyl hoses are available in a coiled format that has some spring to it. These can be very effective when hung from the ceiling over a workbench. However, when used in place of a standard hose on the ground, the recoil of those hoses can often pull the tool out of your reach whenever you put it down, if you are more than a few feet from the compressor. The hoses are not sold with the male and female disconnect fittings, so they must be purchased separately. There are several different types of fittings; choose one style that is readily available, and use that for every hose and tool so they are all compatible.

Control Panel

The control panel of most compressors comprises: an on/off switch, a tank pressure gauge (showing the pressure of air in the tank), an air pressure gauge (showing the air pressure available to the tool), an air pressure control or regulator knob (by which you regulate the air pressure available to the tool), a safety valve (that enables you to quickly release air from the tank), and one or two air hose fittings (that deliver air, through hoses, to the tools). Most compressors will shut off when the pressure in the tank is between 120 and 125 PSI, and will turn on again when the tank pressure drops below 90 PSI. You will find that most air tools run at around the 90 PSI level.

Use the regulator to set the pressure to that specified in the operators manual of the tool you are using. When the proper pressure is unknown, start at a low pressure and increase it until the tool performs properly.

Maintenance

To keep the compressor running in top form you should perform regular maintenance on your compressor. A lot of air moves through this machine so it is a good idea to clean out the air filter regularly to maintain maximum air flow. After every use, crank open the valve at the bottom of the tank and let the water in the tank drain out. Water that is left to accumulate in the tank will cause corrosion on the tank walls, and as the water accumulates it is more likely to get passed on to the tools being used, especially if you have a small tank. If you have an oil filled pump, check the oil level on a regular basis and change the oil based on the schedule supplied in the owner's manual. Oil that is left in the pump can break down and cause premature failure of the internal seals in the pump.

Price

Entry level portable compressors that are ideal for light trim work, filling tires and some occasional framing can be had for \$100 to \$200, with smaller portables ranging from \$200 to \$400. Expect models in the 30 gallon and larger sizes to be in the \$500 price range and higher, while stationary models with a 100% duty cycle capable of supplying several tools at once can run to several thousand dollars. A unit between two and five hundred dollars would likely cover the needs of most non-professional woodworkers.

An air compressor can be an extremely useful tool in your shop. Choose one that will best suit the size of your shop and the kind of woodworking that you do.



MICHAEL KAMPEN
mkampen@canadianwoodworking.com



Safety valve (top), drain valve (bottom)

Average CFM Requirements at 90 PSI

Brad nailer	1-2
Upholstery stapler	2
Framing nailer	2-4
Impact wrench - ⅜"	2.5-3.5
Ratchet - ¼"	2.5-3.5
Drill	3-6
Grease gun	4
Ratchet - ⅜"	4-5
Mini die grinder	4-6
Speed saw	5
In-line sander	5-8
Random orbital sander	16

In upcoming issues of Canadian Woodworking I'll look at some of the more common air tools found in woodworking shops.

RESOURCES

"Air Nailers,"

Oct/Nov '03, Issue #26

"Tooltest: Bostitch Trim Air,"

Aug/Sept '06, Issue #43

"Tool Review: Ridgid Portable Compressor,"

Apr/May '05, Issue #35



Cordless Screwdrivers

For a lot of shop projects and home maintenance tasks, less is more.

Cordless tools that make repetitive tasks easier have been around for many years, and as the technology has improved, the tools have become lighter, smaller and more powerful. The negative aspect to battery powered tools has always been the bulk of the battery and its limited storage capacity. The first series of nickel cadmium (NiCd) batteries held enough of a charge to make cordless tools viable when work needed to be done away from a source of power, such as on a construction site, but these tools were expensive, and the batteries heavy. The battery life of the early tools was often disappointing and they could take up to eight hours to fully recharge.

Lithium Power Makes Small Possible

With improvements in battery technology came new battery types and sizes. The voltages kept climbing and the drills kept growing in size and power, which

made them ideal for heavy drilling and driving on a job site, but less desirable for repetitive use in workshop environment. It doesn't make sense to use your largest framing hammer to drive brad nails into trim, and using an 18 or 24 Volt drill for driving screws is an equal amount of overkill. With the introduction of new Lithium-ion battery technology, companies have been scrambling to get new smaller cordless screwdrivers onto the market.

The new lithium-ion batteries offer two distinct advantages over the older battery technology. The first is that they have a longer shelf life when charged. We've all been there; we put the drill/driver aside fully charged, but after sitting on a shelf for a month or two, when we next reach for it, the charge has faded and the drill is dead. Lithium-ion batteries will hold their charge for a much longer time when the tool is sitting unused on a shelf. For those that are not heavy users of their tools,

this can be a very important feature. The second advantage is that the lithium-ion technology holds a greater density of energy in the same size battery package. This means a bigger bang in a smaller package, making smaller, lighter tools that would not have been possible before. Two of these screwdrivers weigh a mere .7 pounds (Skil, Triton), with the DeWalt topping out at 3.5 pounds.

With these tools, the 'high tech' is in the battery; the rest of the tool is actually very basic. All these models employ lithium-ion batteries except the King (NiMH) and Makita (NiCd). These screwdrivers are not meant for heavy duty drilling or other forceful work, they are primarily designed to drive screws, and most do this very well. Some of these cordless screwdrivers are very basic units with nothing more than a battery, trigger, direction switch, motor and bit holder while others have added some extra bells and whistles.



14.4V-Li Drill/Driver



iXo2 Palm Sized Screwdriver

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7.2V-Li Power Wrench



7.2V-Li Power Driver

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To find the name of your local retailer visit the supplier's web site. Go to www.CanadianWoodworking.com/data for more detailed product specifications.

Voltages Vary

A wide range of voltages are available from the various manufacturers, from a low of 3.6 Volts for the Black & Decker LI3000, Hitachi and Triton models to the Bosch which packs a whopping 10.8 Volt battery pack. Generally, as the voltage goes up, so does the power of the screwdriver. The small 3.6 Volt models are incapable of driving larger screws and lag screws into harder material while this isn't much of a challenge for the B&D VPX, Bosch, DeWalt and Dremel models.

The batteries in these screwdrivers, except the B&D VPX, Bosch, DeWalt, Hitachi, and Milwaukee are non-removable; to recharge them you plug a wall mount transformer into a jack on the screwdriver. The others have removable batteries that must be removed and placed on a charger. The benefit of a removable battery is that you can keep a spare on hand ready to go; this would be particularly handy in a busy workshop. Only the Bosch and Hitachi models come with two batteries. The Milwaukee and Skil have a convenient built-in battery gauge, which lets you know when it's time to 'plug in'.

Speed Varies

Some of these models offer a single speed (B&D LI3000, Craftsman, King and Triton), typically running at 200 RPM. The B&D VPX, Hitachi and Milwaukee offer dual speeds of around 200 RPM and 600 RPM, while the Bosch, DeWalt, and Dremel offer variable speeds (0 up to 500 RPM). All of these models will cover most of your screw driving needs, particularly if you are driving small screws (say 1 1/2" or under).

When drilling small holes, or setting screws without a pilot hole a variable speed driver affords more control. If you find yourself relying on a clutch when driving screws you will pretty well need to look at one of the higher end models as apart from the Craftsman, those under \$100 generally don't have this feature.

Handle Styles Vary

The compact size of these tools makes it possible to work in tight spaces where other tools simply can't go. There are two main handle styles: pistol grip (B&D LI3000 and VPX, Bosch, Dremel, King, Skil, Triton) and barrel type (Craftsman, DeWalt, Hitachi, Makita, and Milwaukee). The pistol grip, which resembles its larger drill/driver cousins, is naturally a little smaller in size and makes a much better fit for smaller hands. The barrel style is long and cylindrical. This allows it to reach into deep narrow openings when required, but the added length can be a hindrance in other situations. To overcome this, these units have a knuckle in the center, which allows them to be folded into a pistol grip when a shorter profile is needed. The addition of a collet lock makes it possible to use some of these to finish driving a screw the last little bit by hand.

As with all tools, ergonomics are important. Some of these, like the Dremel and Triton have a comfortable fit for smaller hands, while others, like the Bosch and DeWalt are larger and more robust and would fit more comfortably in a larger hand: try them out before you buy to find one with a comfortable fit for your hand.

Other Things to Consider

While all the models are reversible, some (like the Bosch, Dremel, Hitachi and Triton) have a spindle lock, which keeps the spindle from moving so that you can use the driver manually as a hand screwdriver. This is particularly handy when you start setting a screw or when you want to do a bit of final tightening, as is often the case when installing hinges.

If you will be working inside dark cabinets or in other poorly lit spaces, consider purchasing a model that has an LED to illuminate the work area (Craftsman, Hitachi, King, Skil). Instead of leaning



into a cabinet holding a driver and a flashlight to see where you are going to place the screw, the LED provides plenty of light to locate a screw accurately in a dark cabinet interior.

All these models accept standard 1/4" hexagonal drive bits. Some come with a few drive bits, others with the whole enchilada: bits, bit holders and carrying case. A range of inexpensive accessories are available, including standard bits in an assortment of sizes and styles, socket drives, centering bits, and hex shanked drill bits and countersinks. While two

models still come with one year warranties (Craftsman, Makita) the bulk offer at least a two year warranty, with Hitachi and Milwaukee offering five year warranties.

These small powered screwdrivers really shine when you have multiple screws to drive. Installing a kitchen full of drawer slides and door and drawer pulls with a manual screwdriver can leave your wrist numb and aching; using one of these can lessen the risk of a repetitive strain injury in this type of situation. People with arthritis and joint problems will find these little tools

especially handy for routine work around the house. The compact size of these make it easy to drive screws in hard to reach areas where it would be difficult to start and drive a screw with a larger drill or a manual driver, such as when installing drawer slides in a cavity. If you have a young woodworker that likes to visit you in the shop, these screwdrivers are a great gift. Imagine their thrill when they can have a real cordless drill, just like dad.

THE EDITORS

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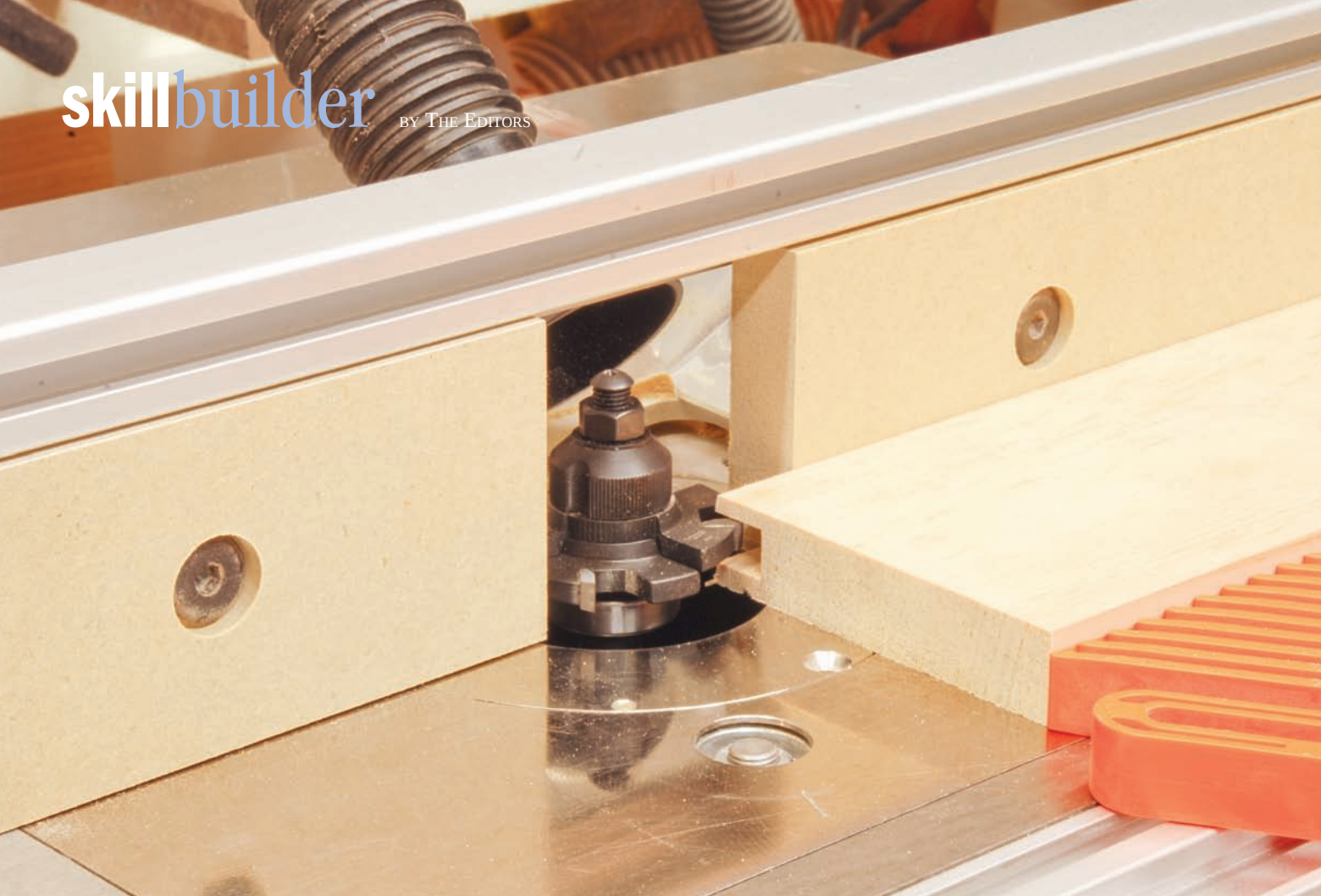
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WOOD Magazine
November 2003, Issue 152

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Part VI. Routing Basics Specialty Bits

A basic selection of straight, edge profiling, and joinery bits will handle just about all your routing needs. But for jobs that are a bit out of the ordinary, you need a different kind of router bit.

Manufacturers are constantly bringing new special purpose bits to market that make routing tasks easier and our time in the shop more productive. Here are four of my favourite specialty bits.

Adjustable Slot Cutters

The slot cutter is a versatile bit (see Dec/Jan '08, Issue #52) that gets a great deal of use in shops that do a lot of casework. It excels at cutting slots for cabinet backs and drawer bottoms, and is safer and more efficient for cutting slots for splines when gluing up panels. In a busy shop, when you are milling a lot of slots, you need to have a lot of slot

cutters in different diameters and widths on hand; and changing the slot cutters on the router table takes time. As well, there are times when you need a slot of a specific thickness, which requires you to fuss around with the height, making multiple cuts to get just the right slot width.

Adjustable slot cutters solve this problem by enabling you to easily and quickly adjust the specific slot width without removing the cutter from the router table. Dimar Canada's 'D-Slotter' comes in two formats (www.DimarCanada.com). One adjusts to cut slots from $\frac{1}{8}$ " to $\frac{1}{4}$ " wide (#108R4-3-5.5), and the other from

$\frac{1}{4}$ " to $\frac{1}{2}$ " (#108R4-5.5-10). You simply release the spring loaded nut on the top of the bit and rotate a dial to the new slot width. Each rotation of the dial changes the slot width by .004". The cutters mill a slot $\frac{1}{2}$ " deep, and come only with $\frac{1}{2}$ " shanks. The cutter head can be resharpened and replaced. I've been really pleased with these two bits – they're fast and efficient, so the time saved will surely offset the initial higher cost (around \$210).

Screw Slots

Wood moves, and whatever we can do to accommodate this movement makes for good workmanship. Whenever I



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- ▶ LIMITED LIFE-TIME WARRANTY ON ALL CUTTERS
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MULTI-PROFILE BIT



Create dozens of patterns from this one bit, just by adjusting the cutting height and fence position. This bit is great for creative and custom woodwork that requires many or unique patterns.

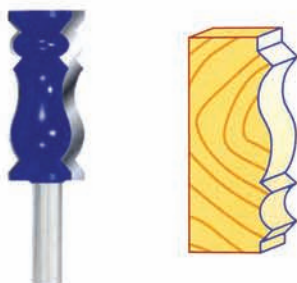
- ▶ DIA: 2 1/4"
- ▶ CUTTING LENGTH: 1 7/8"
- ▶ RADIUS: 7/16", 7/16", 1/4"
- ▶ SHANK DIA: 1/2"
- ▶ TOTAL LENGTH: 3 15/16"

\$63⁹⁸

MODEL 687572B



CROWN MOLDING BIT



Beautiful crown moldings for your home and furniture projects never looked so good than with these razor sharp bits.

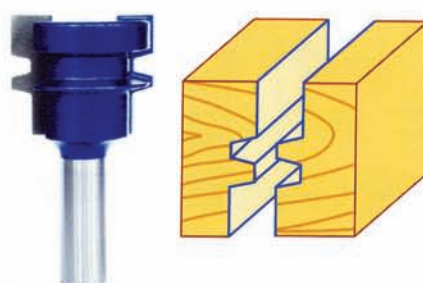
- ▶ DIA: 1 1/8"
- ▶ CUTTING LENGTH: 2 1/4"
- ▶ SHANK DIA: 1/2"
- ▶ TOTAL LENGTH: 4"

\$44⁹⁸

MODEL 777286A



REVERSIBLE GLUE JOINT BIT



This bit is used to join stock to make wide panels. Align the bit to center and reverse each board for the perfect glue joint.

- ▶ DIA: 1 1/2"
- ▶ CUTTING LENGTH: 1 1/4"
- ▶ ANGLE: 30 DEGREE
- ▶ SHANK DIA: 1/2"
- ▶ TOTAL LENGTH: 2 7/8"

\$44⁹⁸

MODEL 797381C

7PC SLOT CUTTER SET

Simply fit the desired slot cutter onto the arbor provided and away you go. No need to buy multiple slot cutting bits with this set.

Sizes include: 1/16", 3/32", 1/8", 5/32", 3/16" & 1/4"



SHANK: 1/2"
MODEL R932
REG. \$59.99

\$51⁹⁸



9PC FACE MOLDING SET

This 9 piece set features 4 face molding bits, 2 round over bits, a roman ogee bit, a classical bit & a half round bit.



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9PC TABLE MAKING SET

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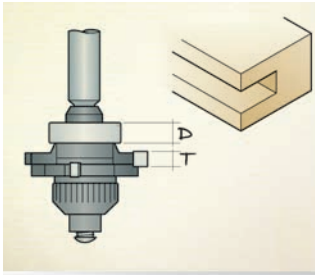


screw cleats, runners, aprons or other solid stock to solid wood panels I use screw slots. The elongated holes allow the panel to expand and contract without the panel splitting or the screws coming loose. For years my method involved using a spiral bit on the router table to cut a stopped slot followed by another larger bit to cut the recess for the screw head. Lee Valley's Screw Slot bits (www.LeeValley.com) provide a simple and elegant one cutter method to cut these slots. The bits come in two formats. One (#16J11.60) cuts a countersink slot for screws with tapered heads, and the other (#16J11.70) cuts a counterbore slot for

flat head screws. Both are sized for the more common #8 screws and come only with 1/2" shanks.

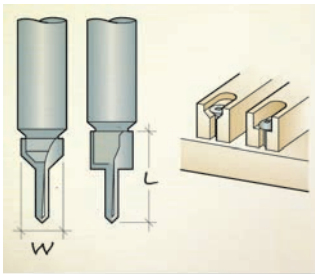
Edge Banding

In my shop I use plywood for most of my cabinetry work, applying solid wood trim to all the cut edges, whether they will be exposed or not. Previously I used square edge trim, which results in a thick edge with a visible glue line. The V-Groove bit set (#WL1324) from Woodline (www.Woodline.com) provides a clever alternative to square edge trim. The "V" shape of the cut makes for a thin, almost invisible glue line at the edge, while the



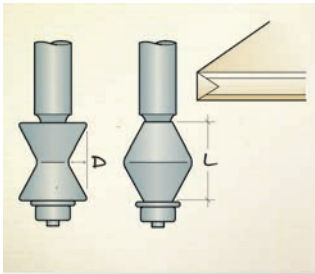
Adjustable Slot Cutters

Uses: Spline joints
Cutter thickness: 1/8" - 1/4"; 1/4" - 1/2"
Slot depth: 1/2"
Available as: 2 wings with bearing



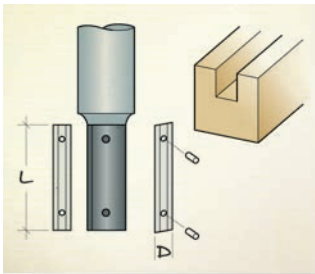
Screw Slot

Uses: Attaching cleats, runners, aprons to panels
Cutter widths: 7/16" - 1/2"
Cutter lengths: 13/16" - 15/16"



Edge Banding

Uses: Applying solid wood trim to plywood
Cutter depth: 3/8"
Cutter lengths: 1 1/4"
Available as: A matched pair with bearing



Replaceable Inserts

Uses: Available in a range of styles
Inserts: Single or double in a range of sizes

Legend:

L= Length; **W=** Width; **D=** Depth; **T=** Thickness;
V= Depth of cut varies with size of bearing

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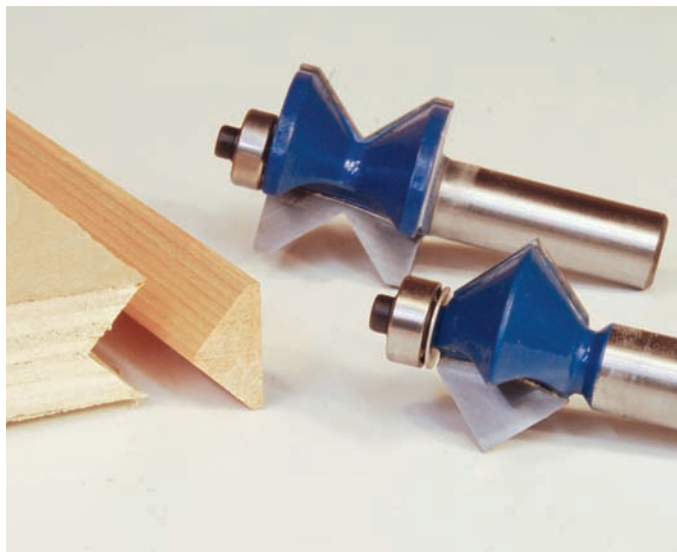
interlocking shapes help align and hold the trim in place during glue-up. This set of bits is also an excellent choice when edge gluing longer boards into a larger panel. You will lose some width using these profiles to glue up panels, but the profile of the cut will ensure that the two boards mate evenly and precisely along the entire length. This will help overcome the tendency of boards to slip relative to each other as the clamps are tightened. At \$59 you are getting great value.



Dado routed with Damar insert bit

Replaceable Inserts

While a weekend woodworker might have an investment of several hundred dollars in router bits, it would not be unusual for a full-time woodworker to have a thousand dollars or more invested, and all these bits need to be resharpened or replaced on a regular basis. When you think about it, the only part of the bit that really needs to be changed is the cutting edge. The shank simply provides the mechanism for connecting the bit to the



Edge banding with Woodline V-Groove bit set

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by Fine Woodworking May/June 2007

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Made from one solid piece of high quality tool steel

One of the largest selections of router bits in North America

router. That would be like buying an entirely new car when your tires wear out.

Dimar Canada has introduced a line of router bits that feature replaceable carbide inserts. This is nothing new in the wood-working industry – the body of a shaper cutter is much larger, and much more expensive, than a router bit. A flush trim shaper cutter might cost \$250 in comparison to a \$25 straight edge



Slot cut with Lee Valley slot cutters

router bit. The tooling costs are primarily in the shaper cutter body. So manufacturers screw the cutting edges (the inserts) onto the cutter body so they can be easily replaced.

Right now you won't find too many replaceable insert router bits on the market. Dimar Canada lists 29 models. However, I think that over the coming years you will see a lot more styles available. They significantly reduce the lifetime cost of a router bit as once you purchase the body, you only pay for the replacement inserts. Insert replacement is a snap, and downtime unaffected. Most of the inserts have multiple cutting edges, so when one edge becomes dull you simply rotate it to expose a fresh edge. When all the edges are dull you replace the insert.

Dimar's two flute straight no plunge bit (#7RL8-12-2), features a 1/2" shank, a 1/2" cutting diameter and 1 3/16" cutter length. The bit (with 2 inserts) costs \$98, and replacement inserts cost \$11 each. While more expensive than a conventional straight bit, in the long run the replacement bit will pay for itself in lower costs, as it is less expensive than resharping the bit. Other Dimar bits include rabbeting, straight plunge, multi-bevel, round over and flush trim.

Specialty bits like these will likely appeal more to the professional or serious part-time woodworker than weekend woodworkers or DIYers. The up-front costs are high, with the savings coming over the long term.

THE EDITORS



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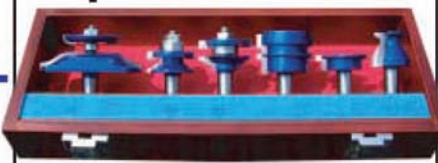
WL-2032 : 1/4" & 1/2" Shank

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Photo courtesy of Preverco Hardwood Flooring (www.Preverco.com)

Hardwood Flooring

Walk into any room and chances are that the first thing you notice is the flooring. Very few flooring options have the visual impact of hardwood. It exudes warmth, elegance, and natural charm.

Hardwood floors have been popular for decades because of their practicality, beauty and value. They offer a lot of advantages over carpet and linoleum. Hardwood flooring is:

- easy to clean (it doesn't accumulate dust and debris like carpeting does)
- long lasting (as long as you maintain it properly; in the event of damage it can be re-finished)
- durable and hard-wearing (it stands up to heavy foot traffic, but be careful of those high heels)
- hypoallergenic (doesn't trap dust, pollen, animal dander and allergens)
- sustainable (a range of sustainably harvested hardwood products are now available)
- versatile (you can choose from a range of colours, board widths, surface textures and finishes)
- an excellent investment (increases property and re-sale values)
- easy to install (for those with basic woodworking skills)

There are two broad categories of hardwood flooring: solid wood and engineered. Laminate flooring doesn't contain any wood (the wood look consists of a photographic layer of resin infused paper). Bamboo is made from grass, not wood, while cork is made from bark. Coconut flooring (sold under the trade name Dura-palm) is somewhat new to the market, and not widely available in Canada. Currently it's only available in a single dark colour. A 'floating floor' isn't a type of flooring at all, but a method of installation (the boards are glued or snapped together and 'float' on the subfloor.)

Engineered Flooring

Engineered flooring is comprised of real wood on top of two or more laminations of plywood, which makes it more dimensionally stable than solid wood flooring. More laminations make for a more stable floor. The solid wood top layer can be anywhere from $\frac{1}{32}$ " to $\frac{3}{32}$ " thick. While these

floors can be re-sanded and re-finished, damaged sections are typically removed and replaced.

Engineered flooring comes in a wide range of wood species and stains, and is sold pre-finished. Typically $\frac{1}{2}$ " thick, tongue and groove engineered flooring can be nailed, stapled or glued down, while the 'European style' flooring is installed as a floating floor. Engineered flooring is the choice wherever moisture is an issue – below grade installations, basements, and on concrete floors. It's also the best choice over radiant heating systems.

Solid Wood Flooring

Solid wood flooring is, as the name implies, all wood. While you can purchase it unfinished, most retailers sell pre-finished flooring. Unless you have finishing experience I recommend that you use pre-finished flooring. Hardwood flooring is ideal for family rooms, living rooms, hallways, bedrooms and dens. You

might consider other flooring types, such as vinyl or ceramic, for kitchens, bathrooms, and entrance ways.

Most manufacturers provide both strip and plank flooring. Strip flooring comes in thicknesses from $\frac{5}{16}$ " to $\frac{3}{4}$ " and widths from $1\frac{1}{2}$ " to $2\frac{1}{2}$ ", while plank flooring is available in $\frac{1}{2}$ " and $\frac{3}{4}$ " thicknesses and widths 3" and greater. Unlike engineered flooring, hardwood floors must be nailed to the subfloor. The process of installing hardwood flooring is not difficult – however it is somewhat time consuming, and it's definitely not for those with back problems.

Today you can purchase hardwood flooring in a wide range of wood species, cuts and finishes. Ash, beech, birch, cherry, maple, oak and walnut are among the most popular of domestic species. Ipe (Brazilian walnut), jatoba (Brazilian cherry), merbau (kwila), sapele, and tigerwood (goncalo alves) are some of the more fashionable exotics. Increasingly, both domestic and exotic woods are available from ecologically harvested supplies; look for the FSC (Forest Stewardship Council) logo.

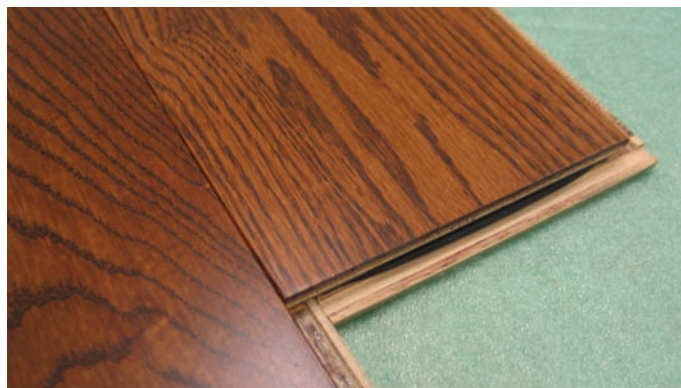
The harder the wood, the better the floor will stand up under day-to-day use. Of the species mentioned above, jatoba has the highest rating (2820) on the Janka hardness scale (a measurement of the force required to embed a 0.4" steel ball to half its depth in a piece of wood), followed by sapele (1500), hard maple (1450) and ash (1450). Cherry, at 950 is the 'softest' of these hardwoods.

As with the lumber for your woodworking projects, you can purchase different grades of flooring, from 'Select and Better', which is the most uniform in colour and virtually knot free, to '#1 Common', which can have the most variation in colour and grain as well as small, but tight knots. Also available is a 'Character' grade, which is similar to a #2 or #3 Common grade; it has the greatest variation of colour and knots of up to $\frac{1}{2}$ " (the knots are typically filled with a putty or epoxy).

While most hardwood flooring is flat-sawn (or plain-sawn), you can also purchase, at a premium, quarter-sawn or rift-sawn flooring. Quarter-sawn boards are less likely to warp, particularly if you choose very wide plank flooring. Otherwise, it comes down to a matter of the look you want to achieve.

Finishes

While you can save a couple of dollars per square foot buying unfinished flooring, applying a finish is a lot of work, and I believe that the resulting finish is not as durable as a factory applied finish. Plus you don't have to deal with taping off rooms, sanding, dust, and the long wait time for the finish to cure. Depending on the manufacturer, pre-finished floors can have acrylic monomers injected into the wood cell structure to increase hardness, be cured with ultra violet lights, and have seven or more coats of finish applied. While the 15 to 25 year warranties are common, some floorings come with 30 and 40 year warranties. These warranties cover degradation of the finish, not scratching or other damage that can be caused by not properly maintaining the floors, or by neglect.



Preverco PreLoc engineered flooring

Installing

Manufacturers provide detailed instructions for installing hardwood flooring, and it's a good idea to read and understand the instructions before you begin. Most woodworkers will have all the tools needed to do the job, except for a flooring nailer, which you can rent from most tool rental outlets. I like a nailer like the King Canada #8260 (www.KingCanada.com) which enables you to drive up to 2" crown staples and 2" cleat nails.

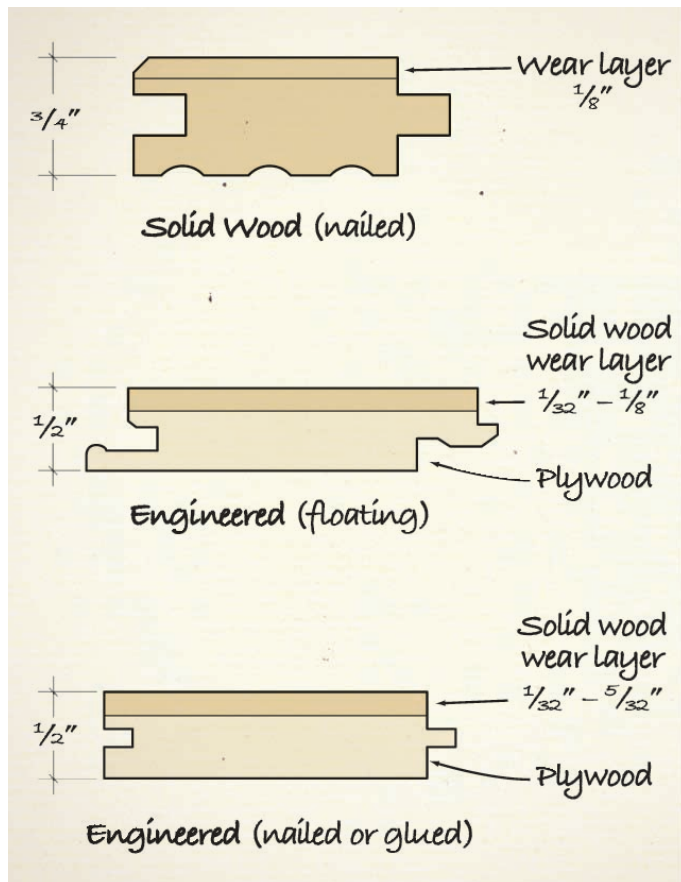
The installation process involves removing the existing flooring (and baseboards) down to the subfloor, preparing the subfloor (depending on the condition of the subfloor you may need to screw the subfloor to the floor joists, install a $\frac{1}{4}$ " underlay, or level the subfloor), laying down 15 pound felt over the subfloor, trimming the bottom of door jambs, and then nailing down the hardwood flooring. Over the years I've done dozens of hardwood floors – they're a piece of cake, but tough on your back.

A hardwood floor is a great investment to make in any home, and one that you can enjoy to boot. It can dramatically improve the looks of any room, and is easier to install than you might think.



King Canada flooring nailer

CARL DUGUAY
cduguay@canadianwoodworking.com



Illustrations by www.JamesProvost.com

Granite Tops

Rock Solid Innovation

When you think of granite it is likely in the context of the flooring often found in prestigious public and commercial buildings, in fountains, columns, monuments and other public structures. Or you may associate granite in its polished form with kitchen countertops, shower surrounds, fireplaces, or bar tops. But how about table saw tops or jointer fences?

There has been a lot of discussion generated since Steel City Tool Works (SCTW) recently announced the introduction of granite as an alternative to cast iron for machinery table tops and fences. Clever marketing ploy or brilliant product innovation?

Granite is probably one of the most common rocks on earth, and has been used for thousands of years, primarily as a building product. It's a type of igneous rock made up of small and large grains of minerals including silicates, feldspar and quartz, and has its origin as molten rock (magma) deep inside the earth. The magma cools either in the earth (as with granite) or after it moves up to the surface as lava. Then after a million or so years of 'stabilizing', we dig it out. The granite used by SCTW comes from China.

One of the major defining characteristics of granite is that it is exceptionally stable. Unlike cast iron (or wood for that matter), granite is not affected by changing humidity levels. Water left on a granite surface will have no effect on its dimensional stability. It won't shrink or swell, and hence won't warp. It is also largely unaffected by extremes of heat or cold. So, if the surface of a piece of granite is milled flat, it will remain flat. The granite table saw tops from SCTW exhibit less than a .001" to .002" variation across their width.

An ancillary characteristic of granite is that it won't rust – a concern with many woodworkers. If your shop is subject to extremes of temperature or humidity levels, you'll never have to worry about rust forming on a granite top, or cracking if

the shop temperature falls below freezing.

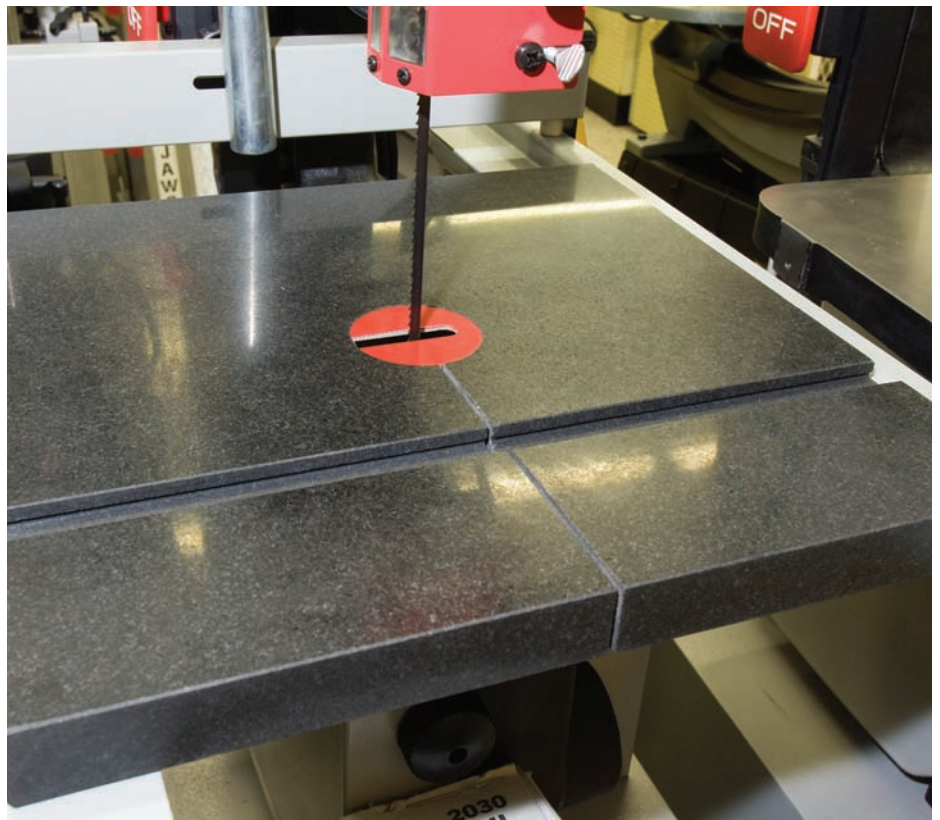
Granite isn't heavier than cast iron, but the granite table saw tops used by SCTW are 44mm (1.73") thick, and at 150 pounds, heavier than ribbed cast iron tops. This extra weight is an added advantage in that it absorbs more motor vibration than does a cast iron top. Of course, granite is more brittle than cast iron, so if you hit the edge of a granite top with a hammer it would likely chip. If you whacked the top with a sledge hammer it would crack. Beyond that, a granite top can easily handle the normal dropping and banging that occurs in a shop.

One of the disadvantages is that you won't be able to use any of your magnetic shop jigs on a granite top. As well, unlike cast iron, you can't tap into a granite surface to add any jigs or acces-

sories. To attach components underneath the granite table saw tops SCTW drills holes and uses stainless steel inserts set in place with a high tensile epoxy-type adhesive.

In addition to being stable, granite is remarkably scratch resistant. This is one of the main reasons it is so popular in kitchens. Of course, after several years of heavy use a granite top will show evidence of usage, but it will retain its original look much more so than cast iron.

SCTW's introduction of granite tops will only have a marginal effect on the world demand for scrap iron and steel, which is a major component of cast iron, but it does make sound ecological sense. For the user, the benefits of granite over cast iron would seem to be well worth the additional \$50 or so that it adds to the purchase price. And to cap it off, the granite tops come with a ten year warranty, which gives some indication of SCTW's confidence in the product. www.steelcitytoolworks.com



Bandsaw with granite top

CARL DUGUAY
cduguay@canadianwoodworking.com

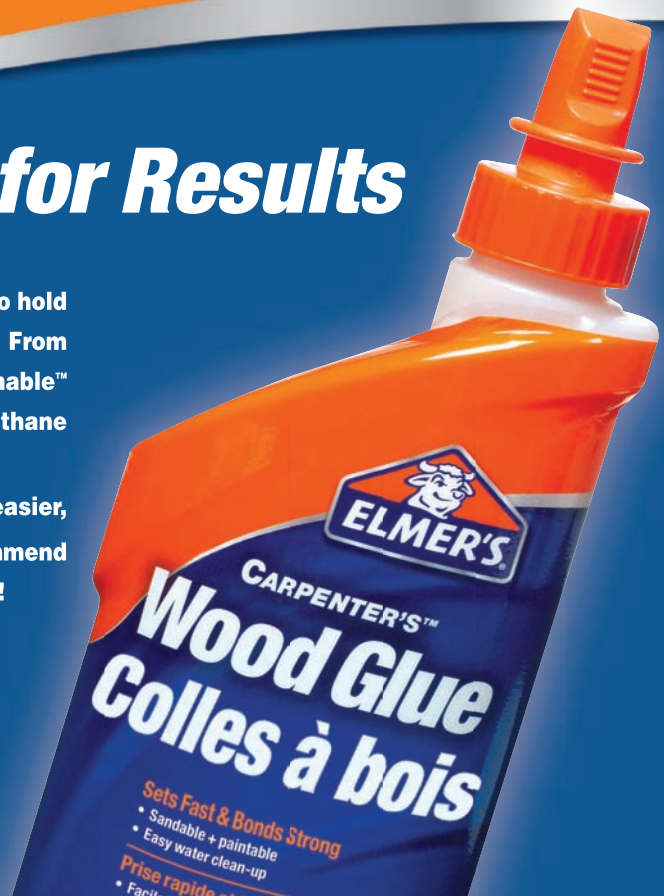


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This project was chosen by the members of our website's woodworking forum.

This workbench by Edward G. Robinson, from Burlington, Ontario, incorporates a unique bench top design.

The top for this workbench evolved as a result of Edward's research into the effects and control of seasonal wood movement. He also wanted a bench that would serve as a carver's bench and a traditional joiner's bench, with an ability to support a variety of clamping options. Adequate drawer storage for a collection of chisels and hand tools was another priority. The result was a two section bench with a center tool tray. Each section was made of three 3" x 3" x 36" long hard maple rails, with 20 tie bars holding them together. The 40 tie bar joints were tapered dovetails that were hammered tight and glued. Each end of the sections also had three tapered dovetail joints that held the end caps in place. The remaining square holes were filled with flush-fitting lipped hard plastic dogs. Four of these dogs had $\frac{3}{4}$ " round bench dog holes and could be moved to where ever they were needed,



since they are all identical. The outside birdseye maple skirts were joined with hounds tooth dovetails and provided continuity with the end caps as well as room for bench dog holes and solid mounting for a variety of vises.

With this design, Edward believes he has the wood movement demon firmly under control, as after one year of seasonal

humidity changes everything remains stable and solid. This may be the only bench in the world like this for many years to come.

Visit **CanadianWoodworking.com** and join our woodworking forum. That way you'll be able to show your work to the world, and vote for our next featured project.

BRENT SMITH

bsmith@canadianwoodworking.com

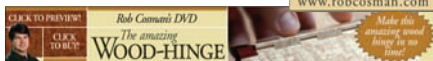
Continued from page 2

• A caul is simply a piece of wood that is used to apply even, consistent pressure across boards that are being glued together. Clamping cauls help align boards while edge cauls help distribute clamping pressure. Make sure you put cellophane tape along the side of the clamping caul that goes against the panel, otherwise it might glue in place. Any hardwood will do for cauls.

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ness of Canadian Woodworking readers towards quality woodworking products, I decided to give your website advertising a try. After all, with web ads it's relatively easy to measure response.

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Cheers

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Woodworking Classes

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issue (Feb/Mar '08, issue #52). We sell air-dried cherry, maple and walnut (which is milled here, by us, to various thicknesses). We also teach woodworking courses every weekend, with several hours of our Introductory Course being dedicated to lumber preparation.

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Calvin Brodie—Spanaway, WA

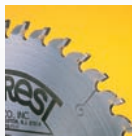
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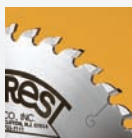


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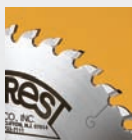


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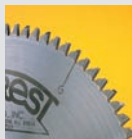


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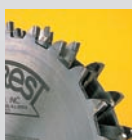


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Jerry Has An Idea

Jerry had an obsessive-compulsive personality. In behavioural psychology circles he would be termed “loony as a fruit bat.”

To me, he was just another customer of my 'do-it-yourself' woodworking shop. Who was I to judge the mental instability of cash paying clients? I had my own problems. As long as they didn't sever any body parts they might wish to use in later life, what did I care? My function as the owner covered instruction, assistance and raking in the cash. I was not an operating-room nurse.

Like many of my customers, Jerry had a dream. And like so many of my customers, he had no skills, woodworking knowledge or experience (other than with tongue depressors and Popsicle sticks.) Also, as with many of my customers, Jerry's dream was grandiose, unrealistic and possibly, just plain silly.

Jerry's dream emanated from an old movie set in England. There was a 20 second scene that took place in someone's study where Jerry spotted something that had triggered a long hidden desire he didn't know he had.

From that moment on, Jerry was going to dedicate his life to the creation of hand carved linen-fold panels. For those of you not familiar with them, linen-fold panels are simply boards that have been carved to look like hanging drapes. Go into your living-room and take a look. (Be honest now, this is the first time you even knew you had drapes, isn't it?) Note the way the drapes rise and fall across the bottom, almost like waves? Well, that's what a linen-fold panel is supposed to look like if carved properly. Simple, if you know what you are doing! Not so simple if you can't tell the difference between a #3 spoon gouge and a sharpened, slotted screwdriver. Or your wife's great-grandmother's, cherished ivory handled, antique paring

knife. In my defence, I only used it the one time. Mainly because it didn't work well at all.

Jerry of course, had no idea how to carve anything but a roast chicken. Not only that, but he had very little spatial differential skills and no matter how many sketches I made for him to follow, he still couldn't get the hang of turning a drawing into three dimensional reality.

After weeks of failing miserably, I decided to take pity on the man and give him a hands-on lesson of the art of linen-fold carving. Truth be known, it wasn't pity at all, I was afraid he'd get discouraged and I'd no longer have the income from his shop rental fees. I picked up a nice straight-grained piece of basswood and quickly sketched the outline of a linen-fold onto it. I glanced over at Jerry. He was still with me. Picking up a gouge to check the edge for sharpness I nicked my finger. As I licked the drop of blood off my finger I noticed Jerry swaying woozily. I was well aware that a minor gash like that would simply need a few stitches at most. I grabbed the tube of Crazy-Glue and squirted a few drops into the wound and pressed the edges together. It would hold

until I could find time to go to the hospital. Right now, I had better things to do.

Within a few minutes I had a reasonable facsimile of a linen-fold panel carved into the board and Jerry had a reasonable facsimile of understanding on his face. The light had 'Don'ed,' so to speak. I left Jerry gleefully carving away while I took my increasingly light-headed self off to the hospital. The ambulance people claim I use up too much of their fuel budget and refuse to come for me anymore. Jerry has continued carving linen-fold panels and has gotten so good at it that he was eventually able to go into business selling them to other like-minded people (four at last count) who also watch late-night English television.

The doctor added another six stitches to the previous score of 738 (my wife and I had added them up one night when we were bored) and with a sigh told me, yet again, to be more careful from now on.

DON WILKINSON
Yukoners@rogers.com



Illustration by: Mike Del Rizzo

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Safety should always be 'top of mind' when working in the shop.

Use one end of this jig to hold stock tight against the rip fence, and the other end to safely rip multiple thin strips from a wider board when you need to edge band sheet stock.

Making the Jig

Select a piece of straight grained stock, such as maple or ash, approximately $\frac{3}{4}$ " x $3\frac{1}{2}$ " x 15".

- Mill the stock square and to $\frac{5}{8}$ " thick. Then rip it 3" wide and cut it to a length of 13".

- Draw a 30° bevel at one end, and then draw a parallel line 3 inches in from the end. The second line determines the depth of the fingers.

- Place the blank on edge with the long side down, and laying a scrap of $\frac{1}{8}$ " hard-board flat beside the blank, draw a cut line on the blank.

- Use a bandsaw to cut along the line to form the first finger. Place one or two business cards in the cut, register the hard-board spacer against the cards, and draw another line. Cut the second line on your bandsaw and repeat this until all of the fingers have been cut.

- Use a $\frac{1}{4}$ " spiral bit to rout the slots for the 1/4-20 hardware (www.LeeValley.com). Mount end stops on the fence to limit the movement of the blank, and stop the grooves $\frac{5}{8}$ " from the end of the board and the bottom of the saw cuts.



Featherboard

- To add a micro adjust screw, drill a hole in the square end of the featherboard to accept the female half of an 8-32 Chicago bolt shaft (www.HomeHardware.com). You will need to cut off the head on the end of the female half before inserting it into the hole. Using a file, scratch the outside of the shaft to give the epoxy an edge to hold on to and then epoxy the female end of the bolt into the hole.

- Mill a piece of $\frac{3}{8}$ " stock 12" long and sized to fit in your table saw mitre track channel. Also mill a thinner piece for the feet, which will fit the wider section at the base of the track channel.

- Rout a channel across the underside of the runner, 2" in from each end, to accommodate the feet.

- Using the same spiral bit and fence from above, set up end stops and rout a 5" slot up the center of the runner. Move the fence back $\frac{1}{8}$ " and set your bit to project only $\frac{1}{4}$ " above the table and rout the recess for the bolt on one side. Flip the piece around and rout the recess on the other side.

- Use fast setting epoxy such as Elmer's Super Fast Epoxy (www.Elmers.com) or a

super glue, like Fastcap's 2P-10 adhesive (www.Richelieu.com) to fasten the feet to the underside of the runner.

Using the Jig

Set the featherboard to hold the material against the fence with firm pressure, slightly ahead of the blade. Your stock should be able to slide past the featherboard without excessive effort and it should have no side-to-side play whatsoever. To rip multiple strips of a consistent thickness from a wider board, place the featherboard in the mitre slot with the square end facing the blade. Set the edge to the approximate thickness and rip a test piece. Use the micro adjust screw to fine-tune the fit; one turn equals $\frac{1}{32}$ ". Set the fence to the width of your material and rip the piece from the board. The piece you want will be cut to the left of the blade, avoiding a potential kickback situation if the piece were cut between the blade and the fence. After the cut, place the board against the jig and move the fence to the edge of the board and rip another piece. Repeat as needed.



THE EDITORS

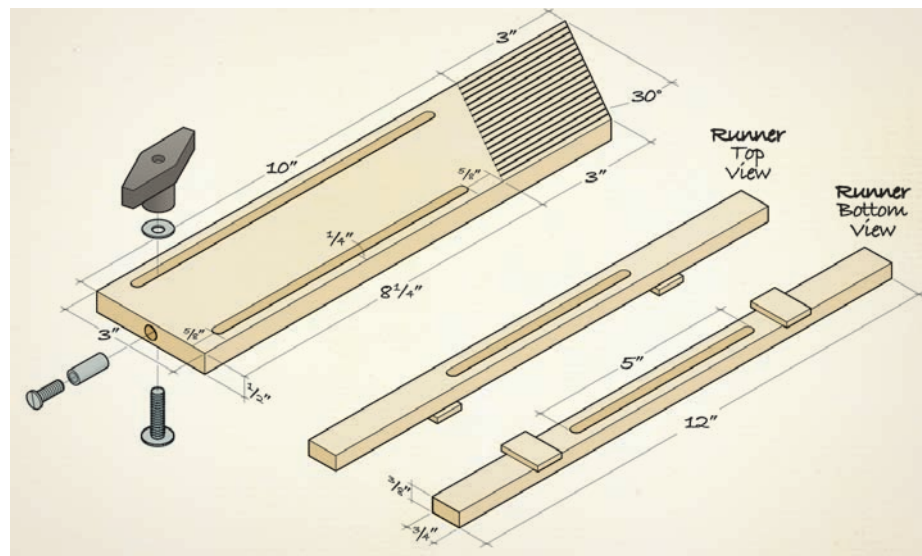


Illustration by www.JamesProvost.com

SUPPLY CHECKLIST

- $\frac{5}{8}$ " x 3" x 13" hardwood
- 1/4-20 Hardware, Lee Valley Tools #00K40.01
- 8-32 Chicago Screw, Home Hardware #2110-860

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