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(page 44)

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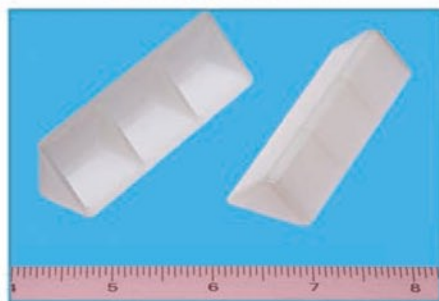


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# The facts are hard to ignore.

Titebond® III outperforms polyurethane glues.

The image shows a workshop environment with a wooden pegboard background. In the foreground, a bottle of Titebond III Ultimate Wood Glue stands next to a comparison chart. The chart, titled 'Glue comparison', lists various attributes and compares Titebond III (marked with green checkmarks) against Polyurethane Glues (marked with black checkmarks). The chart is part of a 'Reference Guide' from a 'Woodworking Handbook 2007'. Wood shavings are scattered on a workbench in the foreground.

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Reference Guide

**Glue comparison**

What woodworkers need to know!

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# Letters

## It's Another New Year ...



### AND WOODWORKING IS ALIVE AND WELL!

It's mid-October as I write this, but you're laying eyes on it as 2014 begins to unfold (Happy New Year!). Every year at about this time I hear a similar theory from the tea leaf readers and palmists among us: "Woodworking," they caution, "is a dying craft." And every year I look up from the sawdust in my shop, spend some time reading the praises and criticisms in our *Letters* column, the great

questions in our *Q&A* department and the clever theories in our *Stumpers* column and wonder ... who in the world can believe this is anything other than a vibrant, active hobby full of fun-loving folks who keep their minds and tools sharp with a little help from us?

From the 91-year-old woodworker we quoted on page 8 (who reads his new issues digitally these days!) to my newest project builder (Kimberly McNeelan, a 30-something woman with major woodworking chops), I just don't see it. Woodworking is an amazing hobby that is attracting young and old alike. What I really like about the new folks out there is their willingness to break a few "rules" (see the recycled cabinet on page 44), combine disciplines (look for a bit of metal-working in the mix this year) and learn a few tricks from their brethren.

Woodworking is alive and growing ... and we welcome the "newbies" with open arms. I've never met a woodworker who didn't love teaching the craft.

— Rob Johnstone

### Carbide Economics

I just finished your article on band saw blades! ["Is Your Band Saw Ready for Carbide?," *October 2013*] That's the first I have heard about carbide-tipped band saw blades. According to your article, you would have to invest in four carbon steel blades to equal the cost of one carbide-tipped blade. But the

carbide-tipped blades will outlast 15 carbon steel blades. Wouldn't that make the carbide-tipped blades a bargain? Or am I not doing the math right? Thanks for your article!

Harold Bricker  
Chambersburg, Pennsylvania

**Rob Johnstone:** The claim by one of the manufacturers was "in some very specific operations," it may exceed the run time by 15 to 1. I couldn't find other manufacturers to say that, and when I asked one of them specifically if they would be more cost-effective by lasting longer, he said "no."

So you are doing the math right — but in general use, the consensus was that the carbide blades will be more expensive. But I love to use them! They are the bee's knees!

**Reader Harold Bricker of Chambersburg, Pennsylvania, asked us to double-check our math from the carbide band saw blades article in our October 2013 issue.**

Letters continues on page 8 ...

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### Contributing Editors

NORTON ROCKLER

SANDOR NAGYSZALANCZY

ERNIE CONOVER

### Advertising Sales

DAVID BECKLER *Advertising Director*

dbeckler@woodworkersjournal.com

(469) 766-8842 Fax (763) 478-8396

ALYSSA TAUER *Advertising Operations*

atauer@woodworkersjournal.com

### Editorial Inquiries

ROB JOHNSTONE

rjohnstone@woodworkersjournal.com

JOANNA WERCH TAKES

jtakes@woodworkersjournal.com

CHRIS MARSHALL

cmarshall@woodworkersjournal.com

### Subscription Inquiries

(800) 765-4119 or

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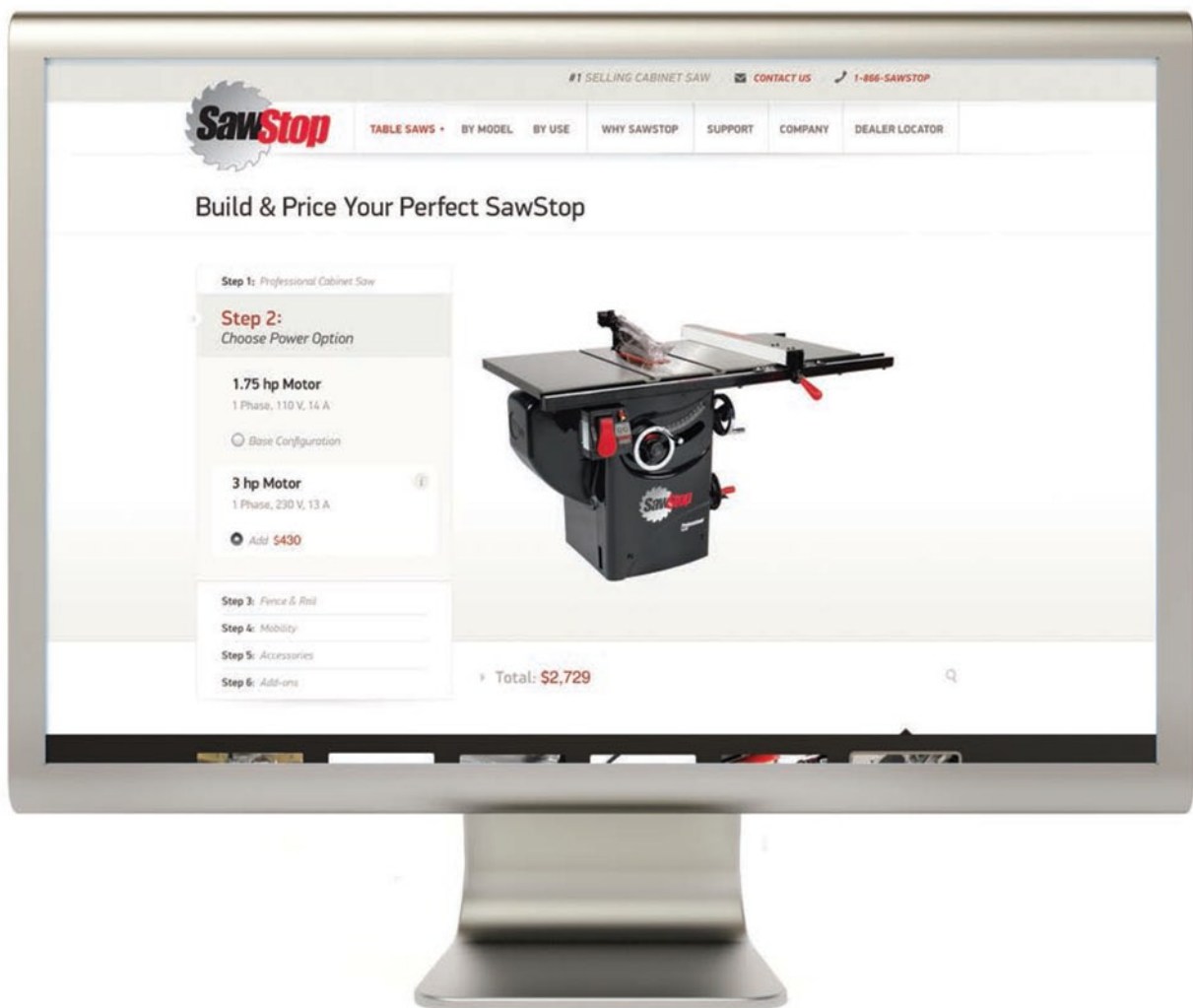


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*“Mostly, the things I am able to do, I do not want to do; the things I want to do, I am unable to do.”*

*Virgil B. Armstrong  
91-year-old woodworker*

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**MORE ON THE WEB**

Check online for more content (videos and PDF files) covering the articles below:

## **Woodturning (page 24):**

Chainsawing bowl blanks and chainsaw safety (video) • Using ClearCoat to finish your turnings (PDF file)

## **Candlestand Table (page 38):**

Dovetail jig for your lathe and turning the candlestand top (video) • Paper chucks (video)

## **Tool Preview (page 50):**

CNC Shark's Ready2Route router table fence (video)

## **Today's Shop (page 52):**

A list and links of computer info for woodworkers (PDF file)

## **Small Shop Journal (page 66):**

Swing-out lumber storage; more project details (video)



Click through Quik-Link on our website to find information on the tools featured in these articles:

## **What's In Store (page 64)**



## **Custom Pencil Boxes**

The article by David Larson, “Artist’s Pencil Box,” in the December 2012 issue inspired me to build a couple similar boxes for the grandkids.

Built of cherry, the boxes are a little taller and a little wider than the project, and they hold a ton of markers. Woodburned names keep them from getting mixed up and add a nice personal touch.

I used mini biscuits to hold the sides instead of dowels, and did not use the compound 12° bevel/angle in the top swing. Just the 12° angle.

The kids love them!

Robert Gartland  
St. Cloud, Minnesota

## **Short Sleeves for Safety**

In “Which is the Right Side of the Saw?” [Questions & Answers, October 2013], you stated “as long as they follow

basic safety practices...” One of the most basic safety rules is “never wear loose-fitting clothes.”

The photo (on page 14 of that issue) shows a fellow wearing an ill-fitting, long-sleeve shirt, an invitation to an accident. I was taught to wear short sleeves or long sleeves rolled above the elbow.

Keith Wood  
Kirkville, Missouri

One thing I picked up that must have been missed by your resident experts. Two important safety rules in the shop are that you NEVER use a table saw with long sleeves or a necktie on.

The individual does not have a tie on but has long sleeves, which is very dangerous. Not a safe shop.

Earle Sternburg  
Lakewood, Washington

## **Blanket Chest Finish**

What specific stain and topcoat were used on [“Veneer Paneled Blanket Chest,” October 2013]? I found it confusing that after you mentioned applying stain and topcoat that you said you applied some “unwaxed” shellac (the correct term is “dewaxed”) to bring out the wood’s figure, implying that the shellac was applied on top of the topcoat. If that were the case, the shellac would do little to enhance the figure. I am still confused as to where in the finishing schedule the shellac was applied.

Dave Bishop  
Richmond, Virginia

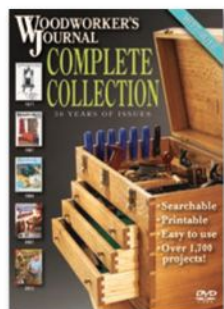
**Chris Marshall:** Thanks for your comments, Dave. I used General Finishes Antique Walnut Gel Stain. The shellac was applied after the stain on the veneered panels to help highlight their figure but prior to the final top coat, which was lacquer (aerosol, satin sheen). And you are correct: we should have used the term “dewaxed” shellac.

Enjoy building the project!

*Letters continues on page 10 ...*

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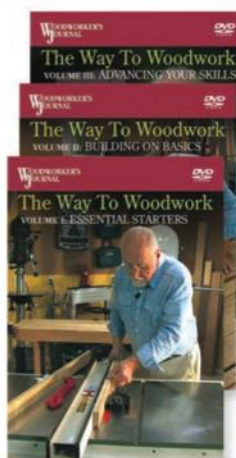
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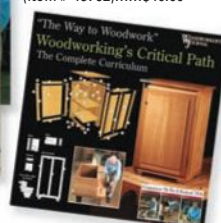
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**Sometimes our readers beat us to the punch. Galen Cassidy built a blanket chest with a hidden drawer (like the one in our October 2013 issue) way back in 2006!**



## Finished Blanket Chest

I had to smile when I saw the blanket chest project with the “hidden drawer” in your October 2013 issue. In January 2006, I made a very similar chest for my daughter out of oak and walnut. This is her favorite piece of furniture in her house.

Galen Cassidy  
Wichita, Kansas

## Stickley Bookcase

I corresponded with you a few months ago on the bookcase you built for the magazine [“Stickley-inspired Bookcase,” February 2013]. I wanted to add casters and you gave me

some advice. Here is how it came out. The only other change I made was to use wooden dowels instead of screws to hold the shelves in place. Since it will be rolled around, I didn’t want screw holes or screw plugs to be visible. Thanks for your help.

Josh Gressel  
Pleasant Hill, California

## Thanks for Writing

It has been too long since I have been an active woodworker. No need to go into all the circumstances, but I am now 91 years old. My shop is in limbo in my daughter’s garage. If I need to do any woodworking, I can excavate the equipment needed, and take care of it. Mostly, the things I am able to do, I do not want to do; the things I want to do, I am

unable to do. Enough complaining now!

Your notes from the editor have been interesting and enjoyable. I don’t remember when my last subscription expired, but I have switched my attention to reading the issues online. I still have many issues of the magazine, and most of them are in mint condition.

Thank you for listening to my sad story, and please continue to print and edit your great magazine.

Virgil B. Armstrong  
Hurst, Texas

**Correction:** Due to an editing error, Simon Watts was misquoted on the subject of epoxy in the “Elegant Floor Lamp” project article (*October 2013*). It is, in fact, his least favorite glue and he prefers the Swiss-made Collano Separoc (when he can get it), available in regular or fast setting times.



**Reader Josh Gressel added some wheels to our bookcase project, featured in our February 2013 issue. Nice work, Josh!**



RIDGID 3-piece 18V Hyper Lithium-Ion Combo Kit

**Feedback!** We want to know what you think of the projects and other stories in this issue, and we’re willing to give one lucky reader a **FREE PRIZE** just for participating. (We’ll put all the entries into a digital hat and pick a winner!)

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# Tricks of the Trade

## Finishing and Finicky Fasteners



### Kitchen Accessory Makes for a Quick Finish Mixer

After my wife's kitchen mixer ran its course and was too expensive to repair, I saved one of the beaters. Now I use it chucked in my drill to mix all of my gel stains, plus water- and oil-based paints. It really saves me lots of time and effort over mixing them by hand with a stir stick — just make sure you don't remove the mixer while the motor is still running!

Ernest Guerra, Jr.  
San Antonio, Texas



### Power Strip Just Makes Cents

How many cordless tools do you own? Probably more than two, like I do. But if you leave your chargers plugged into various outlets 24/7 with the batteries trickle-charging, you're wasting watts ... and money. So, consider plugging them all into a power strip with an On/Off switch. Before you leave the shop for the day, turn off the strip. Most chargers fully recharge a battery in an hour or less, so your batteries will be ready the next time you need them anyway. Turn the power strip back on only when you need to for recharging. After all, saving every little bit of energy just makes "cents."

Serge Duclos  
Delson, Quebec



### Thicker Tip with Electrical Tape

Recently, my beloved 5½" bench plane fell off the bench, and the handle cracked off at the top so it needed to be replaced. But you have to be careful when removing the soft brass screw that attaches the handle to the plane, because it will scratch and deform easily. In order to prevent that from happening, I wrapped the tip of my flat-blade screwdriver with several loops of electrical tape so that it fit the slot of the screw better. I use the same trick when I need to tighten the screws on my vintage hand saws, because it's hard to find replacement screws if I damage them.

Alejandro Balbis  
Longueuil, Quebec

### Wood Screw Corner Clamps

Here's how you can turn two 8" wood screws into a handy corner clamp for holding larger workpieces square while you assemble them. Cut a piece of 5¾" wide x 9"-long scrap into a trapezoid shape by miter-cutting it to 45 degrees. It's important that the corner opposite the angle cut is precisely square. Now, fasten one clamp to the 5¾" side with a couple of screws so the inside face of the jaw is flush with the scrap's edge and the tip of the jaw is even with the long side of the scrap. Screw the second clamp to the scrap's 9" side in the same way, but set the tip of the jaw 2½" back from the square corner. Flip the assembly over so the scrap is underneath, and your corner clamp is ready for use. You can even rack the "loose" jaw of the clamp situated at the corner forward a bit to serve as a stop for locating the adjacent workpiece during clamping.

John Stahr  
Chicago, Illinois



## PICK OF THE TRICKS

### Leave Sanding Discs in the Dust

I bet you, like me, have struggled before to remove a 12" adhesive-backed sanding disc from your disc sander. Even when the disc is spent, that adhesive wants to keep sticking as you peel the disc off of the plate. The other day, I faced this task again but with a new approach: I dusted the backing with baby powder while using a putty knife to pry it off. The powder adhered to the adhesive to prevent it from sticking again, and it really helped. Make sure to vacuum the plate clean again before you install the new disc to keep it from coming loose.

Bob Mohalski  
Hebron, Kentucky



In addition to our standard payment (below), Bob Mohalski of Hebron, Kentucky, will also receive a RIDGID 3-piece 18V Hyper Lithium-Ion Combo Kit (Drill, Impact Driver & Radio) for being selected as the "Pick of the Tricks" winner. We pay from \$100 to \$200 for all tricks used. To join in the fun, send us your original, unpublished trick. Please include a photo or drawing if necessary.

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**Safety First** Learning how to operate power and hand tools is essential for developing safe woodworking practices. For purposes of clarity, necessary guards have been removed from equipment shown in our magazine. We in no way recommend using this equipment without safety guards and urge readers to strictly follow manufacturers' instructions and safety precautions.



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# Questions & Answers

## Upgrades for Tools and Your Shop

### THIS ISSUE'S EXPERTS

**Jason Feldner** is a group product manager for cordless power tools at Bosch Tools.

**Sandor Nagyszalanczy** is the author of *Woodshop Dust Control*, the definitive book on dust in the workshop.

**Michael Dresdner** is a nationally known finishing expert and the author of *The New Wood Finishing Book*.

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with your question.

**Q** My NiCad batteries, and I have several of them, tend to last for a couple of years. I always treat them right and charge them the way that is dictated in the directions — following all the time and frequency suggestions.

What I'd like to know is this: Can I switch over to Li-ion batteries for my drills, etc.? Can Li-ion batteries be used in place of NiCads and if yes, what must be done to accomplish the change?

Any positive or negative information would be greatly appreciated so that I can put the thought out of my mind once and for all.

John P. Cich  
Apple Valley, California

**A** This is a frequently asked question we hear at Bosch, as NiCad batteries were the industry standard for more than a decade. The reality is that manufacturers are no longer improving NiCad, and Lithium-ion performance is light years beyond where NiCad left off.

Some manufacturers do offer a Lithium-ion pack that will work with their previous generation NiCad tools. Contact your tool's tech support group to confirm whether or not an updated battery is available. But please understand a couple of things as well: Li-ion tools are more compact. Their batteries

have twice the run-time at about half the weight and size. And the tool and battery price is roughly equivalent to what you would pay for a new NiCad pack. I would recommend any user consider

*Can you just put a Lithium-ion battery into a tool designed for the old-school NiCad batteries? A tool expert responds.*



adopting the new technology. It is the new standard and where many advancements continue to be on the horizon.

— Jason Feldner

*Continues on page 16 ...*



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# Questions & Answers continued

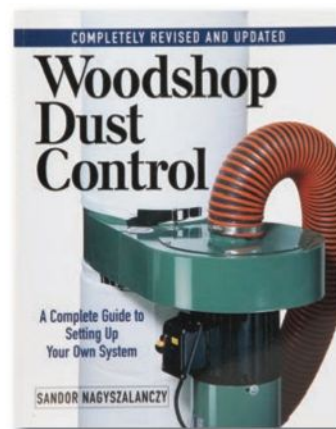


## Winner!

For simply sending in his question about batteries, John P. Cich of Apple Valley, California, wins an Osborne Miter Gauge by Excalibur (from General International). Each issue we toss new questions into a hat and draw a winner.

*“Designing and installing a dust collection system is a lot more complicated than just choosing the type of pipe and its diameter. I had to write an entire book to cover all the technical aspects of dust collection.”*

*Sandor Nagyszalanczy*



**Q** I have a new shop, 20 foot by 30 foot, where on two walls will be tools that will be using a dust collection system. What I would like to know is: what material should the pipe be, PVC or metal? I have looked at schedule 40 PVC pipe, 4" diameter. Would that work? Are there other considerations regarding [cubic feet per minute] and static buildup?

Marianne Dawson  
Newport, Washington

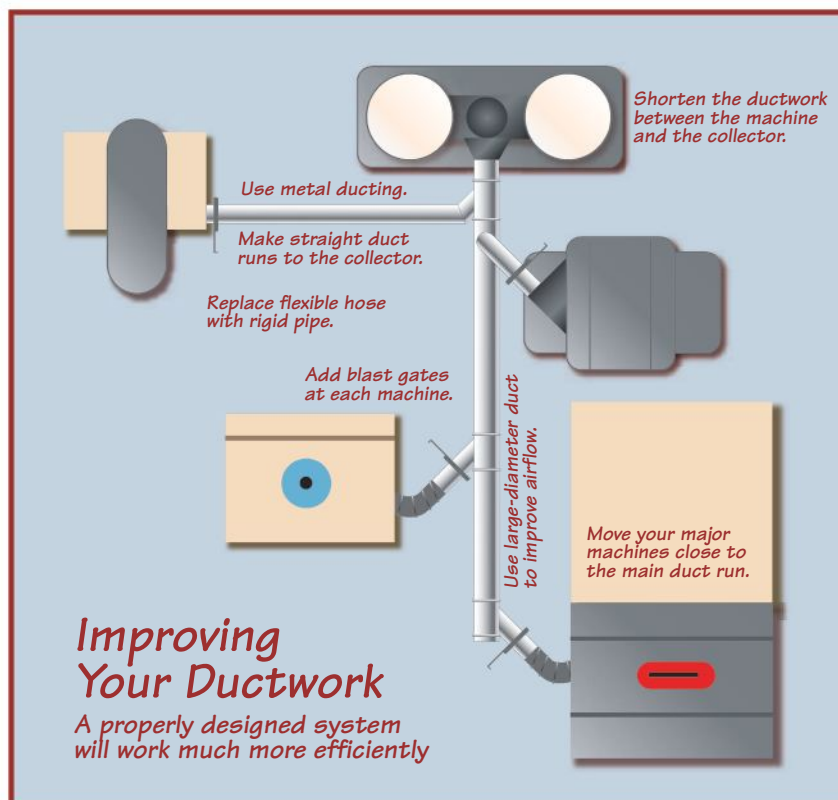
**A** Your question is kind of like asking, “What kind of eggs should I use to make

a soufflé?” The kind of eggs doesn’t matter nearly as much as how you go about making the soufflé itself. Designing and installing a dust collection system is a lot more complicated than just choosing the type of pipe and its diameter. I had to write an entire book (*Woodshop Dust Control*; Taunton Press) to cover all the technical aspects of dust collection, from ductwork specification and layout, to collector size and suction power, to filter type and efficiency, to hood design.

That said, here are a few words of advice: Although

plastic pipe certainly works, I’d rather you use metal pipe for your ductwork. Snap-lock HVAC pipe (not stovepipe) isn’t that expensive, it won’t crack, and you can ground it to the rest of the collection system to thwart static shocks. If your main duct will run 20-30 feet or longer, you’ll get better collection if you use 6" pipe for the main duct, and use 4" pipe for the branches that run to individual machines (use 5" or 6" for heavy chip producers, like planers and shapers). Keep your duct runs as straight as you can and, when connecting branch ducts to machine dust ports, don’t use more than a few feet of flexible hose—that stuff really reduces airflow efficiency. That should get you started; but please do the necessary airflow calculations as outlined in my book, to make sure you end up with a dust system that performs well in your shop.

— Sandor Nagyszalanczy



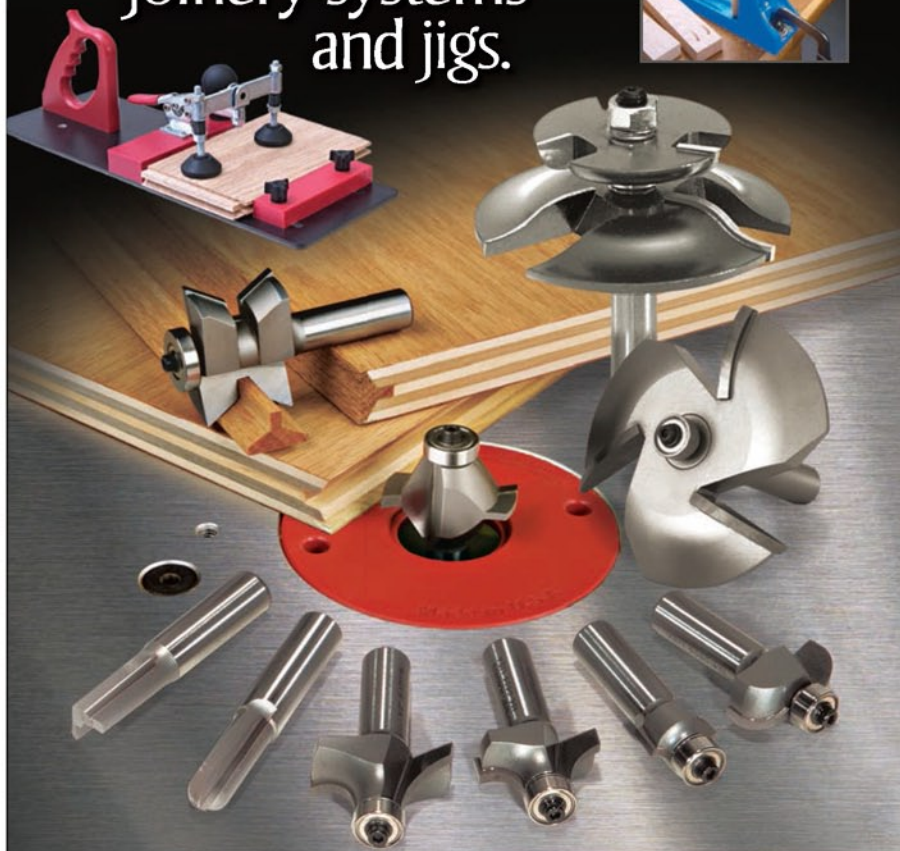
**Q** In the fine article on your website: “Cyanoacrylate: Everything You Need to Know” by Michael Dresdner, he wrote, among “other important information” on cyanoacrylate, that it “neither expands nor contracts while curing.” Does cyanoacrylate expand and contract, and does it breathe, after curing, after it has been applied to wood?

I’m specifically thinking of a situation where it is used on

*Continues on page 18 ...*

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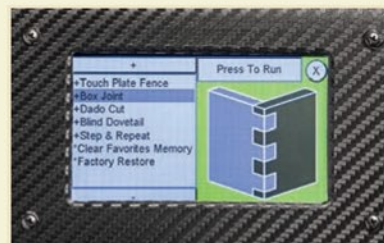
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# Stumpers

## We Got Stumped!



*This tool, unfortunately, continues to be a mystery ...*



### What's This?

This tool belonging to Vance Parker of Lewes, Delaware, was manufactured

by P Lowntraut Mfg. Co. of Newark, New Jersey — but it's not one of their typical wrenches or dividers.

The numbers 1 through 5 are stamped into both sides of the arms.

Do you know what it is?

Send your answer to [stumpers@woodworkersjournal.com](mailto:stumpers@woodworkersjournal.com) or write to "Stumpers,"

Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340 for a chance to win a prize!

When **Jim Davis** of Reston, Virginia, wrote in about the mystery tool from our October 2013 issue, he was honest about his mercenary approach to guessing its identity (and we appreciate that, Jim): "I have no idea what it is, but put my name in the hat anyway!"

Trouble is, no one else had any good ideas about what it was, either. To clarify: there were plenty of ideas about the tool belonging to **Steve Hodges** of Indianahoma, Oklahoma, but none that we could confirm.

For instance, **Howard Atamian** of Fresno, California, indicated, "My guess for the Stumpers tool is either a parting tool or a tool to clean out the ring grooves in a piston." Whereas **Ron Duecker** of Wooster, Ohio, thought "The first clue is that it was found in a barn!" surely meant that "The Stumper is a tool used for de-horning cattle!"

**Robert Murphy** of Daytona Beach, Florida, said, "I believe it to be a hide cutter. Stick sharp point in hide and push to cut to start skinning." **Merlin J. Jespersen** of Spokane, Washington, thought

that "The object appears to be a grass clipper. The handle is attached to the upper blade; the trigger in the middle moves the lower blade to cut grass."

When **Jim Costa**, of Woodridge, Illinois, wrote in about the mystery tool, he indicated that "I can't wait to read the concocted answers." He then proceeded, of course, to "concoct" a few possibilities of his own:

"A. It could be a sod-buster, the 'spike' pushed through the soil, parallel to surface, the blade closed down and then struck with a mallet to cut one side of a sod brick.

B. Wool gatherer used when shearing sheep: Grasp the wool. Squeeze it closed.

C. Cotton picker: Gather cotton bolls. Pull them free from plant or hold them so fingers can grasp fibers and put in bag."

It could be any of those things. Maybe. Or maybe not.

If you know what it is, feel free to write in — with some solid evidence, please.

—Joanna Werch Takes

**Winner!** Merlin J. Jespersen of

Spokane, Washington, wins a

**PORTER-CABLE Tiger Saw.**

We toss all the Stumpers letters into a hat to select a winner.



## Questions & Answers continued

a thin piece of wood as a finish on both sides and it expanded or contracted from heat and cold. Is there a good chance the wood would eventually crack?

Roger Wye  
Chicago, Illinois



*Is CA glue a good finish for a thin, flat piece of wood?*

**A** No, cured cyanoacrylate is not likely to cause wood to crack. It does not appreciably expand or contract within the normal range of temperature furniture is likely to experience. In fact, on very thin wood, it might help prevent cracking.

As you probably know, wood does move, but not from heat or cold. It expands and contracts indefinitely with changes in humidity. Wood moving through a wide range of moisture conditions can move enough to cause a brittle finish to crack. That's why we use flexible finishes on exterior woodwork.

Thin cyanoacrylate applied to both sides of very thin wood is more likely to impregnate the wood, possibly all the way through, than it is to sit atop it. In doing so, it will replace much of the air space through which wood takes up and releases moisture, and will make the wood fibers more rigid, thus reducing the amount of wood movement that would otherwise occur. More stability means a lower likelihood of wood cracking.

—Michael Dresdner

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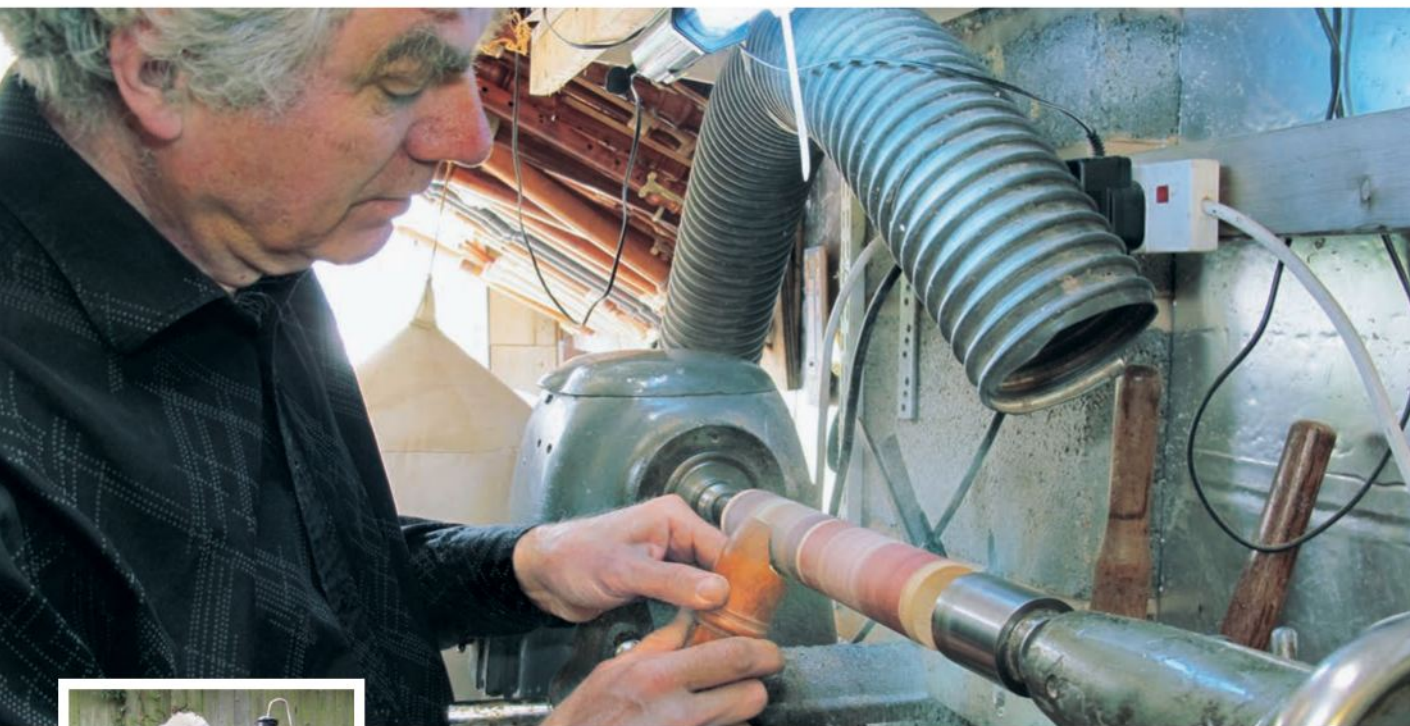
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# Shop Talk

## The World of a Fine Woodwind Maker



### How does it work?

"The energy in the breath is converted into transverse vibration converted to longitudinal vibration along the bore."

— Tim Cranmore

**T**im Cranmore makes his living in a small workshop in Worcestershire, England, where he makes wooden recorders for musicians playing Baroque and Renaissance music in pre-18th century style.

He studied the instrument to orchestral standards and, 35 years ago, discovered there was a market for making precise replicas. Instead of taking a formal course, Tim, as he put it, "sat in a corner and figured it out for myself." After examining instruments in museums and a period of trial and error he succeeded, and today he sells instruments worldwide.

His workshop is compact and basic. Most tools are handmade or adapted. He has a couple of aged lathes; some heavy-duty drill bits for the bore; small chisels, scalpels and customized knives; scrapers and graded

handmade reamers for shaping the bore and his "windway cutter," a tool exclusive to the trade.

### The Materials

Dense-grained clear timber is essential to the craft of woodwind making. Some fruitwood works, but the best, Tim claims, is a combination of European boxwood and African blackwood. The block, part of the mouthpiece, is cedar — ideal for its moisture resistance.

A boxwood instrument has a gentle, mellow sound. Blackwood makes a sharp tone able to resonate above the orchestra. Combinations blending the qualities of each are one of the many secrets of a successful instrument. The timber is quartersawn and turned unseasoned on the lathe into oversized tube blanks. The recorder will be in three sections: the head

(mouthpiece), body and foot, so the blanks are made to fit all.

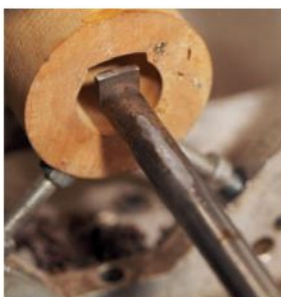
Air-drying can take up to 15 years, but Tim does it in the microwave. It sounds risky, but his reputation is at stake: the precision required for tone and durability is test enough that it works. When asked how long recorders last, he replied confidently, "centuries."

### The Making

The work is in two phases, described as gross and fine. The "gross" phase involves turning, boring, reaming, cutting the "windway," fitting the "block," carving the "ramp," drilling the finger holes and cutting the "beak." In spite of its description as the "gross" phase, it is exacting work.

The "fine" phase is the clever bit. Described as voicing and tuning, it produces the required sound and pitch for each note. The





bore creates the tone and affects the tuning. Tim, in his other capacity as a teacher of recorder making, can give a three-hour lecture on this. The bore tapers away from the mouthpiece in fine graduations. When asked how it works, Tim's answer was, "The energy in the breath is converted into transverse vibration converted to longitudinal vibration along the bore"! The gradual and minute removal of wafers of timber with a sequence of handmade reamers enlarges the bore to create the taper until the instrument resonates properly.

The windway is the slot you blow into. It is formed by a groove in the top of the bore, its base being the flattened top of the "block." The groove tapers inwards, compressing the air to accelerate it. Each surface is concaved lengthways. Proportions are critical. It's possible to cut the windway using blade and abrasive, but the windway cutter makes an exact, reproducible cut. It is a complex jig that moves a broaching tool back and forth, gradually raising it for the required depth of cut.

The labium and ramp form the shaped hole seen on any

whistle — their shape and position is vital in recorders.

The shaped "block" is a friction fit, any discrepancies taken up by beeswax. The beak is rough cut with a coping saw and finished on a lathe.

The finished instrument spends a week soaking in a mix of boiled and raw linseed oil. Then is the time of fine-tuning: spells of playing, bore adjustment and fine movement of the finger holes, undercutting or adding films of beeswax. Finally, the instrument is oiled and ready to make music.

— Barrie Scott

*When he's not occupied with the exacting details of woodwind making (photos above), Tim Cranmore is the course director/teacher of recorder making at the Cambridge Woodwind Makers. A few of his recorders are shown below.*



## WOODWORKER'S JOURNAL

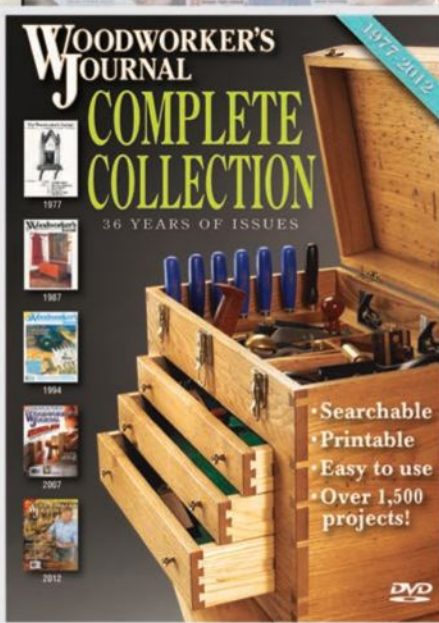
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*JET and Powermatic's generous donations to the Fort Houston co-op shop provide young woodworkers like Jonathan Malphrus (upper left, top) and Daniel Heering (upper left, bottom) with a place to launch their careers, and to teach others.*



*A building space, the co-op also allows members to show and sell their work (above right). Innovative furniture like a slab-topped cedar table is one great example.*

## Co-op Lets You Pay for Shop Time by Teaching Others

Daniel Heering, an architect by education, is one of the co-founders of Fort Houston, a member-based co-op located in Nashville, Tennessee. As a young man himself, he, along with Jonathan Malphrus and others, lamented the problems that confront young entrepreneurs, who have the drive and the fresh ideas needed to start a business — but who are often stymied by overwhelming obstacles. One primary roadblock for these 20-something go-getters is a place to put their ideas into action. Affordable space (10,000 square feet) that is appropriate for a variety of manufacturing and building options is exactly what Fort Houston provides to its members.

Fort Houston, now in its second (and larger) location,

offers a full-scale woodshop, print shop, bike shop and photography studio. In addition to the opportunities the co-op provides to its members, classes open to the community extend the benefits of Fort Houston to its neighborhood and beyond. You can learn to woodwork, screen-print or even work on a moped. One of the unique ideas employed by the co-op is that members can pay their dues by teaching classes, “using their intellectual property to pay their bill,” as Heering puts it.

On the woodworking front, locally based JET Tools decided to support the cooperative by generously donating a complete shop full of tools, which explains how a gaggle of woodworking editors ended up at Fort Houston this

past August, checking out the newest JET and Powermatic tools. The event was inspiring, but one reason it was so uplifting was meeting the young woodworkers using the space to do real woodworking — and trying to make a living at it. Their passion for woodworking, supported by the JET and Powermatic shop, was enough to make an old woodworker's heart beat a little faster.

That's because one question that has been troubling woodworking editors and toolmakers both is: “What does the future hold for woodworking?” Well, with folks like the ones at Fort Houston, that question might just have a happy answer.

— Rob Johnstone





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# Woodturning

## Chainsawing Your Own Bowl Blanks

By Ernie Conover



left as a log, cracks (called checks by lumbermen), will soon appear. The nature of these cracks depends on the wood. One huge crack can appear in a wood like pine, while elm or beech will have a myriad of small cracks, as in the photo at right. The lumber industry deals with this by cutting logs into boards that do not have a complete annular ring. Think of it as the cardinal rule of the cardinal rules: leave no complete annular ring in your bowl blanks.

To do this, I will crosscut a section of log slightly shorter than my chainsaw bar — this is called “bucking” by tree cutters. Support this log on a cradle, which you can nail up from construction material or improvise from short sections of logs. Next, I’ll rip boards from the log section, after first ensuring that my chain is very sharp!

I rip down the middle first, but do not cut all the way through. I stop about 1" to 2" shy of the bottom. For a small log, I make a center rip, trying to cut through the center or pith of the tree. More specifically, for larger logs, I make two rips, one to each side of the center so as to completely eliminate the center of the log. I stop both cuts 1" to 2" shy of completion. Next, I rip planks of the desired thickness to either side of the center cut or cuts. On a smaller log, I will get two

**T**urning a bowl from kiln-dried wood is problematic due to the sparse availability of 4" or thicker planks needed for a decent bowl. And if you do find some, expect to pay \$14 or more a board foot. That’s why most turners turn green wood from blanks they chainsaw from freshly fallen logs. Historically, this was the way bowls were turned, so I don’t think our ancestors thought anything of a bowl being oval. That was the way it was supposed to look!

Many turners, myself included, keep the tradition alive by turning green wood

bowls to final dimension and allowing them to warp oval. If this bothers you, it is only slightly more work to leave your bowl a bit thicker initially and allow it to dry for about three months. You then re-chuck your dried blank and make it round with a normal wall thickness in a second turning session.

As shown in the *Drawing* at right, a log does not shrink very much along the grain: only 0.1%. However, it shrinks up to 8% tangentially along the annular rings, and slightly more than 4% in the radial plane, which is at right angle to the annular rings. If

[www.woodworkersjournal.com](http://www.woodworkersjournal.com)  
**MORE ON THE WEB**

For a video of the author demonstrating his technique for chainsawing bowl blanks, plus safety tips, please visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on the “More on the Web” tab shown above.

You’ll also find there the author’s article on finishing turnings with Clear Coat.

planks, but on a larger log I can get four or six planks. On larger logs, I work from the outside to the center.

I do enough of this type of work that I have a very powerful chainsaw: 70cc with a 25" bar, what the manufacturer, Stihl, catalogues as "a saw for extraordinary cutting needs." I can get two good-size bowls out of each plank I rip with this saw. The average home or farm duty saw will typically have a 12" to 18" bar so you will more likely yield one bowl per plank.

After ripping the planks from my log, the next chore is to band saw a circle to create a blank. It's straightforward, but you need a coarse blade. I use a wide, four-tooth, skip pattern that cuts very aggressively. You must now turn your freshly cut blank before it dries or store it in such a way that it will not dry out.

This brings a second caveat to wood drying — the elastic limit of the material. If I bend a thin strip of wood, it will bend a good deal before breaking. A thicker strip will not bend nearly as much. I'm dealing with very thick planks here, and they will almost certainly check during drying if left as is. But if I turn a freshly minted blank to a bowl with a reasonably thin wall, the wood will be able to bend much more readily as it dries. A good rule of thumb is the wall needs to be 10% of the



**End Grain Checking:** Because a log or a board loses water faster from the end grain than from the face, or plank, it's normal to see grain checking at the exposed ends. The checking must be cut away.

bowl diameter, or less. This means that a 10" bowl needs a 1" wall to survive drying. If you want to turn your bowl a second time after drying oval to achieve a round vessel, 10% gives sufficient wall thickness to do so.

If you want round bowls, turn your blank to a 10% wall thickness and let it dry for about three months. Wrapping it in several sheets of newspaper, or a brown paper bag, for the first month further reduces checking because the end grain loses water faster than the plank grain. The paper creates a sufficient vapor barrier to

equalize this. If tomorrow is someone's birthday, you can dry the wood rapidly in a microwave. Directions abound on the Internet for microwave drying — but I just wait three months. I have a big pile of blanks drying — handy.

More often than not, I simply turn the bowl to a pleasing wall thickness. I then sand it and apply an oil or an epoxy finish. (See my article on Clear Coat online.) The finish creates a vapor barrier and does the same thing as newspaper. The bowl dries oval over the succeeding week, but it is just as useful as its round cousin.

## Chainsaw Safety

1. Never use a chainsaw left-handed. It is a right-handed tool only.
2. A chainsaw is only to be used by one person at a time. All observers should stay a good distance away.
3. Never use a chainsaw alone.
4. Never use a chainsaw above your shoulders or on a ladder.
5. Always ensure that the chain is tight before starting work and check it frequently.
6. Make sure your chain is sharp — a dull chain is more prone to accidents.
7. Always cut at a high throttle setting. Cutting at partial throttle is more prone to kickback.
8. Use a ground start or a knee start — never a cowboy start.

## Wood Shrinkage and Annular Rings





## How to Create Slab Bowl Blanks



*With the checks cut away from the end of the log section and your properly sized log securely raised from the ground, begin the first cut.*



*Continue your first cut across the width of the log, but leave an inch or two at the far end of the log uncut. A very sharp chain helps here!*



*Next, completely cut away the outside waste from both sides of the log. (Note the piece on the ground on the near side in the photo.)*



*With the two outside waste pieces sliced away, complete the center cut, and you have two thick planks from which you can remove bowl blanks.*

A final scheme is to drop your freshly bandsawn blank into a plastic trash bag and tightly seal it. This will prevent any water from escaping and give you between a one- and a six-month window to get to the turning. Temperature has much to do with how big that window is. All wood contains anaerobic microbes that cause spalting (which is rotting). Cutting off the air accelerates this process, as does heat. In the summer, or in Florida, you may only have a few weeks. Long-term storage can be achieved by throwing your bagged blank in a deep freeze. Tell your significant other that it is fresh game from a recent hunting trip and there probably won't be any peeking.

### Safety First

Chainsaws are a dangerous tool, so I would like to enumerate some important safety considerations (sidebar, previous page), the most important being what causes a kickback. The most common cause is for the upper quadrant of the nose of the bar to contact a limb or another log. This will drive the bar and saw upwards and rearwards and can hit the operator in the face. For this reason, you must always be cognizant of where the tip of the bar is. It is also a good reason to wear a hardhat with ear protection and a face shield.

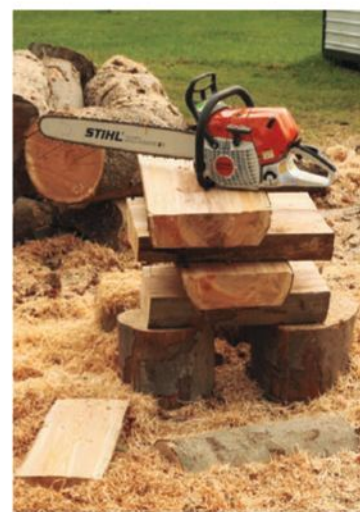
The second reason for a kickback is pinching the chain during a crosscut. Pinching the chain at the top of the bar causes the bar and

saw to push back. Pinching the chain at the bottom of the bar causes the saw to pull in. Either can be avoided by studying the log before the cut and cutting in such a way that the kerf opens and does not close. The severity of kickbacks can be greatly ameliorated by the use of safety chain and a kickback bar. All farm duty and homeowner saws come with safety chain, but pro models often don't.

In addition to the hardhat, ear and face protection mentioned above, you should wear chaps, leather boots and gloves. Chaps have multiple layers of protection and really do work well, and they are a lot cheaper than a trip to the emergency room!

I demonstrate much of this safety information above in a video that you can find on the *Woodworker's Journal* website. Be safe!

*Ernie Conover is the author of The Lathe Book, Turn a Bowl with Ernie Conover and The Frugal Woodturner.*





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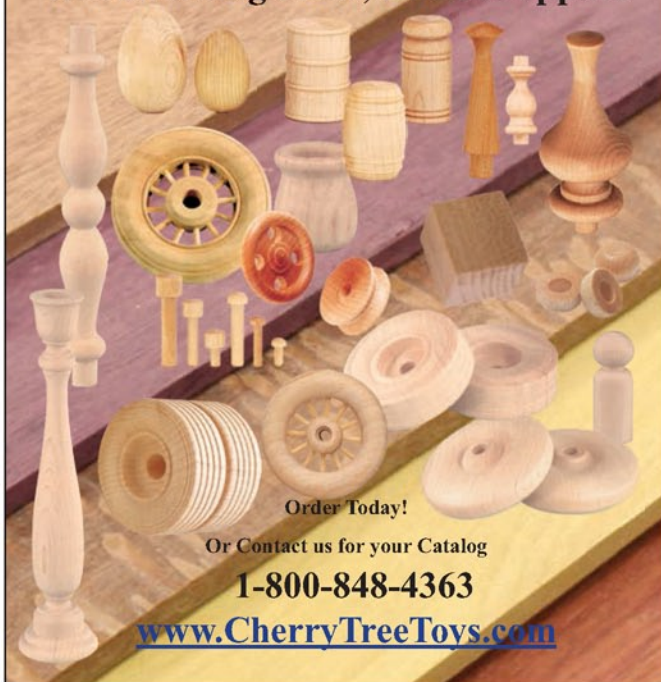


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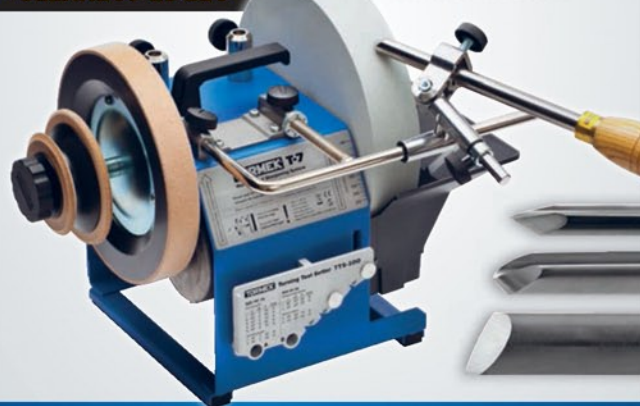
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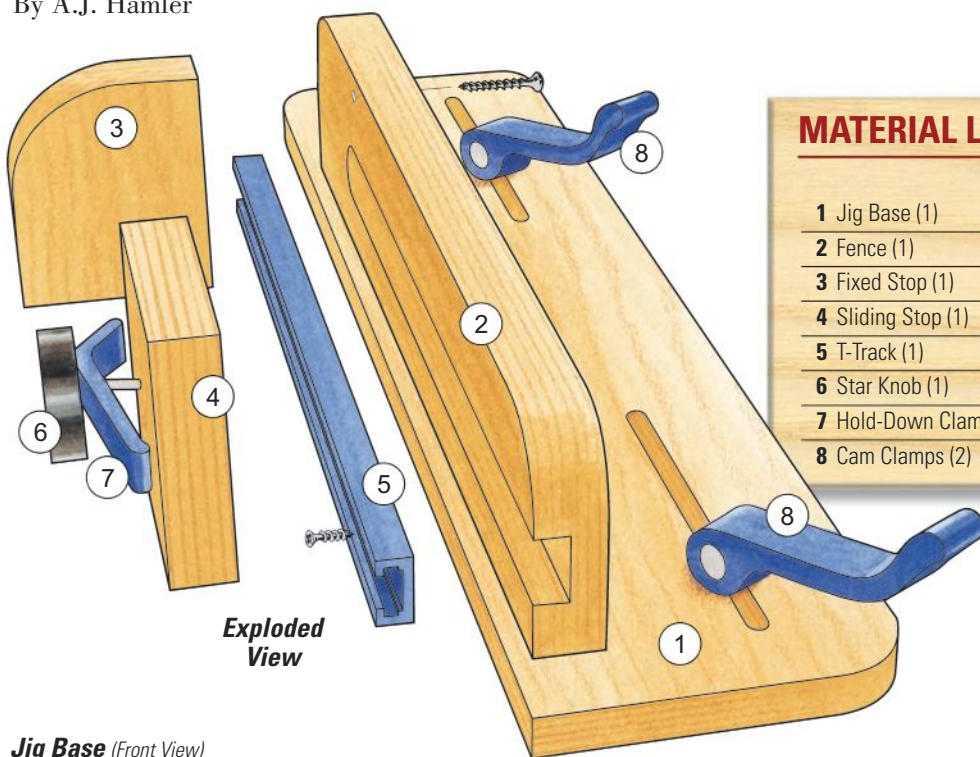
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# Jigs & Fixtures

## Dual Stop Vertical Drilling Jig

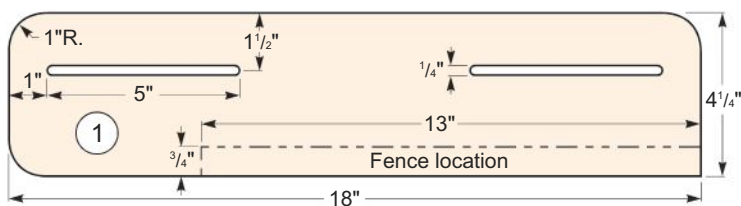
By A.J. Hamler



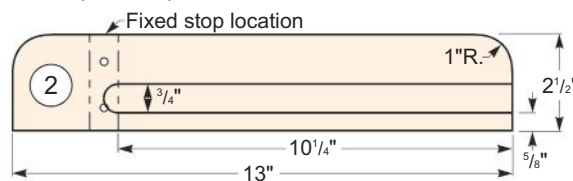
### MATERIAL LIST

|                       | T x W x L           |
|-----------------------|---------------------|
| 1 Jig Base (1)        | 1/2" x 4 1/4" x 18" |
| 2 Fence (1)           | 3/4" x 2 1/2" x 13" |
| 3 Fixed Stop (1)      | 3/4" x 2 1/2" x 3"  |
| 4 Sliding Stop (1)    | 3/4" x 3" x 3"      |
| 5 T-Track (1)         | (see hardware box)  |
| 6 Star Knob (1)       | (see hardware box)  |
| 7 Hold-Down Clamp (1) | (see hardware box)  |
| 8 Cam Clamps (2)      | (see hardware box)  |

**Jig Base** (Front View)



**Fence** (Front View)



Properly adjusted, nothing beats a drill press for boring perfectly vertical holes. With your stock flat on the table, held by hand or with a clamp when needed, as long as your table's square to the chuck, you'll get spot-on vertical holes.

However, when drilling holes into the ends of a workpiece, turning the work on-end and keeping it rigidly vertical while drilling creates a delicate balancing act. A vertical drilling jig like this one makes the process easy again.

This jig works with the drill's table (properly adjusted so it's square, of course) to hold your workpiece vertically with a dual stop system — one stop permanently affixed to the jig's 90° fence serves as the vertical register for the workpiece, while a sliding stop adjusts along a T-track to hold the workpiece upright.

Sliding stops and T-tracks go well together — a hole drilled through the stop accepts a star knob and T-bolt; slide it along the track to wherever you want it and then just snug it up. I offset the hole in the sliding block to add versatility.

For simple drilling of shallow holes, just use the sliding stop and knob by itself to orient your workpiece against the jig's fixed stop. The jig provides the verticality while you simply hold the piece in place. For deeper drilling (especially for things like pen blanks that tend to "get stuck" on the drill bit), add a hold-down

clamp beneath the star knob. Slide the whole thing over against your workpiece and clamp everything down securely.

Because the T-bolt hole is offset in the sliding block, you can orient the long tang of the hold-down to one side or the other of the block and orient the block with the hole to the right or left, all of which provides versatility and efficient clamping power for differently sized workpieces (photos, bottom of opposite page).

### Making the Jig

You can make your jig from just about any flat material, but I chose 1/2" birch plywood for the jig base, and 3/4" for everything else. I've sized the jig and its components for my drill press, so you may want to adjust sizing to best fit your machine. Also, my drill press has a pair of T-tracks in the cast-iron table that I took advantage of with T-bolt cam clamps, but if your drill lacks those you can also use the cam clamps with regular bolts and large washers in the open slots in your table. If that does not work, you can simply clamp the jig to your drill press table to hold it securely.

Begin by cutting the base to size and routing a pair of 1/4" x 5" slots for the cam clamps. Place these about 1 1/2" from the back edge, and an inch from each end. (This placement and slot length

## Drilling Jig Hard-to-Find Hardware

The following supplies are available from Woodworker's Journal.

**T-Track (1) #22104 ..... \$14.99 ea.**

**Star Knob (1) #23812 ..... \$1.99 ea.**

**Hold-Down Clamp (1) #21912 ..... \$7.99 ea.**

**Cam Clamp (2) #58244 ..... \$9.99 (2-pk.)**

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gave the movement range that worked best for my drill press, but adjust yours as needed.) The router table works best for this task. Mark the router fence so the bit lines up with the slot's starting point, then mark the workpiece where you want the slot to stop. To cut the slot, line up the workpiece on the fence mark and drop the wood onto the bit. Then just slide the workpiece along the fence till you reach your stop mark, and lift the workpiece off. Repeat the process for the other slot. With that done, round off three of the corners with a band saw or jigsaw as you can see in the *Drawings* — the right/front corner of the base remains square for placement of the fence shortly.

Now, cut and round off the jig fence and mark the location of the fixed stop onto the fence face as shown in the *Drawings*. Rout a 3/8" x 3/4" dado along the length of the fence, stopping the dado in the middle of the stop location. This allows you to attach the T-track so the end is hidden underneath the fixed stop once it's in place.

Attach the fence to the front of the jig as shown in the *Drawings* with glue and screws, and then glue the fixed stop into place on the front of the assembly. Note: The fixed stop holds the key to keeping your workpiece vertical, so check for squareness as you do this glue-up. Once the glue has cured, reinforce the fixed stop with a pair of screws countersunk from the back of the fence.

Finally, drill a hole for the star knob through the sliding stop centered top-to-bottom and about 1" from the edge.

You can leave the jig unfinished if you like, but two coats of polyurethane will help the sliding stop move more smoothly along the face of the fence (and make the jig look terrific).

A.J. Hamler is the former editor of Woodshop News.



*To make a routed slot inside a workpiece, line it up with your start mark on the fence. Then just drop, rout and lift on your stop mark. The location of the slots may need to be adjusted to accommodate your drill press.*



*By routing the dado slightly long, the end of the T-track is neatly hidden underneath the fixed stop: a nice touch. The T-track is held in place by screws driven in through prepared countersunk holes.*



*For more holding strength, install a hold-down clamp underneath the star knob on the sliding stop. For wider workpieces, flip the sliding stop and hold-down clamp as needed. Because the hole for the star knob is offset on the sliding stop, the blue hold-down clamp can be flipped 180° to accommodate differently sized stock. When drilling shallow holes, you can remove the hold-down to speed up your drilling.*



# Bed/Desk Combo

By Kimberly McNeelan



*This ultrapractical hidden bed design allows you to have a spacious desk that pulls down to a twin bed — and you don't even need to clean off your desktop.*





*Here's a new twist on the old Murphy bed, featuring cherry lumber and some innovative new hardware.*

I was asked if I could build a Murphy Bed/Desk combo. Of course I can, I thought to myself! It involves some cool new hardware and unique challenges that sound interesting, and the whole concept would be a useful space saver. (My wonderful studio home is a whopping 475 square feet.)

The project went together fairly easily with simultaneous work on different sections. I started with a mock-up to be sure the hardware would be located properly, created the case, constructed the desktop, constructed the bed, and then put it all together.

Before starting, there are some things one must consider. I decided to show 1/4" solid wood edging on all the exposed plywood edges, and the measurements listed reflect that. You could use edge banding rather than solid wood, but you will need to adjust the measurements accordingly. Editor Rob Johnstone suggested I try Rockler's Edge V-groove Bit to cap the plywood edges, and it worked fine after some practice (see sidebar, page 34).

I created an MDF mock-up (see sidebar, above) to confirm that the metric conversions for the hardware would indeed work. Imperial measurements are very ingrained in our work habits, but I do think metric could be easier for all of us. Fractions don't come naturally for everyone. Sometimes my new students look at me cross-eyed if asked for something like 5/16". Fractions, I tell them, take practice.

## The Case

Starting with the large ends of the case, cut the cherry plywood to size on the table saw. Before establishing and routing the curved sections on the case sides, you must rout the V-shape into the straight edges of the plywood. After that, move on to the curved sections, which have a nice solid wood edge treatment attached with a butt joint.



## Why Build a Mock-up?

**A mock-up is just an even safer version of the measure twice, cut once practice. Once you have the case pieces built out of the final material, you'll want to be sure you drill the holes in the proper place, unless you are a fan of the Swiss cheese look or of wasting good wood. The arm mechanism of the bed/desk required a little bit of tweaking on the mock-up to get the desk resting flat on the floor in the bed position and perfectly level in the desk position. If you follow our measurements, you will be fine. But if you modify the plan, be sure to make your own mock-up to work out the details. You'll be glad you did!**

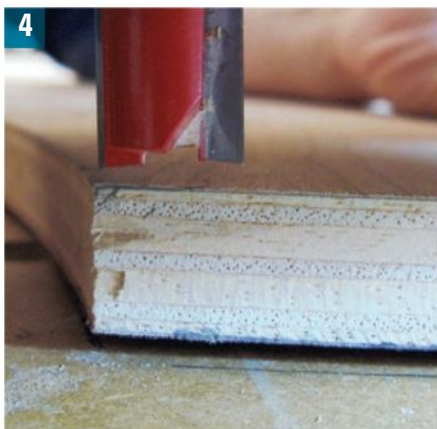
Achieving a solid wood edge on the curved section of the side requires patience and a trick or two. There is a numbered photo sequence on page 32 that takes you through the process I'll describe here. First, I made a couple of trammels out of a scrap piece of MDF. Then I established the pivot point for the trammels at the corner of the work table. I put the plywood that would become the side on the table and scribed the arc I would be routing onto the plywood using the first trammel, as shown in *photo 1*. Marking the setup so that I could put the plywood exactly back in place, I used a handheld jigsaw to rough out the arc, leaving about 1/16" or so to trim off (*photo 2*). Now, with the second trammel set up to cut the arc

perfectly, I put the plywood end piece back on the table with a piece of plywood underneath to boost it away from the table (you don't want to rout into your table). The arm of the trammel needs to be parallel to the table to get a perpendicular cut. You can achieve that by drilling a hole the size of the pivot dowel in small scraps and adding the scraps at the pivot point. Attach the router to the trammel, centering a straight bit in the

**Cutting up 3/4"-thick plywood is one of the first major tasks in building the bed/desk. Here, the author has the table saw set up to rip large pieces.**







**Cutting the arcs and matching curved hardwood edging for the case sides required a step-by-step process. Using trammels to scribe and cut the arcs is the key. It is very important to locate the plywood pieces and the pivot point for the trammels accurately and securely. Then, by moving the location of the pivot holes in the trammel, you can precisely cut all three arcs required to get perfect results. Use the same process on the bed ends to shape and edge those plywood pieces.**

hole. I used a 3/8" carbide-tipped straight bit. (Please, be sure to have your router unplugged while you are setting up. I'm a fan of my fingers, and I'm guessing you like yours, too.) Adjust the plywood again so that the edge of the bit aligns with the scribed line. Turning the bit so that you are aligning with the outermost point is imperative to getting the cut where you want it. Clamp the plywood side piece to the table securely. Now plug in the router, and clean up the jigsaw edge by routing that perfect curve from left to right, as shown in *photo 3*. Repeat the process for the second side piece, but before you remove it from the work table, drill a second pivot hole in the trammel that will locate the edge of the router bit to the other side of the arc you just cut, as shown in *photo 4*. This will allow you to rout the matching curve in the hardwood you'll use for your edging. Label these holes so that you will know which



is which. Grab your hardwood stock and mark the curve from the plywood onto the hardwood (*photo 5*). Cut the curve on the hardwood piece using either the jigsaw or band saw, again leaving at least 1/16" extra (*photo 6*). Place the hardwood piece on the table where it will match up with the plywood curve and then remove the plywood. Rotate the router bit so that the innermost tip is just touching the line on the solid wood. Take note: you'll be routing in the opposite direction this time (see *photo 7*). In order to not have clamps in the way of the trammel, I screwed the solid wood piece (a good portion of the

solid piece will be scrap) into a piece of MDF which I clamped to the table. Please, make sure the trammel arm is now perpendicular to the table again. Now you can rout that curve!

I glued the solid wood curve to the plywood by using some creative clamping. Because much of the solid wood piece will be cut away, screw a slightly wider but just as long scrap to the top of it, as shown in the top left photos on page 33. Clamp two pieces of scrap wood on the front and back faces of the plywood. Now you have two parallel surfaces so you can get good clamping pressure on the curve.



***Clever clamping is required to get a sound butt joint between the curved case side and the solid hardwood piece that will later be routed away to leave only 1/4" of edging. Scrap MDF is screwed to the hardwood piece to help spread the clamping pressure.***



***Glue and clamp the V-shaped hardwood edging onto the front and back edges of the case. Don't apply too much pressure, or you'll split the plywood. The author needed to shape the top end of the front V-strip (see inset) to fit the curved hardwood piece.***

Glue the curves together now, and leave the ends of the solid wood long. I usually let glue-ups set overnight.

Once the glued curve is dry, take the base side back to the trammel table. If you used a 3/8" straight router bit, drill another hole in the trammel arm, making the distance from the first hole 5/8" less (1/4" for the edging and 3/8" to account for the straight bit). Label the three holes on the trammel to use them later on the bed end curve. Yes, you will be doing this exciting exercise again later! Mark on the solid wood where you want the edge to be (for me it was 1/4" from the plywood to leave a 1/4" solid wood edge). Mark this curve with a pencil on the solid wood that is now glued to the plywood. Use a jigsaw to cut the curve, leaving at least 1/16" extra. Align the pieces so the router bit cuts the curve and leaves 1/4" of solid wood edging glued in place.

After those tricky curves, the next steps may seem like a breeze. Rip the plywood for the top, bottom crossbar, and back of the case. The top stretcher is made from solid wood as well as solid wood edging strips for the bottom stretcher, case sides, bed ends, top and bottom of the bed rails. See the *Material List* for the dimensions and details of all these pieces. Then go

ahead and rout the rest of the plywood edges for the case with the V-groove bit.

Next I moved on to making the body concealers, locking pin blocks, bed stops, and top of the case molding, which are all pretty straight forward. Just follow the sizes and pre-drill according to the *Material List* and the *Drawings*. Then I decided to put the top of the case together using the fabulous Festool Domino. The Domino is such a fun tool, and the Festool tools have such great dust collection! I sanded up to 180-grit before gluing up the top of the case. You should sand each group of pieces before gluing, even if I don't keep reminding you to do so. Remove any pencil lines, etc. Remember, work smarter, not harder.

Before the case sides can be assembled, you must mark and drill for the hardware. I marked where to drill the holes by placing the hardware plate on the case inside and measuring from the bottom and the back side to the edge of the hardware plate. Then mark the center of the holes in the hardware plate. For the piston mounting bracket, the measurements are for marking to the center of the holes. Since the case sides are much too big to get on the drill press, use your combination square next to your drill to

help you drill perpendicular holes.

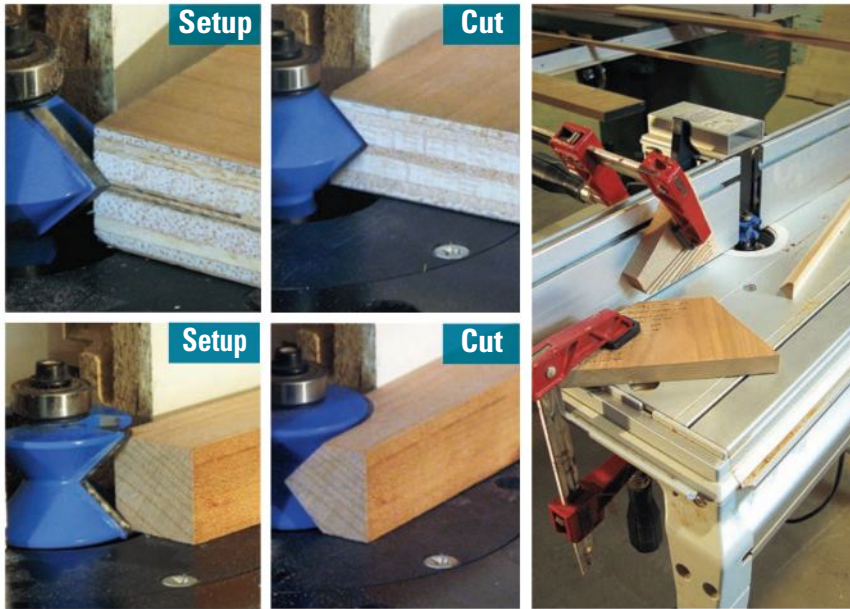
And remember, at some point, you'll need to notch out the little section on the bottom back of the case to make room for the baseboard. Attach the body concealers, locking pin blocks, and bed stops by countersinking and pre-drilling the holes. I covered the screw heads later using plastic screw cap covers for Phillips and Square-X screws. These little covers snap right in the screw heads, if you countersink to the proper depth.

Moving forward, the case sides, back, and bottom stretcher need to have their Domino mortises machined. In order to get the bottom stretcher where you want it (kind of floating behind the hardware), measure and mark a line to align the Domino machine perpendicular with the bottom of the case. Set all these parts aside now and move on to the desk.

## The Desk

The desk assembly is very similar to the case top construction. Rip the desktop to width, use the edge V-groove to attach the solid wood front support, and then cut it to length. Next, make the desk sides and the back out of solid wood. Measure, mark and drill for the hardware that attaches to the desk sides,





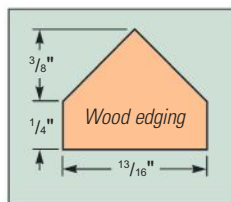
## Edge Banding with V-groove Bits

This project requires about 700 lineal inches of wood edging to cover the plywood edges. I used an Edge V-groove Bit set to attach most of it so the joints would be interlocking. But they only work on straight edges that don't intersect on the same piece to form an inside corner. It's necessary to cover the curved plywood edges and two intersecting straight edges on the bed ends without using the Edge V-groove Bits. I just used a butt joint for those edges.

The setup for the Edge V-groove Bit is pretty straightforward. The negative "V" will be cut into the plywood, and you will align the point of the router bit with the middle of the ply (see double pencil line in first setup photo). The positive V will be cut into the solid wood edging. The strips for the solid edging need to be the thickness you want exposed ( $\frac{1}{4}$ " here) plus  $\frac{3}{8}$ " which will be routed into a V-shape and glued into the plywood. The width of the solid wood strips should be just over  $\frac{3}{4}$ ". I used a flush-trim bit to trim the hardwood flush with the plywood once it was glued and dry. When routing the matching V

into the plywood, make sure the fence is aligned perfectly with the bearing of the bit. These bits cut pretty clean, but don't waiver the plywood at all. It will cut too much off of one side, which will leave a gap on that side and mess up the V-groove alignment. I recommend using a featherboard to apply pressure down on the plywood to stabilize those large pieces. Remember, you only get one shot at routing the plywood. If you try to touch up the cut, the bit will damage the delicate veneer edges. And after routing the solid wood once, there won't be enough surface left to handle it safely. When routing the banding, featherboards are necessary for downward and inward pressure (see photo, above). Use a push stick, do at least one practice piece, and let the router do the work.

During the tricky parts of this project, one may forget that this should be fun. I recommend keeping cookies on hand for said moments. Cookies can be more soothing than a freshly sharpened hand plane cutting its first ribbon of wood.



*The tri-bearer needs to be mounted before the desk components are assembled. Part of the hardware will be captured by the wood.*

including the tri-bearer, link pivot and locking pin. You will bolt the tri-bearer to the desk sides now, before gluing up. The cap nuts used with the connector bolts will be concealed in the desktop (see photo at left).

Go ahead and cut Domino mortises in the sides and back to the desktop. I used the same clamping trick of clamping solid wood strips to the desktop in order to get a right clamping angle using short clamps for the desk sides. Then I glued the desk back on.

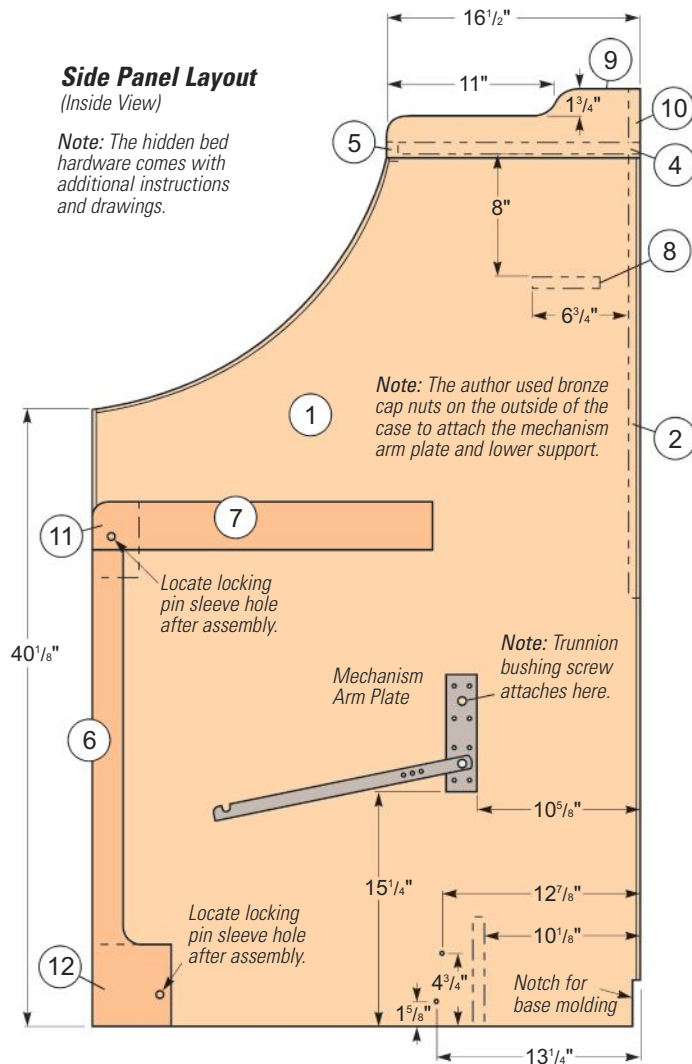
## The Bed

The bed ends are rather tricky, just like the case ends. Now that you have practiced doing the curves for the case, the curves on this section should be easier. After routing the edge V-groove on the four parts of the sides shown, mark and drill for the trunnion bushing. Then attach the bed end to the case side with the trunnion bushing. You can align the bed end in the perpendicular (desk) position and clamp it. Then mark where the curves will line up on the case side and

## Side Panel Layout

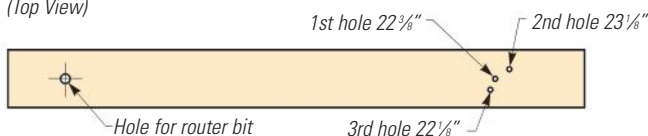
(Inside View)

**Note:** The hidden bed hardware comes with additional instructions and drawings.



## Router Trammel Hole Layout

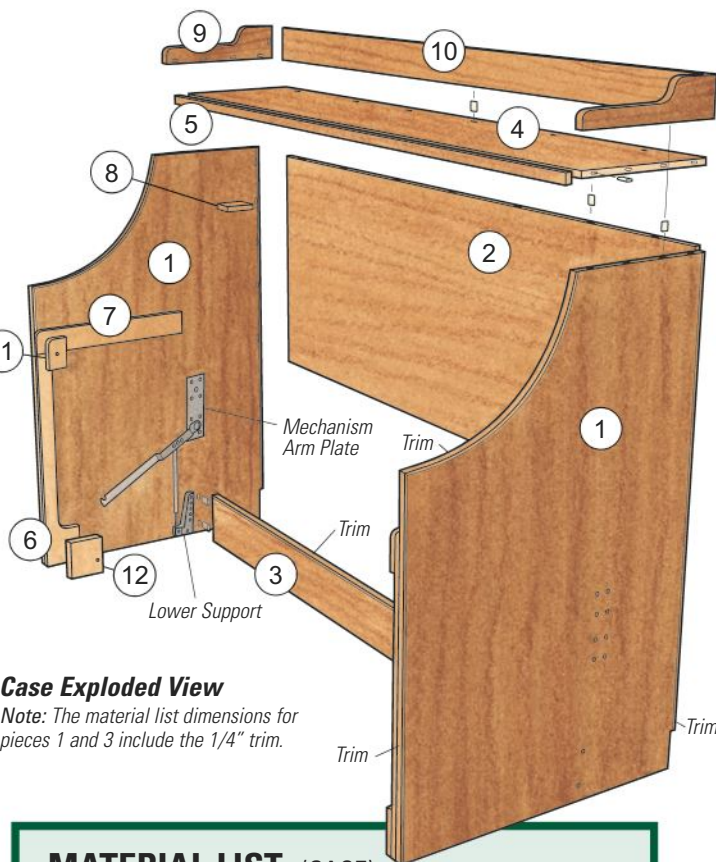
(Top View)



the bed side (see photo at left). Now remove the bed end.

You are ready once again to go through the steps of making the curves — mark, cut, and rout the plywood, and then move the trammel arm. Mark, cut, and rout the solid edge. Glue the matching pieces as described in the case side curve. Mark the final dimension 1/4" out from the plywood. Cut it leaving at least 1/16" of

**The bed end is attached to the case side with the trunnion bushing. You can align the bed end in the perpendicular (desk) position and clamp it. Then mark where the curves will line up on the case side and the bed side.**



## Case Exploded View

**Note:** The material list dimensions for pieces 1 and 3 include the 1/4" trim.

## MATERIAL LIST (CASE)

|                                  | T x W x L                |
|----------------------------------|--------------------------|
| 1 Sides (2)                      | 3/4" x 35 5/8" x 56 1/2" |
| 2 Back (1)                       | 3/4" x 28 5/8" x 80 5/8" |
| 3 Bottom Stretcher (1)           | 3/4" x 7 1/8" x 80 5/8"  |
| 4 Top (1)                        | 3/4" x 15 3/4" x 80 5/8" |
| 5 Top Stretcher (1)              | 3/4" x 1 1/4" x 80 5/8"  |
| 6 Front Side Body Concealers (2) | 3/4" x 5 5/8" x 31"      |
| 7 Top Side Body Concealers (2)   | 3/4" x 3 5/8" x 22 5/8"  |
| 8 Bed Stops (2)                  | 3/4" x 2 1/2" x 4 5/8"   |
| 9 Top Side Molding (2)           | 3/4" x 4 1/2" x 16 1/2"  |
| 10 Top Back Molding (1)          | 3/4" x 3 3/4" x 80 5/8"  |
| 11 Upper Locking Pin Blocks (2)  | 3/4" x 3" x 5"           |
| 12 Lower Locking Pin Blocks (2)  | 3/4" x 5 5/8" x 5 5/8"   |



For a video of the Desk/Bed being folded into a bed, while items on the desk stay put, visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on the "More on the Web" tab shown above.

extra wood. Move the trammel arm to the third hole. Clamp the bed end down and rout the curve again. I made this the same curve, but it is 1/4" smaller than the case side curves. This still looks nice, and it takes the pressure off of counting on the curves lining up spot-on. Once you have completed the curves, glue on the





*The author had some extra-long clamps that came in very handy while assembling the case section of the desk/bed.*



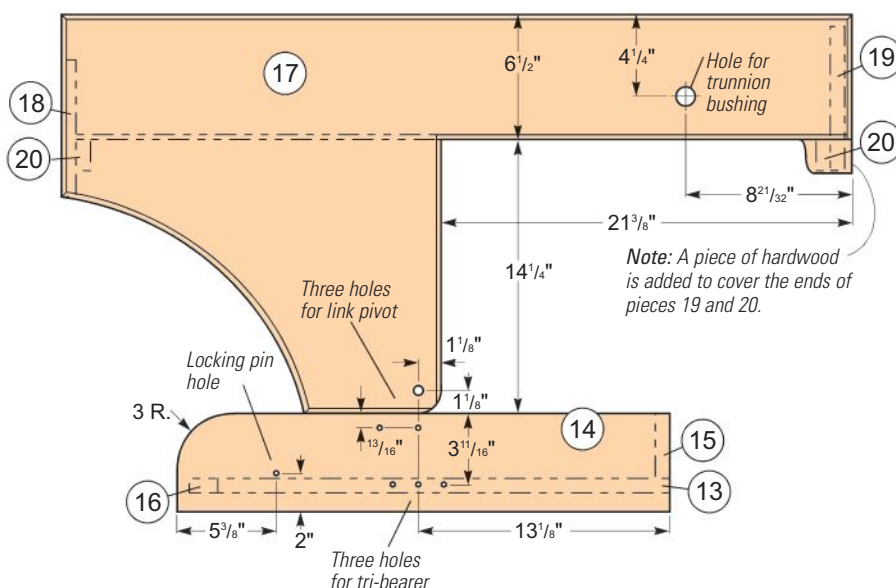
*While the author used Dominos for her construction, biscuits would work, too. Use the best solution you have at hand.*



*With scrap wood pieces securely clamped to both faces of the case sides, the author uses them to clamp down the top subassembly.*

## Desk and Bed Layout

(Side View)



edge treatments. You will need to rip 1/4" pieces for the edges on each bed end, and you will also need to make the solid wood round pieces with edging. Fit these edges, miter them and glue them on. The clamping for the bed ends is a bit easier because they are smaller. Once all the edges have dried, been flush-trimmed with the router and sanded, then round the corner where the link pivot goes, using a jigsaw or the band saw.

Next, I ripped the bed rails and attached the edge banding using the edge V-groove and glue. Go ahead and chop Domino mortises into the bed rails and the ends of the bed. Glue the rails to the bed ends after sanding. Check for square by measuring corner to corner. Tweak the bed if needed. I used two giant clamps for this assembly. That allowed the middle of the bed to be open, so I went ahead and made the cleats out of solid wood and attached them. Use a countersink bit to pre-drill for the screws. Put screw covers over them later on, because the holes will be visible.

The next step (there are a lot of steps, aren't there!) involved ripping and cross-cutting the 1/4" sheet stock for the bed bottom cover. Set this piece aside for now. When the bed is in use, you'll never see the slats, so I used pine alternating with maple for the bed slats, which feature chamfered edges. I also pre-drilled the bed slats using a countersink bit so that the mattress won't get snagged. For ease of finishing, I did not yet assemble the bed bottom cover or the bed slats.

## Finishing/Assembly

Now you are ready to do the most difficult glue-up of the project. Go collect the case

parts you set aside earlier and get your biggest clamps close at hand. I clamped the sides of the case to two tables so they wouldn't fall over while I glued the back and bottom stretcher in place. I also put one of the two long clamps under the case to get the best pressure for the bottom stretcher, and put the other clamp across the back panel. This worked pretty well. All right, now attach the top of the case to the rest of the body with Dominos. I clamped solid strips to the plywood panel so I could get better clamping pressure on the glue-up of the case top to the sides/bottom (see photo at left).

Once I completed construction of the bed, desk and case, I finished sanding everything up to 180-grit. I usually go to at least 220-grit, but I think 180-grit is adequate for this project. Break all of the edges while sanding.

Now, you get to see the wood come alive! I used Watco® Danish Oil for the finish on this project. It is easy to use and protective enough for a bed/desk. Flood the surface with the first coat. Let it sit for about half an hour. I just let it sit long enough to move through the three sections and the bed bottom cover, which did take about 30 minutes. Then wipe everything down, going with the direction of the grain. After 24 hours, I put on another coat of the Watco Danish Oil, and then I wiped it off after going over all of the pieces. You will need to do this a total of five to six times to get a nice buildup of the finish.

Then you need someone to help you assemble. The hardware arms are much too strong for someone to do it by themselves, and the case is unsteady until you

The following supplies are available from *Woodworker's Journal*.

**Statuary Bronze Cap Nuts (8-pack) #31815 ..... \$5.39 pk.**

**3/4" Edge V-Groove Bit (Convex) (1) #40362 ..... \$39.99 ea.**

**3/4" Edge V-Groove Bit (Concave) (1) #40368 ..... \$42.99 ea.**

To purchase products online, visit [www.woodworkersjournal.com](http://www.woodworkersjournal.com) and click on the "Store" tab. Or call 800-610-0883 (code WJ1416).



### ***Desk and Bed Exploded View***

**Note:** The material list dimensions for pieces 17, 18 and 19 include the 1/4" trim.

## MATERIAL LIST (DESK AND BED)

| T x W x L                        |                          | T x W x L                                     |                          |
|----------------------------------|--------------------------|-----------------------------------------------|--------------------------|
| <b>13</b> Desk Top (1)           | 3/4" x 24 3/4" x 75 1/4" | <b>18</b> Bed Front Rail (1)                  | 3/4" x 7 7/8" x 75 1/4"  |
| <b>14</b> Desk Sides (2)         | 3/4" x 5 1/8" x 25 5/8"  | <b>19</b> Bed Back Rail (1)                   | 3/4" x 7 1/2" x 75 1/4"  |
| <b>15</b> Desk Back (1)          | 3/4" x 3 3/8" x 75 1/4"  | <b>20</b> Bed Bottom Sheet Support Cleats (2) | 3/4" x 1 5/8" x 75 1/4"  |
| <b>16</b> Desk Front Support (1) | 3/4" x 2" x 75 1/4"      | <b>21</b> Bed Bottom Cover (1)                | 1/4" x 39 1/4" x 75 1/8" |
| <b>17</b> Bed Ends (2)           | 3/4" x 20 3/4" x 41 1/4" | <b>22</b> Bed Slats (12)                      | 3/4" x 4 3/4" x 39 1/4"  |

attach it to a wall. Start by attaching the bed bottom cover by pinning it between the bed slats and the cleats. Then attach the hardware to the base sides. Next, attach the bed to the desktop using the link pivot. Attach the bed ends to the case ends using the trunnion bushing. Now lift the bed and desktop up to attach the tri-bearer to the hardware arm. This is when you will most need someone to hold the bed and desk in the up position while you pull the arm down and under the tri-bearer. Move the whole contraption from the bed position to the desk position. It should work smoothly, but you're not finished yet.

Now you can mark where to drill the holes in the upper and lower locking pin blocks for the nylon bushings that accept the safety locking pins. I marked where to drill these holes by tapping the safety pin into the locking pin block to leave a

mark. Remove the locking pin blocks. Drill the holes on the drill press, and then reattach the locking pin blocks to the body case/concealers, and glue in the nylon bushings for the locking pins.

It's almost time to make your bed and take a well-deserved nap! I disassembled the bed at this point for ease of moving it. Remember! You must anchor the bed/desk to the wall! Finally, put the mattress in, strap it down using Velcro® straps, and you're ready to take a load off.

## Safety and Knockdown Advice

Let there be no confusion about this next point. This Murphy Bed/Desk absolutely needs to be anchored to the studs in a wall for stability and safety. Also, the techniques for this bed involve permanently gluing the case together. The finished case is just under 36" wide. Please, keep this in mind when planning where

you will install it. You don't want to be disassembling door frames! There is an option to use confirmat screws to assemble the case sides, case top, bottom stretcher and case back, which would make this project somewhat "knock-down" in nature. If you choose to use confirmat screws, keep the number of times you assemble and disassemble the parts to an absolute minimum.

Well, there you have it. Hopefully you learned something, tried a new technique, or benefited from this project some other way. Now you can leave your work spread out on the desk, pull down your bed in a matter of moments, and take a snooze. Happy working/sleeping!

*Kimberly McNeelan is a woodworker, artist and woodworking teacher in Minneapolis, MN. Her website is [kimswoodfurniture.com](http://kimswoodfurniture.com).*



# Queen Anne Candlestand Table

By Ernie Conover

*This candlestand is a lovely little table that will allow you to put your turning skills to good use. Its elegant design has stood the test of time.*

If you are thinking that it is time to try out your turning skill on a furniture project, this little candlestand or tea table is just the ticket. A tilt-top tea table represents a nice balance between spindle and faceplate turning and, in this case, requires the use of a shop-made jig to mill the dovetail slots to attach the legs.

The elegant Queen Anne design dates from the mid 18th century but still turns heads in contemporary settings. The TV trays of their day, tilt-top tables were made for quickly situating a candle at a convenient height for reading and conversation, or to hold each individual's dishes during a serving of tea. (No *Duck Dynasty*® in those days; they actually had to talk to each other for entertainment.) The tables could be stored folded against a wall during daylight hours and are still grand for taking a solitary meal or to hold a laptop at an ergonomically correct height when seated in a chair.

The stem of the Queen Anne table is a spindle turning tour de force. I suggest mahogany as the wood, as it is true to the originals and is one of the easiest woods to turn, and it can be scraped with dull scrapers with success. The top of the table can be formed from a disk of 3/4"- to 1"-thick wood which can be band sawed or routed with a circle jig and sanded without the need of a lathe at all. Although the table is certainly elegant, don't let that frighten you. Even turners of moderate skill levels will have no trouble getting good results with this project.

Enough palaver, let's go out to the shop and get to work.

## MORE ON THE WEB

For a video of the author using his jig to cut dovetail slots in the stem and turning the tabletop, plus a link to his video on paper chucks, visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on the "More on the Web" tab shown above.





*The author prepares to use a simple box-like jig keyed to the lathe bed. This allows milling of dovetail-shaped slots to attach legs to the base of the stem.*

## Turning the Stem

The stem is at the heart of the table and it is straightforward spindle turning, albeit of a robust 3" diameter. Careful layout and sharp tools carry the day. If your tools are not as sharp as they should be, I cannot overemphasize the forgiving nature of mahogany! (But you should really learn to sharpen your tools.)

Mount your stock between centers and look to the *Drawings* on page 42 for the details of the stem's shape. As you turn the stem, it does not need to match the drawing perfectly: you are striving for a lovely shape, not computer-generated exactitude. The tenon on the end of the stem must be sized to tightly fit the hole in the support block — but that is it for super-accurate dimensions.

## Milling the Sliding Dovetails

The most daunting problem in making the stem is milling three dovetail-shaped slots to attach the legs to the base of the stem, and having them spaced exactly 120° apart. This is accomplished handily with a very simple jig which I outline the construction details for in the sidebar on the following page. If your lathe lacks indexing, it is easy to step off two radiuses of the finished stem diameter, thereby dividing the circumference of the stem base into thirds. You'll then need to figure a way to lock the spindle with a clamp when each of the marks is aligned to the center of the guide-bushing slot in the jig. At that point, it is a simple routing operation to form the dovetailed slots. Once the slots are cut, their rounded end needs to be squared out with bench chisels to the exact 3/4" height of the leg.

One other detail in the Queen Anne design is carving a pattern between the legs. The detail requires a V-shaped veining gouge and a second gouge of about 8-sweep. The carving is no more than a generous chamfer that slopes to the center of the stem at about a 15° angle. Again, like the spindle turning, this carving is within the scope of most woodworkers' talent. You are not carving a relief frieze of a da Vinci copy, it is just a bit of shape that complements the curves of the legs (see photos at the bottom of the next page).



*If your lathe has indexing, there will be 12, 24 or 60 positions. All are divisible by 3, allowing 120° between slots. Marking the spindle with a marker greatly simplifies indexing during the anxious moments of routing.*

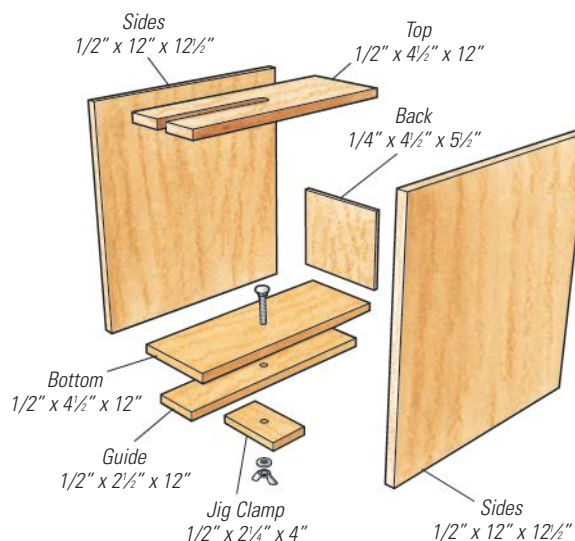


*When the dovetailed slots are completed on the lathe, the next step will be to square up the ends of each slot using a sharp chisel.*



## Lathe Dovetailing Jig

This simple box-like jig (see photos on preceding page) provides an accurate means of guiding your router as you cut the dovetailed grooves on the bottom of the stem. This jig fits my Powermatic full-sized lathe, so you may need to adjust some of the dimensions to accommodate your machine. The guide aligns the jig between the ways of the lathe, and the jig clamp holds the jig in place. The routing slot is centered in the top and is machined to precisely fit a rub collar on the bottom of your handheld router. The back piece of the jig is sized to leave an opening large enough for the stem to fit through while it is between centers. (See the photo at the top of the previous page.) Keep the jig around your shop; you'll be surprised how often you might want to use your router to cut a groove or plunge drill some holes in a spindle.



### Turning the Top

The top is a bit more challenging than the stem. It is difficult to find 18"-wide material today, but a glued-up top will work fine and is what I used for this article. While I made mine 18", anywhere down to about 14" would be fine. Much depends on the swing of your lathe if you are going to turn the top. Band saw the square blank to your decided diameter and mount it on a paper chuck. (I cover this chucking method in a video; find a link at [More on the Web](#).) Make a glue block by mounting a 6" circle on a faceplate or screw chuck and scrape it flat. During the glue-up, interpose a piece of brown kraft paper between the glue block and the top with PVA glue on both sides of the paper. I use old grocery bags. Clamp the joint with pressure provided by the tailstock and a live center. If you put the center point on the dimple left by your trammels when you laid out the circle, you'll get it perfectly in the center. The advantage of a paper joint is that the paper will easily release when the turning is done, leaving no trace of chucking, because the paper and glue can be sanded away with an orbital sander.

Begin shaping the top by establishing the raised band and forming the decorative edge treatment shown in the *Drawings*. The 1" band is now dished from about 1/4" shy of the perimeter to a 1/8" reveal above the flat area. This shape and its shadow line give an elegant look to the top.

The real work of accurately flattening the recessed area of the top is achieved with a scraper specially designed for the purpose. It can be ground from any 1 1/4"-wide square-end scraper to the pattern shown in the *Drawing* on page 42. I call it a *Boat Tail Scraper* because it will cut when moved to the left but leaves no line in its wake, because of the 15° chamfer at the right corner. The trick of using this most useful scraper is to align the tool-rest at right angles to the lathe bed and position it close to the top. By gripping the scraper firmly with your left hand, you can keep it at the same distance from the rest during the cut, thus achieving a flat surface.

Final flatness is obtained with a sanding disk in an electric drill. Even greater flatness can be obtained off of the lathe with an orbital sander starting with 120-grit or coarser paper.



**On the leg end of the stem, at exactly the center point between two dovetail slots, carve a V with a veining chisel and carver's mallet.**



**To complete the carving, use the 8-sweep gouge to carve arches between each of your three Vs and the dovetail slots (a total of 3 Vs and 6 arches).**



*A bowl gouge is used to excavate the 1"-thick top to a depth of about 1/2". The 1"-wide band at the perimeter is left at its original 1" thickness to lend strength to the top and a decorative accent (photos above).*



*Use the Boat Tailed Scraper downhill and use the tool-rest to guide your left hand to obtain a flat surface on the table's face.*

## Sculpting and Mounting the Legs

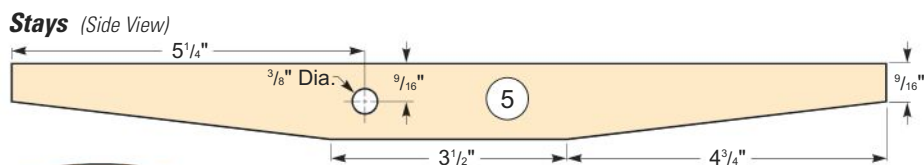
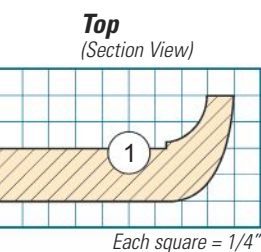
The legs of the table carry the design, but you should understand that they are quite labor-intensive. After band sawing to rough shape, there are many ways to get the flowing rounded profiles required. The bottom side of either leg is square so a spindle sander works well, as does a spokeshave. The top side needs to be a half circle that flows smoothly from the stem to the floor. I use spokeshaves and rasps and a lot of sanding.

The pad foot of the Queen Anne Leg is achieved by cutting a 1/4" by 1/4" rabbet at the toe and sides. I do this with a rabbet plane, but it can be done with bench chisels. The final detail is to cut dovetails in the root of the legs to match the dovetail slots we milled in the stem with the router. This forms what is called a sliding dovetail. The traditional way is to transfer the pattern from the stem to the leg and cut the cheeks of the dovetail with a backsaw. An easier way is to mount the same bit that we milled the slots with in a router table and mill the dovetails. By using a scrap piece of the same thickness as the legs, you can move the fence incrementally until a perfect sliding fit is achieved. Patience here is essential, as the fit must be just right.

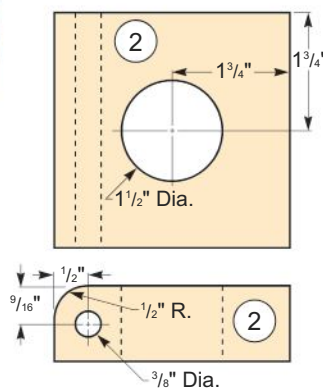


*Flatness and smoothness are best obtained with a sanding pad mounted in an electric drill. Start with 60- or 80-grit paper and work up to 180. An orbital sander is a good last step after you've demounted the blank.*

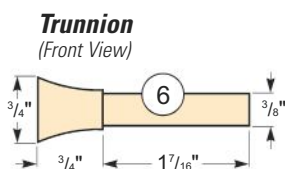
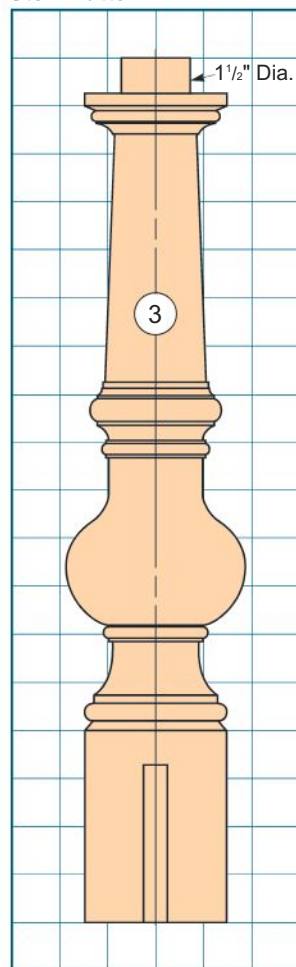




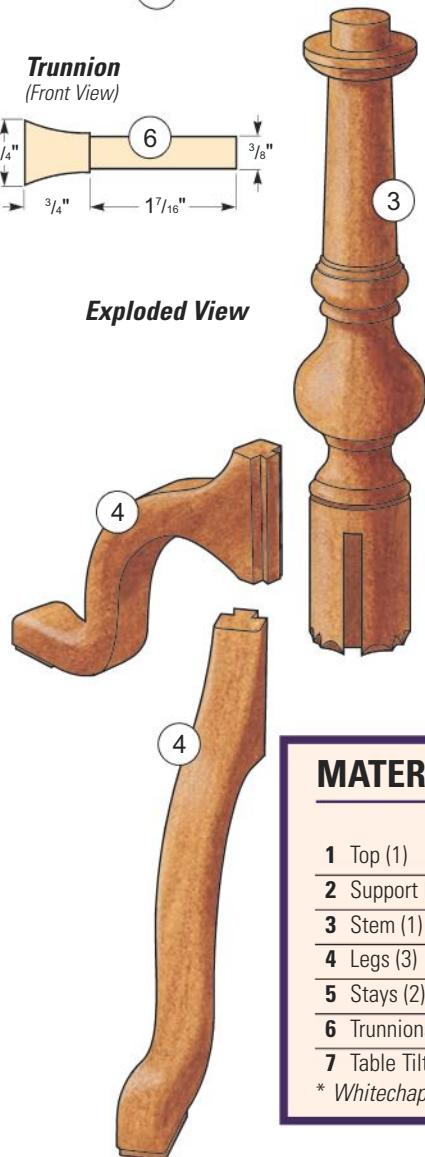
**Support Block**  
(Top and Front Views)



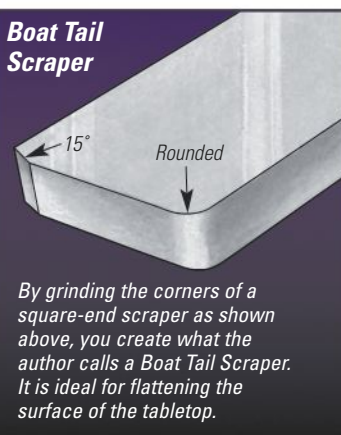
**Stem Pattern**



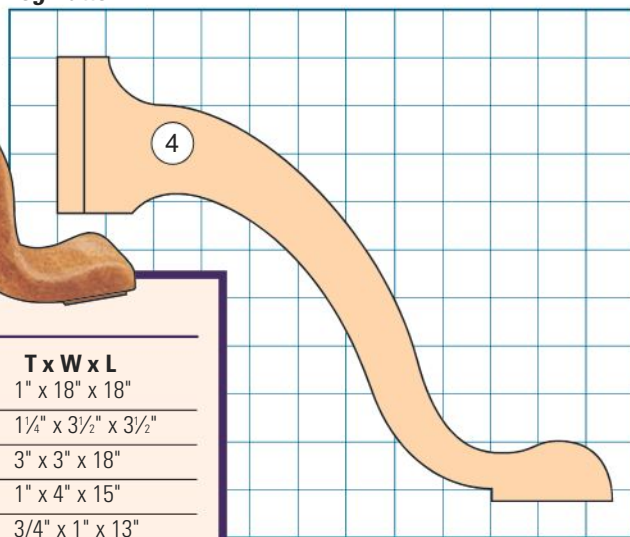
**Exploded View**



**Boat Tail Scraper**



**Leg Pattern**



## MATERIAL LIST

|                         | T x W x L                |
|-------------------------|--------------------------|
| 1 Top (1)               | 1" x 18" x 18"           |
| 2 Support Block (1)     | 1 1/4" x 3 1/2" x 3 1/2" |
| 3 Stem (1)              | 3" x 3" x 18"            |
| 4 Legs (3)              | 1" x 4" x 15"            |
| 5 Stays (2)             | 3/4" x 1" x 13"          |
| 6 Trunnions (2)         | 3/4" x 3/4" x 2 1/16"    |
| 7 Table Tilt Catch (1)* | Small, Polished Brass    |

\* Whitechapel-ltd.com Item 148C6P, \$22.27

*“Although the table is elegant, don’t let that frighten you. Even turners of moderate skill levels will have no trouble getting good results with this project.”*



**The author uses spokeshaves and rasps to sculpt the flowing lines of the top edge of the legs, as shown in the photo above. The shoulders of the dovetails in the legs needed to be carefully undercut to mate perfectly to the stem (top right). When done, the finished dovetail should be a nice slide fit on the stem (bottom right).**

As is my regular practice, I put the first coat of finish on the stem in the lathe, then put masking tape on the dovetails of the legs and finish them before glue-up. Either PVA glue or hide glue are good choices for gluing the legs to the stem. Before you go any further, take a few minutes to turn the trunnions, between centers, to the shape and dimensions shown in the *Drawings*.

### Attaching the Top

Attaching the top is achieved by using a support block and stays as shown in the *Drawings* at left. Carefully lay out the holes and drill them using a drill press — before any cleanup. The 1½" by 1"-deep stem-mounting hole is centered on the support block. While it can be through drilled, I do not, mainly for aesthetic reasons. Drill the trunnion hole by halves from each edge so as to get as straight a hole as possible. Check the fit with the trunnions, which are turned to 1/64" less than the 3/8" hole running across the block. Now clean up the stays and the block. Radius the top corner of the block adjacent to the trunnion holes (see *Drawings*). Test the mechanism by assembling the parts and pushing the stays flat on your bench-top (just as they would be under your table) and checking if the block pivots freely.



The stays are glued to the top along the grain (not across it!). To ensure the correct play, I put a playing card on each side of the block and insert the trunnions through a hole I punch in the cards. Now clamp this assembly together with a small clamp. Next, apply glue to the stays and clamp them to the top until the glue cures. This setup will give the correct play. Glue the block to the stem but attach the top and align the block so that the top is square to one of the legs when it is attached. This allows two of the legs to be against a wall and the top to be perfectly parallel to the wall when folded down. Install the catch, which is a piece of period hardware I got from Whitechapel. Now you are done!

Take some pictures of your finished masterpiece and use the new table to support your laptop while you email the photos to friends. I would love to receive a copy!

*Ernie Conover is the proprietor of Conover Workshops, author of The Frugal Woodturner and a contributing editor to Woodworker's Journal.*





*The rules of the game change a bit when you're working with recycled materials. Starting out, the window/door is a set size, so it determines the face frame dimensions. Your stock must also be scanned for blade-breaking metal scraps (top photo), and existing parts might require some filler lumber, as with the channels in the window stiles (above).*

# Recycled Cabinet

*Using repurposed and recycled material to make new and useful furniture is a hot new trend. Our editor gives it a try.*

By Rob Johnstone

On a recent visit to Kentucky with my *inamorata* Mary, the lovely woman happened upon a window that looked like it would make a great door to a cabinet ... at least to her. Said she: "Would you build a little cabinet around this window for me?" Said he: "I would be ever so happy to do so." Hence the start of a unique project challenge for yours truly.

Building a brand-new cabinet is something I have done many, many times. But building a new cabinet from materials that

are as old or older than I am, and looked older than dirt when I was done with it: now, that was new to me. In addition to the old window that inspired this project, I chose to put some recycled lumber to use as well. This wood started its useful life as flooring in a semitrailer, and when it was too old and worn out for that job, Jim Frey at Rockler Woodworking and Hardware decided that it might make interesting stock for some woodworking projects. He contacted me and asked if I wanted to try it out, and the recycled

cabinet concept came together. All in all, the project turned out great, but I learned some things along the way about working with recycled material.

## Working Backwards

Due to the unique materials involved in the cabinet, the design and planning process was a little "back to front." Because of its fixed size, I needed to start with the window and work out from its dimensions, determining the face frame component's sizes and lengths. The window





***Even with the metal removed, the lumber was full of ground-in grit and grime, and the author did not want to chance his jointer on this lumber. Instead, he used a guided circular saw to straighten the edges (top). Once the face frame components were cut, he cut loose tenon mortises to join them.***

also had channels machined into its stiles that needed to be filled with solid wood before I could go forward.

So I sanded the inside of the channel free of dirt and other contaminants and then machined strips (on the router table) of poplar to fit the channels. With the pieces fitting nicely, I applied a thin coat of glue to the channel and the poplar strips and clamped them in place (photo above left). When the glue cured, I used my table saw to expose fresh wood on all the edges of the window — squaring up its edges as I did so. Now I was ready to work out the rest of the cabinet's proportions.

The cabinet was being built to hold a very small flat screen TV and an equally diminutive (9¼"-deep) DVD player. I was able to easily get 11½"-wide boards from the recycled truck lumber, so that, plus the 1¼" thickness of the face frame stock, became the depth of the cabinet.

After several sketches drawn to 1/8" scale, I came up with a pleasing-looking cabinet that met with approval from all concerned, and it was almost time to start building.



***An old six-pane sash window found in Kentucky and some truck trailer flooring recycled in Minnesota are at the heart of this recycled cabinet.***





**Rabbets on the top of the sides are cut to accept the stretchers (top photo). They are routed to the same depth as the bottom's dadoes. A section of the 3/4" pine is used to test the rabbet's accuracy. This cabinet was assembled with standard blue-collar joinery (inset photo) — plain old yellow glue, finish nails and clamps.**



**The author used a sliding bevel gauge to trace the angle of the legs (above left). He cut the shape of the legs into the cabinet with a handheld jigsaw (inset, right).**

## Lumbering Forward

When I first viewed the lumber, I thought it looked so cool that I just had to try it. But when I got it in my shop, I thought to myself, what have I gotten myself into! It was so gritty, and had random nails and other metal in it, that I took every caution in preparing it. Even though I had used a metal detector to check out the lumber (and found a pile of metal pieces for my trouble), I was not about to expose the knives on my jointer to this sketchy stock, so I used a guided circular saw to get straight edges on the recycled lumber. I did use my table saw after that to rip the pieces to width and crosscut them to length using a miter saw. You can find the sizes of the components in the *Material List* on the opposite page. (The size of the door — window — is set here. If you use a differently sized window or door, you'll need to adjust the dimensions accordingly.)



Once the face frame components were cut to size, I used loose tenons to join the stiles and rails. After test-fitting the frame together and making sure the window-door fit well, I glued and clamped the face frame together.

## Blue-collar Construction

The joinery on this cabinet is nothing fancy. OK, other than the fact that I used an \$800 tool to cut the loose tenon mortises in the face frame. But hey, loose tenons are just loose tenons. Make them any way you want to, and for that matter, dowels or biscuits would work fine in this case. The face frame is nailed onto the carcass, and all the lumber that is not the recycled oak is #3 Ponderosa pine.

After I cut the sides to length and width, I plowed a dado across them to accept the bottom and small rabbets at the top of the sides (photo, top of page) to accept the top stretchers and back stretcher. See the *Drawings* for details and locations. The bottom, top stretchers and back stretcher are the next things to be made. An important detail to note is that the back stretcher and the bottom each have a 3/8" x 3/8" rabbet machined into their back edge. I formed that on the table saw with a standard blade in a two-step cut. Later, the back slats will fit into those rabbets (see *Drawings*).

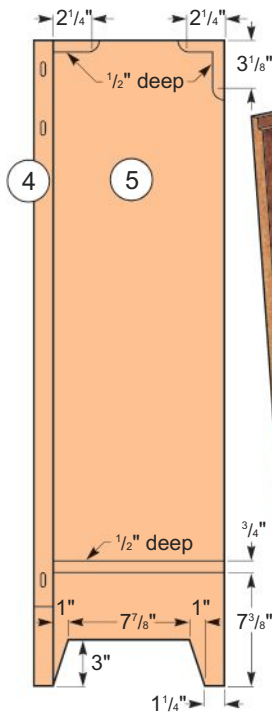
To prepare for assembly, I preassembled one top stretcher to the back stretcher to form an L-shaped subassembly by gluing and nailing those pieces together (see the *Drawings*). When that was done, I dry-assembled the bottom and the stretchers to the sides to form the carcass. They all fit together well, so I glued, clamped and nailed the pieces securely, checking to make sure the subassembly was square. Then I let the glue cure.

While the glue on the carcass was drying, I grabbed more of the recycled lumber and made the top blank. It required that I glue two pieces together to get the width I needed. Even though the wood was old and distressed, I tried to match the color and the pattern of the pieces when I did so. Leaving the top in its clamps, I moved on to making the back slats.

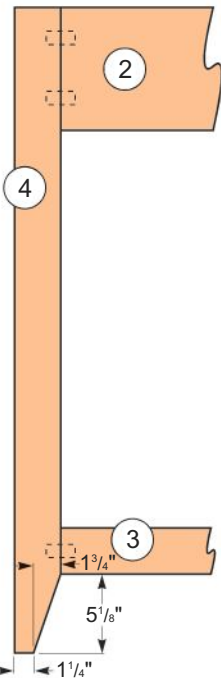
I purchased 1 x 12 lumber from which to make all of the pine parts. I could have made the narrower pieces from 1 x 4s,



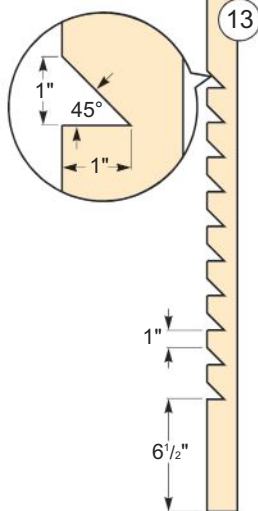
## Stile and Side Subassembly (Inside View)



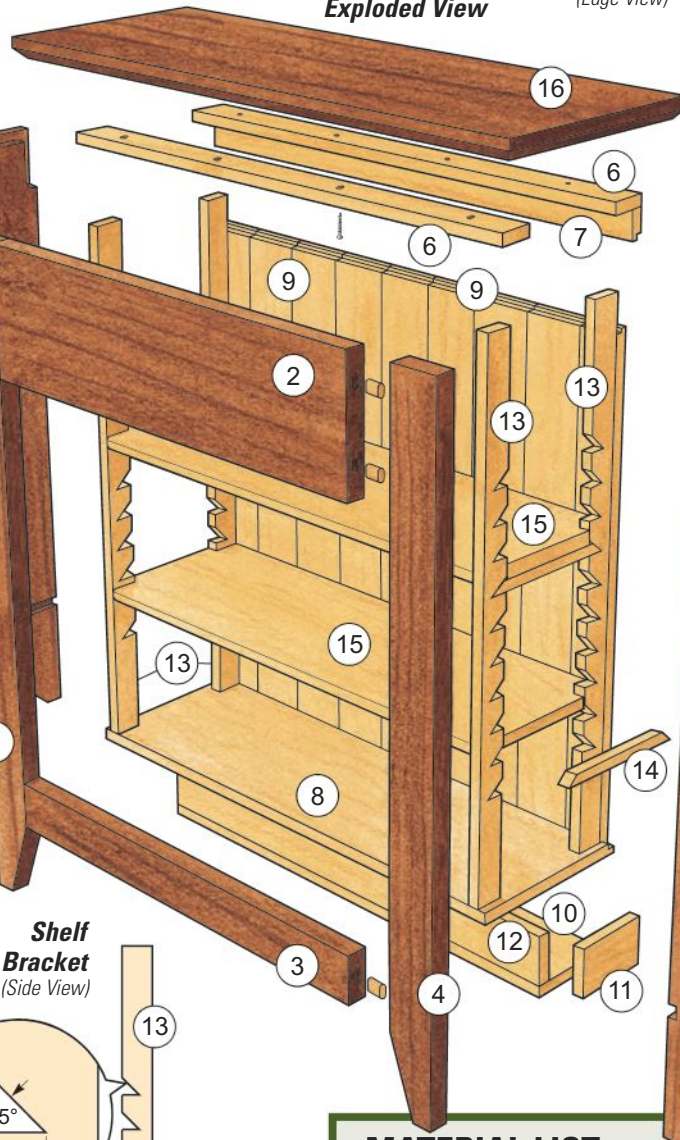
## Face Frame Subassembly (Front View)



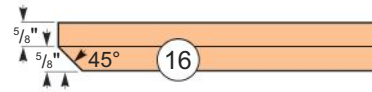
## Shelf Bracket (Side View)



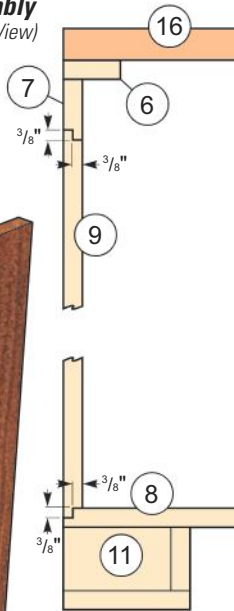
## Exploded View



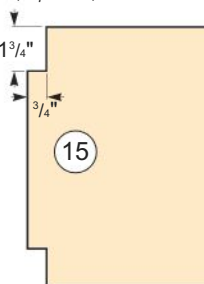
## Top (Edge View)



## Back Subassembly (Section View)



## Shelf (Top View)



## MATERIAL LIST

|                         | T x W x L                  |
|-------------------------|----------------------------|
| 1 Door* (1)             | 1 1/4" x 27 1/2" x 27 1/2" |
| 2 Upper Rail (1)        | 1 1/4" x 8" x 27 7/8"      |
| 3 Lower Rail (1)        | 1 1/4" x 3" x 27 7/8"      |
| 4 Stiles (2)            | 1 1/4" x 3" x 42"          |
| 5 Sides (2)             | 1 1/4" x 11 1/8" x 42"     |
| 6 Top Stretchers (2)    | 3/4" x 2 1/4" x 32 3/8"    |
| 7 Back Stretcher (1)    | 3/4" x 2 3/8" x 32 3/8"    |
| 8 Bottom (1)            | 3/4" x 11 1/8" x 32 3/8"   |
| 9 Back Slats (9)        | 3/4" x 3 3/4" x 31 1/2"    |
| 10 Brick Shelf (1)      | 3/4" x 5 3/4" x 31 3/8"    |
| 11 Cleats (2)           | 3/4" x 3 1/4" x 5"         |
| 12 Brick Shelf Back (1) | 3/4" x 3 1/4" x 31 3/8"    |
| 13 Shelf Brackets (4)   | 3/4" x 1 3/4" x 33 1/8"    |
| 14 Shelf Supports (4)   | 3/4" x 3/4" x 8 7/8"       |
| 15 Shelves (2)          | 3/4" x 10 1/4" x 31 3/8"   |
| 16 Top (1)              | 1 1/4" x 13 1/2" x 38"     |

\* The door was made from a recycled six-pane window.

## Recycled Lumber and More

A limited supply of the recycled lumber used in this project is available for purchase from *Woodworker's Journal*, as are the hinges used here.

**Recycled Lumber (2 sets) #44241 ..... \$89.85 set**  
**Parliament Hinges (1 pair) #66759 ..... \$21.59 pr.**

To purchase products online, visit [www.woodworkersjournal.com](http://www.woodworkersjournal.com) and click on the "Store" tab. Or, call 800-610-0883 (code WJ1414).





**Ripping the back slats and other pine components from 1 x 12" stock gave the author more options. Wider lumber provides you with the opportunity to select the best-looking sections of the board for each component.**



**The components of the "brick shelf" are attached under the bottom at the rear of the cabinet (photo above). The shelf allows weight to be added that will counterbalance the weight of the door and the force of momentum created when the door is opened — it keeps the cabinet from tipping (photo bottom right, opposite page).**



**The back slats were secured to the carcass by a single screw at each end of the slats. The author chose to gang-cut the notches into the shelf stiles on his band saw (below). The primary advantage to that technique was to save time both on marking out the shelf stiles and in cutting all the notches.**



but I felt like I could be more selective and get a little better quality by cutting the slats from wider stock. While I was at the miter saw and table saw, I roughed out the pieces for the shelves and the shelf stiles.

could use bricks or anything else that is heavy: bars of gold, silver ... it's up to you.

The brick shelf is a simple construction that is nailed and glued in place (see photo, above right).

When I drew up this little cabinet, Mary and I decided on some simple legs which added some shape to the piece. I cut out the legs once I took the carcass out of the clamps. I transferred their angles with a sliding bevel gauge and cut the shapes with a jigsaw.

It was at this point in time that I decided to address another concern that reared its head as a result of using a six-pane window as a door. As a window it was hunky-dory; as a door, it was a bit heavy.

A heavy door swinging open can tip a narrow cabinet over, so to counteract that problem, I built a "brick shelf" under the cabinet's bottom. By putting additional weight low and at the rear of the cabinet, I was able to keep the door from tipping the cabinet forward. You

## Give Me that Old-Time Construction

With the back slats cut to length and width, I rabbeted their ends, selecting which face of the boards would go to the inside of the cabinet as I did so. With that done, I formed a tiny chamfer on the long edges of the slats. It's there to add an "old-time" look to the cabinet. A bit of sanding was all that remained to complete the slats.

To get a symmetrical look, I installed the first slat dead center in the opening and secured it with a single screw at each end. Then I mounted the next slats the same way, working out toward the sides. The last two slats mounted on the right and left needed to be ripped to fit. I screwed them in place, and with that the cabinet took a big step forward.

Another nod to the past are the shelf stiles and supports. As you can see in the *Drawings*, the shelf brackets have triangular 45° notches cut into them. I gang-cut the notches on the band saw (photo at left), but a handheld jigsaw will also work if you want to mark out and cut each notch on the stiles one at a time — I didn't. The little shelf supports are sticked-up pine that have been miter cut to length. They fit in between the shelf brackets with their mitered ends matching the notches.

Nail or screw the shelf brackets in place. (Don't mount one upside down ... it'll make you feel a little dumb, trust me.) Then grab the shelves that you roughed out earlier and fit them to the cabinet.





**A light sanding with 100-grit paper on a rotary sander brought out highlights of the oak hidden by the ultra-dark patina (above). Soaking steel wool in white vinegar creates a solution that will darken oak by reacting with tannin in the wood fibers. The results on these pieces matched the exposed oak edges to the recycled lumber.**



You will need to notch the corners of the shelves to fit around the shelf brackets. I followed that up with a 1/4" roundover treatment to the edges of the shelves. I thought the look added to the old-fashioned style of the cabinet.

There are just two construction steps left to complete this recycled cabinet: machining and mounting the top and hanging the door. The top is straightforward with a large chamfer profile around the ends and the front edge. I cut that on my table saw. It's mounted to the carcass with screws driven up through the top stretchers. I pre-bored holes for the screws, and elongated the holes on the forward stretcher to allow for seasonal wood movement. I hung the door using hinges that had a finish that matched the handle (which was original to the window ... just moved to a more appropriate location for this project) and a vintage look to them. As with hanging any door, there was some trial-and-error fitting to be gone through, and then it was done. The shelves stop the door, so I did not feel the need for a stop block or a magnetic catch. You can certainly add one if you find it necessary.

## Finishing Up

There was one final workaround that I needed to develop regarding the recycled lumber. Cutting and ripping the lumber literally exposes another challenge — the freshly cut edges of the lumber looked like, well, freshly cut oak. The difference between the dark face of the lumber and

the cut edges was extreme. How could I address the difference? The fact that the lumber was oak led me to believe that I could use an old trick where you soak some steel wool in vinegar (at a minimum, overnight) and wipe that on the exposed oak to darken it and, in this case, hopefully match the dark patina (photo above right). It worked better than I had hoped. The mixture works by reacting with tannin in the oak, making it very black. (It's a "science thing.")

There are always a few final sanding efforts to get done before you apply your finish. I gently sanded the recycled lumber with 100-grit paper on a rotary sander. It was important to get a little of the oak peeking through the dark patina, but not too much. With that behind me, I brushed two coats of clear shellac onto both the inside and outside of the cabinet. I wanted to seal all the gunk, crud and corruption into the recycled lumber, and the shellac did the trick. For the pine parts, I brushed on two coats of amber shellac, to add the orange color that looks so great on pine. To be safe, I rubbed a thin coat of paste wax on the shelves to keep them from accidentally "welding" to the other parts that had shellac on them. My final finishing task was to try to match the color of the window frame to something that looked good with the recycled oak lumber. A coat of black paint with

a rubbed-on coat of brown paint over the top did pretty well.

Making this cabinet from recycled material was satisfying, and it turned out really well. The cabinet has received many unsolicited compliments. Now that I've tried it, this is a type of woodworking that I can recommend without hesitation.

*Rob Johnstone is the editor in chief of Woodworker's Journal magazine.*





# Tool Preview

## Ready2Rout Computerized Fence

By Sandor Nagyszalanczy

*Is this the most accurate router table fence ever? An electronic router fence's precision movements demonstrate how far tool electronics have come since the early days.*



**The solidly built and easy to use Ready2Rout fence can fit on nearly any router table. Built by the makers of the CNC Shark, and sold exclusively by Rockler, it uses an electronic interface to provide extremely accurate and repeatable setups.**



Figure 1

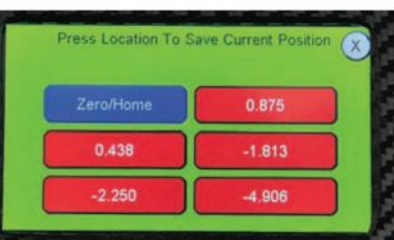


Figure 2

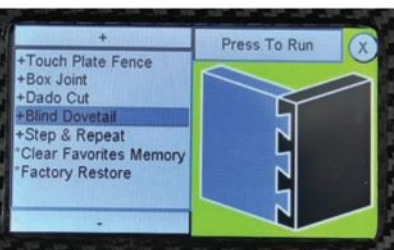


Figure 3

The first machine I ever saw that featured built-in electronics was a Sears Craftsman radial arm saw that came out a little over 20 years ago. It had a small LCD digital readout prominently situated on the end of the arm that displayed the saw's miter and bevel angles, blade elevation and carriage position (for ripping). Although Sears hyped its “electronic measurement” capabilities, the readout ultimately wasn't dependably accurate or terrifically useful.

Fortunately, we've come a long way since then, as demonstrated by the Ready2Rout computerized router fence shown above. Made by the same folks who produce the CNC Shark line

of computer-numerically controlled routers (see “Computers in the Woodshop” on pg. 52), Ready2Rout bolts atop a regular router table and features a motorized aluminum fence that moves back and forth in very precise increments — as accurate as .001 inch. Fence motion is controlled by the unit's built-in electronics. They drive a stepper motor (the same kind of motor used in robotic devices, like CNC routers) that moves the fence by rotating a long lead screw with anti-backlash (see middle photo, top). A 19-volt AC adapter powers the unit.

Fence settings are controlled via a color LED touchscreen on the Ready2Rout's carbon fiber-

like plastic top cover (see above middle photo, bottom). After zeroing the fence relative to the center or edge of the router bit, you can set whatever fence-to-bit distance you wish by entering the measurement (in millimeters or inches) on a numeric pad display (zeroing is even easier using the optional Touch Plate accessory). Using the touchscreen's plus and minus buttons, the fence can be moved in precise increments, a few inches or a few thousandths of an inch as needed (see Figure 1). After repeated trials, I found the unit's accuracy was good enough that I could forego taking a test cut each time I changed fence settings — a real timesaver.

Ready2Rout can store up to six fence positions (including the zero position) in its memory, allowing you to call them up with just a tap of the touchscreen — very useful for repeat operations (see Figure 2). I liked having the ability to recall the fence settings I needed for a project at will, with no ruler measurements or “fence tapping” required. My only quibble was that the zero position isn’t saved when the Ready2Rout is turned off (I got around this by returning the fence to zero before I switched the unit off, then resetting zero immediately after powering it back on).

But wait, there’s more: Ready2Rout’s computer brain features applications (“apps”) for cutting box joints and blind dovetails (see Figure 3). There’s also a “step-and-repeat” app that moves the fence in a series of user-set increments: useful for creating fluted columns or bead board moldings. After selecting an app and specifying variables, such as bit diameter, material width, etc., the program takes you through all the necessary cuts needed to complete the operation, automatically resetting the fence between steps (see top photo, near left). You can adjust tail-to-tail spacing and even the joint’s degree of fit, say to

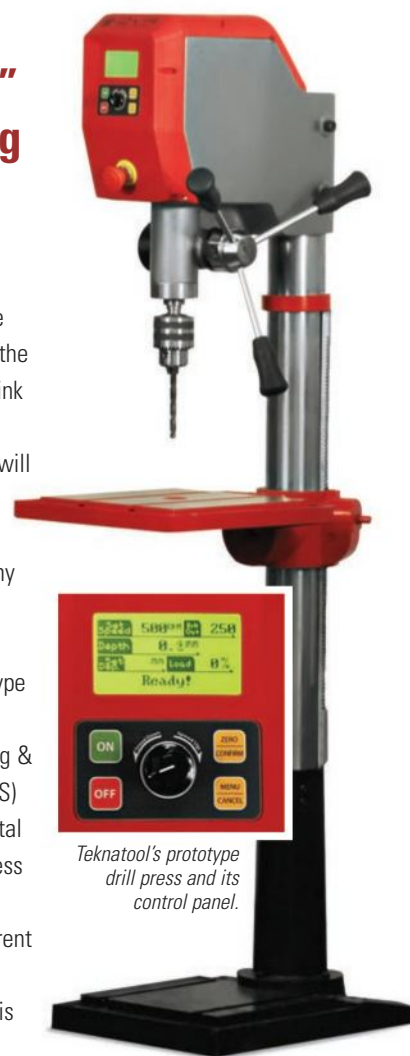
leave a skosh of clearance between pins and tails that allows for the wood swelling slightly during glue-up. Last but not least, there’s a neat dado cutting app which makes child’s play of routing off-sized dados and grooves. Say you want to plow a 15/32"-wide dado with a 3/8" diameter bit (to fit an undersized 1/2" plywood panel). After entering the diameter of the bit, the width and position of the desired dado, the app sets the fence for the first pass, then repositions it for a second pass to recut the dado to precise final width.

Even though you never need to connect a computer to operate the Ready2Rout, it does have a USB port that allows you to install new applications as they become available, as well as to update the unit’s software/firmware (by the time you read this, there should be an app package that includes sliding dovetails, flutes and repeating dados available for purchase). There’s also a dust port built into the unit’s top of the housing for connecting a 2½"-diameter dust hose. This is most useful when the fence is positioned over or near the bit, as necessary when edge routing or raising a panel.

## More “Smart” Woodworking Machines

The Ready2Rout is not the only brainy tool headed for the woodshop. We’re on the brink of a new era of “smart” machines and devices that will be revolutionary to the modern woodworker.

The New Zealand company Teknatool, known for their NOVA line of woodturning products, revealed a prototype drill press at last summer’s Association of Woodworking & Furnishings Suppliers (AWFS) show. Teknatool’s DVR (digital variable reluctance) drill press features both advanced electronics and a very different kind of motor (now used on some lathes). The machine is powered by a “switch reluctance” variable speed brushless motor which is compact, quiet, easy to maintain, powerful and produces high torque even at slower speeds. The motor drives the press’s spindle directly, and is controlled by a built-in computer which not only determines speed and direction, but also senses torque output and spindle position. This makes the DVR a “smart” machine so, for example, you can program it to ramp up speed gradually, to prevent splintering as the bit enters the workpiece, then come up to full speed. It can also sense when the bit is



*Teknatool's prototype drill press and its control panel.*

***Not yet on the market is a revolutionary new drill press that takes advantage of a unique motor design and advanced electronics.***

about to exit the work, and increase speed momentarily, to help prevent tearout. The drill press also features “Safety Shield” sensory electronics, which intelligently monitor the use of the machine and can, for instance, switch the drill press off if there is excessive vibration or if the user has accidentally left the chuck key in the chuck. There are future plans to integrate the DVR’s data functions into a smart phone or tablet application.

—Sandor Nagyszalanczy



For a video of the Ready2Rout router table fence in action, visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on the “More on the Web” tab shown above.



# Today's Shop Computers in the Woodshop

By Sandor Nagyszalanczy

*The computer revolution has entered the woodworking shop in ways both bold and subtle. Even the Luddites among us are likely taking advantage of the hard drive harvest without even knowing they are doing so!*





CAD Drawing



Completed Project

**Computer design programs are terrific for creating not only plans and shop drawings, but also photorealistic renderings such as the desk by California furniture maker Roger Heitzman, shown above.**

Computers in the woodshop? It doesn't seem like they'd be too compatible. After all, laptops and desktop models are built in dust-free clean rooms, and the average woodshop isn't exactly the place to bring an expensive device that might be compromised by a little fine dust — never mind the bilious discharge of a belt sander!

But just as computer electronics have found their way into everything from your car to your alarm clock and toaster oven, woodworkers are finding computers more useful, both in and out of the shop. There are three major ways that the computer revolution can change the way you do woodwork: One is using a computer in your home office to create drawings or cut lists, create and print out plans, etc. The second is to use your smartphone, computer tablet or other device in the workshop or on the jobsite to perform duties, such as checking for level/plumb, or do calculations that help you lay out parts or set a machine for cuts. The final way is to use computerized machines either in your workshop or via online services, to actually cut out

and/or shape parts, engrave or embellish surfaces, and more. There's even a new generation of "smart" machines on the horizon that promise to make standard tasks, like setting a router fence or drilling holes, safer and more precise. (See *Tool Preview*, page 50.)

Because the Internet is an expansive place and the world of software changes at a blinding pace, it's likely I've overlooked some useful apps, programs and websites (please let *Woodworker's Journal* know of your favorites that weren't included in this article).

### Design & Drawing Programs

If you're ready to trade your pencil and paper for a mouse and computer screen, there are a huge number of ways to create a design for a woodworking or home improvement project using a computer or electronic tablet, from simply sketching out an idea to drafting a dimensionally accurate drawing to creating a photorealistic rendering (see photos, above). Programs suitable for woodworking range from basic paint and drawing programs to CAD (computer-aided design) programs to specialized

cabinet/furniture design and management software. Ultimately, the kind of program you choose depends on your computer skills, your budget and the time you want to devote to learning the necessary software; design software can be expensive and require lots of time and patience to master. If you're not particularly computer savvy and are intimidated by all the available choices, a good path to follow is to choose design software based on your design goals:

- If you just need to draw the shape of a part or project, such as the outline of a turning or a loosely sketched design of a chair, dresser, etc., a basic free or low-cost paint/drawing program such as Krita or MyPaint is relatively easy to use and can produce good results. To create wood parts from a sketch, simply print out your design full-size, paste it atop your workpiece and use it as a template to cut the part out.

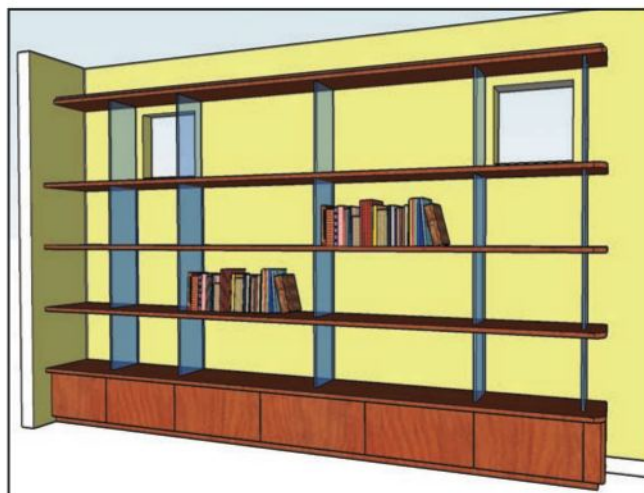
- To create drawings or plans to use to build a project, choose a basic CAD program, such as CadStd Lite or JustCad 10.0. Both of these free programs (for Windows operating systems) let you

### Expanding a computer's woodworking savvy

Besides using a computer to create designs, drawings and plans, or to run computerized machines in the shop, there are other ways to put your laptop or tablet to work in making your woodworking hobby or business easier and more enjoyable.

- Store tool manuals
- Keep track of inventory
- Share your work and ideas
- Read magazines or books
  - Get online plans
- Get new tool information
  - Check user reviews
- Expand your knowledge
  - Solve problems
  - Purchase products





**Computer-aided design (CAD) programs are terrific for creating all kinds of furniture, cabinets and DIY projects. Basic programs generate basic plans, elevation views and shop drawings, while 3-D programs let you visualize your project from any viewing angle. Some programs feature object libraries that let you create, say, a kitchen by simply dragging and dropping cabinets into place.**



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create and print out accurate two-dimensional drawings of cabinets, furniture, floor plans, construction details and more using standard drawing tools like lines, rectangles, arcs and circles (see photo, above) you render and manipulate on-screen with your computer's mouse. More complex curved shapes take longer to draw, but are also possible. Most of these programs can save designs as .dxf files, which may be used to create parts with CNC lasers and routers (see sections below).

- To generate a fully three-dimensional drawing of your project, you'll need to use a CAD program with 3-D capabilities. While there are plenty of pricey programs used by professional industrial designers, such as AutoCAD or SolidWorks, you can get excellent results using "SketchUp Make," a free program that works with PCs or Macs. Drawing an object in three dimensions takes a bit of getting used to, but SketchUp has some excellent

online tutorial videos that teach all the necessary skills. Once you've got the hang of it, you may wonder how you ever designed a piece of furniture, such as a bookcase, chair or desk, without rendering and examining it first in 3-D (see top illustration, above).

- If you're aiming to remodel your kitchen or bathroom, add a deck or some other home improvement project, a home design program, such as HGTV Ultimate Home Design, can help you quickly create a design, then visualize it in photorealistic 3-D. Instead of making a drawing one line or shape at a time, designs are created by using a "wizard" function that takes you through the design process step-by-

step, or by "dragging and dropping" elements into your plan from an extensive library of forms, such as cabinets, furniture, appliances, lighting fixtures, etc. (see bottom illustration, above).

- If you're a professional cabinetmaker or kitchen builder, a comprehensive (and expensive!) cabinetmaking program, such as CabinetPro or Cabinet Vision can help your business with everything from creating shop drawings and 3-D presentation graphics to generating cut lists, bills of materials, pricing and bidding reports, and even code for running CNC machines that cut out and shape your parts.

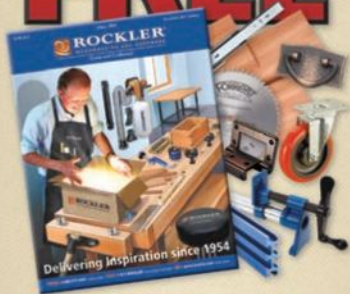
*Continues on page 56 ...*



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## Woodworking Programs

Besides CAD software, there are literally hundreds of programs useful to small-shop woodworkers.

Websites offer dozens of links to programs like compound angle calculators, dovetail angle and layout calculators, and more. On

the technical side, there are free calculators for lumber shrinkage, board feet, log or lumber volume and weight. Another handy online

"wizard" helps you determine where to clamp your router guide

fence when routing grooves, dadoes or flutes. Having trouble with the rise and run of stairs

(straight or spiral), baluster spacing (decks or upper landings) or deck design and layout? There's

an online wizard for that, too!

## CNC Laser Engraving

If you're tired of cutting out intricate parts using a scroll saw or jigsaw, having your parts laser cut is an increasingly practical option. While few woodworkers have the budget to purchase their own laser machines (prices start in the thousands), there are online companies you can use to cut out your parts using a powerful CNC-guided laser machine. Some community workshops may have a laser that you can rent by the hour as well. Laser machines cut with such precision that they're superb for creating

intricate parts with complex shapes or parts that require a high degree of accuracy. Laser cutting can even create flexible hinges (see book cover at left) or interlocking joineries that allow entire projects to be assembled with only a tiny bit of glue; for example, toys, games, boxes, models or even musical instruments.

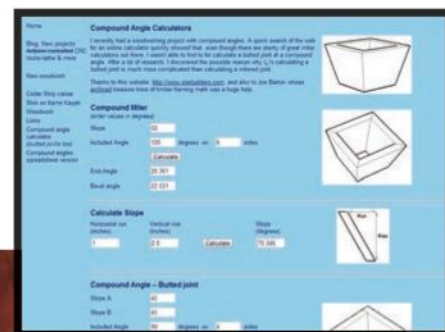
By using a less powerful laser beam, designs, patterns or even photographs can be burned into the surface of the wood, a process known as laser engraving.

Laser cutting and engraving can be done on a wide range of solid woods and wood materials, like hardwood-faced plywoods, MDF (regular and veneered) and melamine. On these materials, the laser leaves a dark cut edge — a result of the laser actually burning a thin kerf through the stock. Laser cutting or engraving can also be done on plastics, paper and

cardboard, leather, cloth and even some metals, including aluminum and steel.

If you have a project that seems a good fit for laser-cut parts, one online vendor I've found, Ponoko, makes it very easy to upload computer files via the Internet for parts up to about 1/4" thick and 12 x 24 inches in size. For thicker and/or larger parts, you'll need to use an industrial laser cutting service such as Advanced Laser Cutting Technologies or create parts using CNC routing methods, described in the following section. After you've designed your parts with a CAD program (see the CAD section), be sure to save them as vector graphics files (.dwg, .dxf, .ai or .cdr). This kind of file is needed in order to run the laser machine. (Epilog Laser's "Sample Club" has some great examples of projects designed

**Many useful computer programs for woodworking are freely available on the Internet. Two examples are the router fence distance calculator (below) and compound angle cutting calculator (at right).**



specifically for a laser machine.) Multiple parts can be nested on a single sheet of material, to create less waste. If you've created your part designs in a paint or photo program, you'll need to convert the resulting raster image file (bitmap, jpeg or similar) to a vector graphic file before uploading it (laser engraving can often be done directly from raster files). Ponoko's site has instructions on how to convert and submit your files so they'll be ready to use, and even has links for free raster-to-vector conversion programs.

It's worth noting that some companies, including Ponoko, offer 3-D printing services. The process takes a three-dimensional design created with a CAD program and turns it into a physical object using a special 3-D printer that builds the part up by bonding ("printing") thin layers together, one at a time. The process can only be done with plastic, ceramics and some metals. But it could be used to create custom hardware, such as drawer pulls, or decorative details for your wood project.

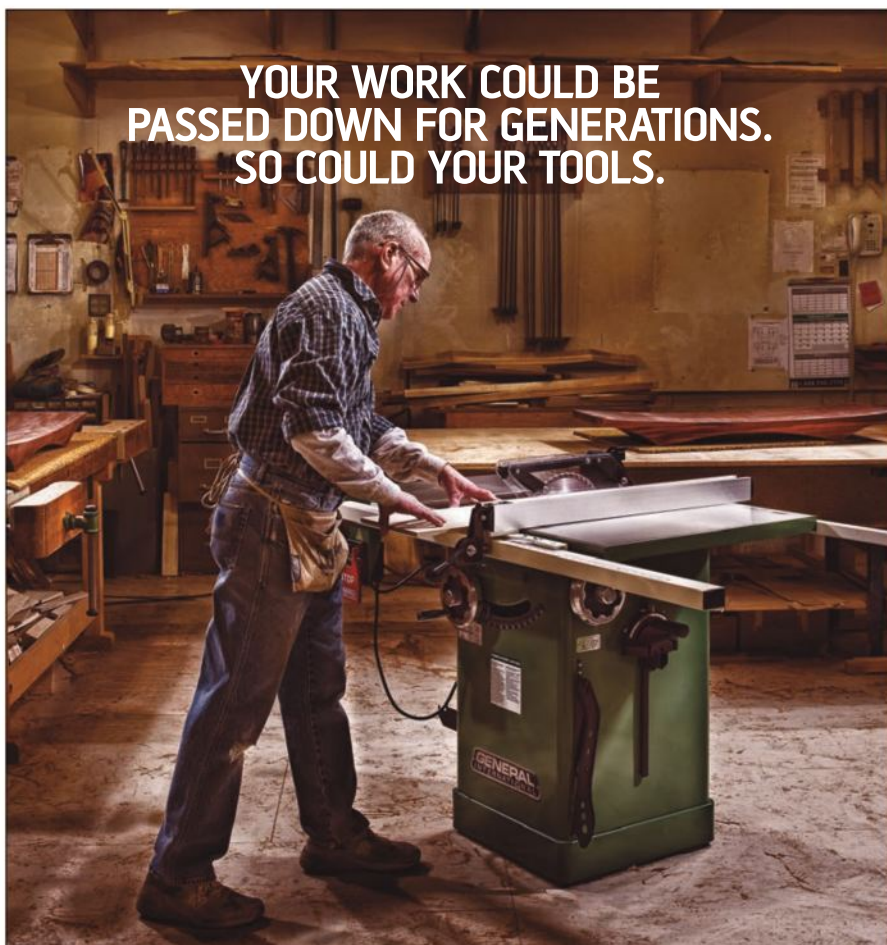
### Small Shop CNC Routers

Anyone who has ever attended a major woodworking show has seen them: humongous computer numerically controlled (CNC) routers as big as a small house, robotically dancing at breakneck speeds as they create complex parts from vacuum-clamped panels. Although these computerized giants don't have a place in the home workshop, the same technologies that make them so valuable in industry are now found in dozens of small-shop-sized CNCs that are practical and even affordable.

What is a CNC router? Basically, it's an automated shaping machine run by a computerized controller. A router is mounted to a two-part sliding fixture that uses stepper motors (a special kind of motor with a precisely controlled rotation) to accurately move the router above a base table where the workpiece is securely clamped. Although there are industrial CNCs with 6-axis capabilities, smaller models are typically three-axis machines. This allows the router and bit to cut in any combination of side-to-side, back-and-

forth and up-and-down motions. The path of the router is determined by a computer programming language that tells the stepper motors which way to move the router and how fast. Fitted with the right bit, a CNC router can cut out flat or 3-D

*Continues on page 60 ...*



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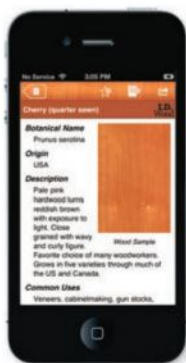
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# Today's Shop continued



## Apps for Tablets and Smartphones

Smartphones and tablets are portable and less susceptible to damage from fine dust. Coupled with the right application, they are very handy for woodshop tasks. There are scores of apps designed to tackle woodworking or home improvement tasks. I've used them successfully for the following functions:

- Check for level or plumb
- Identify wood species
- Lumber grading tables
- Board foot calculator
  - Cut crown molding
- Screw and nail sizes
- Lumber dimensions
- Metric/fractions calculator
- Share furniture designs
  - Cut list program
  - Joint types



**A desktop CNC router can easily cut out all the parts needed for building this handsome butler tray.**



parts, shape edges and surfaces, bore holes, cut joinery and inlays, and even create intricate carvings and fretwork. These machines are useful for producing all kinds of wooden items, from decorative plaques and lettered signs to shaped doors and drawers to architectural details to all manner of parts for furniture, toys, clocks, lamps, etc. (see butler tray photo, above). Once a CNC program is created, it can be run over and over again, which makes these machines great for creating multiple identical parts for all kinds of wood production items: clocks, magazine racks, trays, you name it. Although they represent a substantial investment both in money (a larger model can run \$4,000 or more) and in the time it takes to learn and operate, a CNC router could be an indispensable tool for a full-time or part-time woodworking business.

Small-shop CNCs come in many different sizes and configurations, each best suited to a particular range of applications. The smallest, least expensive machines, such as the Click-N-Carve, are designed primarily for engraving small plaques and

pictures. This small, microwave-sized machine connects to a computer and uses software that translates an uploaded photograph into a shallow relief carving created with its built-in 30-watt router. Slightly larger in size and capacity, CNC routers like the CarveWright™ are capable of cutting out, shaping and carving moderate-sized parts: signs, door and drawer panels, etc.



**CarveWright CNC Router is an example of the mid-sized home shop CNC machines.**

(photo, above). Machines like this are simple to operate using the included software.

Larger in size and capacity, desktop-style CNC routers, such as the General iCarver, mount atop a bench or stand and can handle solid wood or panel stock large enough for

full-sized furniture and cabinet parts. For example, another desktop model, the CNC Shark HD 2.0 (photo, above) handles workpieces up to 36" long, 28½" wide and 5" thick. In lieu of a small built-in router used by smaller CNC routers, many desktop models like the Shark can run a more powerful router and make use of 1/2"-shank bits. A bigger router allows the use of larger, longer bits and faster cutting speeds.

The software used to actually run a CNC router varies between different machine makes and models. Most come with all the basic software necessary to both design your project and generate the codes that determine the router's tool path — the sequence of motions the router takes as the bit cuts the part. There are also additional CNC routing programs, many of which are specialized for a particular task: for example, transforming a photograph into a relief carving.

*Sandor Nagyszalanczy is a furniture designer/craftsman, writer/photographer and contributing editor to Woodworker's Journal.*



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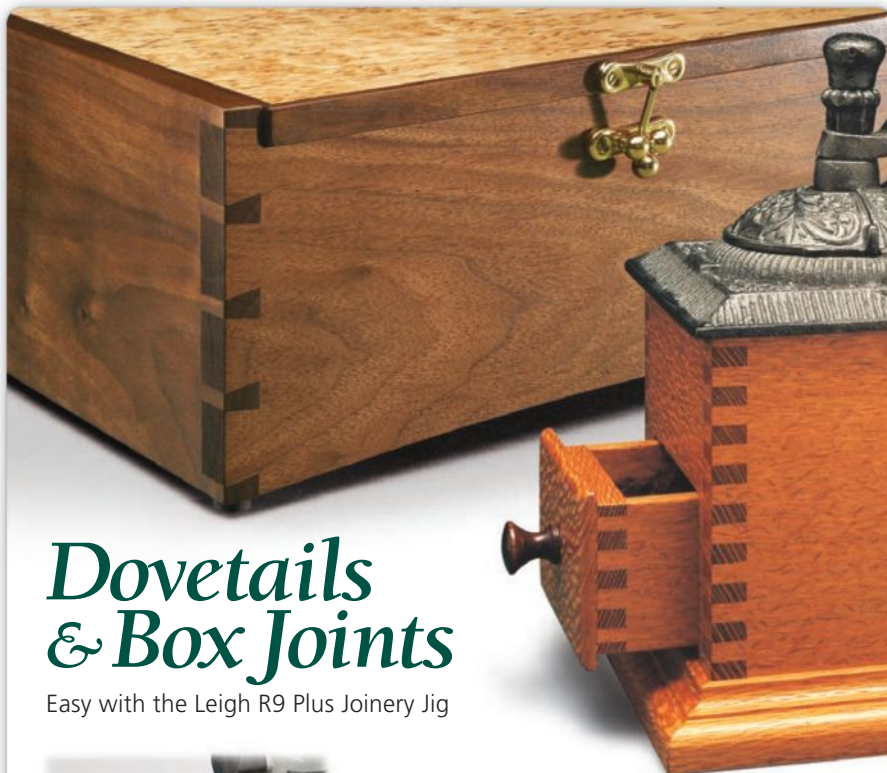
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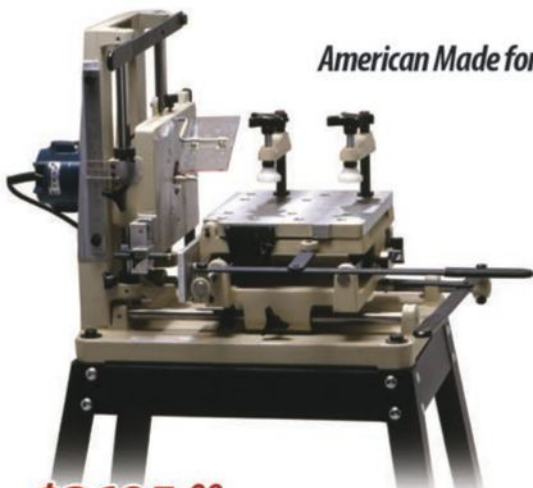
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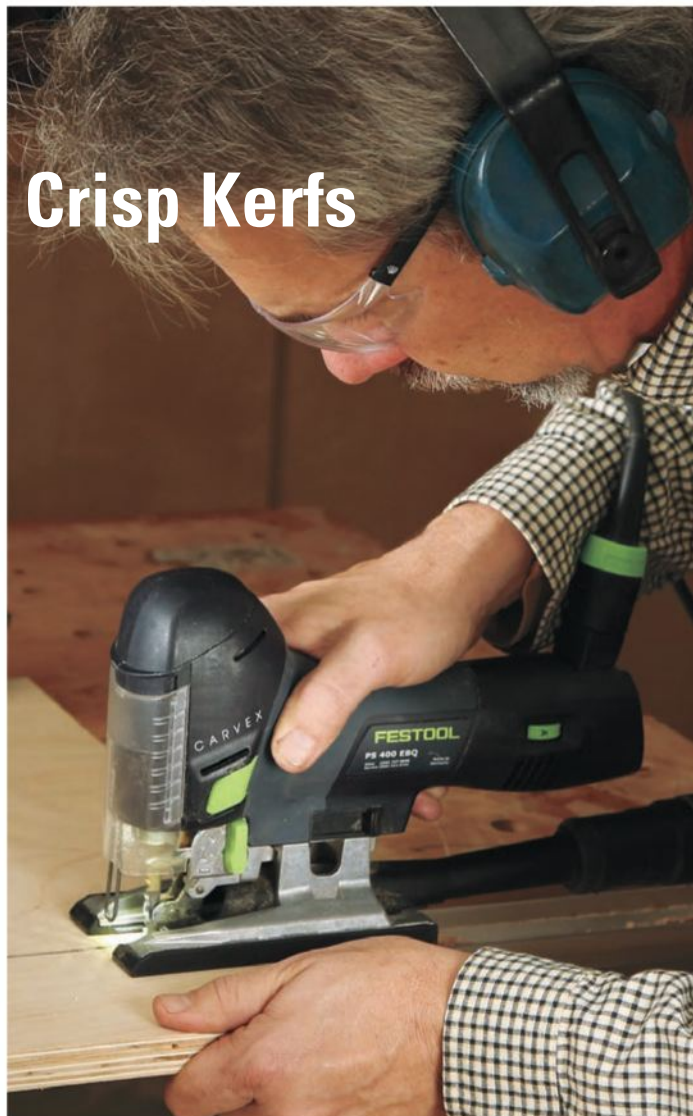
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Among the features in **Festool's** new *Carvex 420 Jigsaws* are stroboscopic LED lights, a tool-free base change system, and brushless motors. The four high-intensity white LEDs, which surround the blade on every side, reduce shadows that interfere with the visibility of your cutline. At speed, the LEDs synchronize to the speed of the blade: while it is moving, it appears still, giving you another visual advantage in following your cutline. You can configure the LEDs to be always on, always off, or stroboscopic. In order to change among seven task-specific bases, including a circle cutter, a base for cutting on metallic surfaces and an Angle Base, flip the base release lever for a tool-free operation. The Standard Base comes with the Carvex Jigsaw; others are available separately. Carbide blades cut wood up to 4¾" deep and can be changed with a patented tool-free blade chuck. A stroke adjustment



*Festool Carvex 420 Jigsaw*

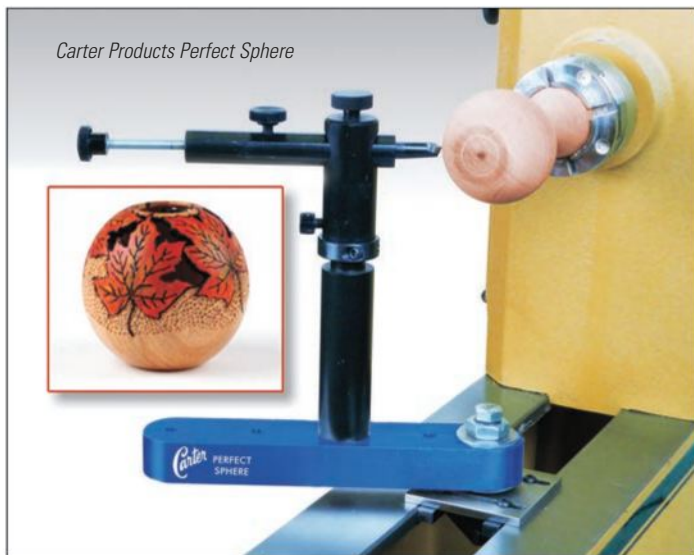
knob lets you choose among four modes, ranging from fine to aggressive, for cutting speeds between 500 and 3,800 strokes per minute. On D-handle models, you can use an auxiliary trigger on the handle to regulate cut speed, in addition to the variable speed dial. The Carvex 420 Jigsaws are available in corded or cordless, D-handle or barrel-grip versions, with each of the basic models priced at \$350. The cordless versions are also available with battery and charger for \$550.

**Carter Products' Perfect Sphere™** lathe accessory is designed to make spherical turnings fast and easy. The patent-pending Perfect Sphere mounts on the bed of almost any lathe, fitting on machines

with center heights from 10" to 25" with the appropriate tool riser stud. Its cutterhead, which features a precision-threaded cutter control knob, can be adjusted so the Perfect Sphere can cut any blank from any direction. It can produce spheres from 1" to 14" in diameter. The Perfect Sphere is shipped with a #4 Hunter carbide cutter. It is priced at \$349.

The new **Bostitch® 15 Amp 7¼" Circular Saw Kit (BTE300K)** is part of a new line of Bostitch-branded power tools. The circular saw weighs 9.5 pounds; a cast magnesium shoe enhances its lightweight design. Tool-free bevel adjustment provides a bevel capacity of up to 55° with positive detents at 45°

*Carter Products Perfect Sphere*





*Bostitch 15 Amp  
7 1/4" Circular Saw Kit*



*Rockler 24" Shop Stand Apron*

and 22.5°. It delivers 5,600 rpm and can cut up to 2 3/8" deep at 90° and 1 3/16" deep at 45°. The cord is 10' long to provide plenty of reach when ripping and crosscutting. Included in the kit are the circular saw, a 7 1/4" carbide-tipped blade, a rip fence, a blade wrench and a kit box. The BTE300K kit has a suggested price of \$89.99.

The **3M™ Clean Sand System** extracts dust during the sanding process. While originally designed for automotive use, the Clean Sand System works with wood as well. The sanding block from the system attaches with an adapter (also included) to vacuum hoses ranging from 1 1/4" to 2 1/2" in diameter, so the loose dust is captured while sanding. An air control valve in the Clean Sand Block allows you to control the

amount of suction. The 3M Clean Sand System, including the Clean Sand Block, eight feet of flexible hose and a vacuum adapter (item 03210) has a suggested retail price of \$29.99. Abrasives are sold separately.

**Rockler® Woodworking and Hardware** has introduced a new line of tool storage pouches and aprons, including a 24" *Shop Stand Apron* that is made to hang on shop stands and store hand tools, keeping them visible and easily accessible at all times. Also in the line are pouches with a clip on the back that can attach to a tool belt or be secured to other areas. Pouches are specifically designed to house tool groups such as gluing tools, measuring and marking aids, fasteners and hand tools. The tool

pouches and aprons are made of heavy-duty fabric with each pouch reinforced with an internal backer board for added structural rigidity. Prices for items in the line range from \$6.99 for the Glue Pouch (item 47812) to \$29.99 for the 24" Shop Stand Apron (item 45095).

**Tormek®'s TS-740 Sharpening Station** is designed to be the perfect height to use when sharpening: it adjusts between 29 1/2" and 32" in height, so that "when your shoulders are relaxed and your arms extended about waist high, you can apply the right amount of pressure and get the best results," according to Håkan Persson, CEO of Tormek, Sweden. The TS-740 is 22 3/4" wide and 15" deep, to provide a small footprint in the shop. It features six drawers, three of which have custom inserts for Tormek jigs and accessories. The composite worktop is moisture-proof and the metallic surface has pre-drilled holes for hooks (two included) for storing items such as special stones. The Tormek TS-740 is priced at \$679.



*Tormek TS-740 Sharpening Station*



*3M Clean  
Sand System*

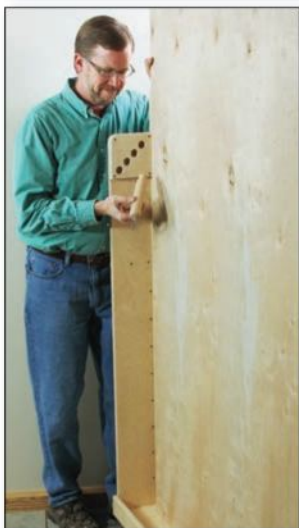




# Small Shop Journal

## Swing-out Panel Storage

*In just under five feet of wall space, this pivoting cart can stow lots of full-size sheet goods and cutoffs. Just swing it out for easy access to either side.*



**A pivoting design (top), peg holders (center) and locking push-action "brakes" (bottom) make storing your sheet goods supply convenient and secure.**





**Get started on this project by plowing dados in the side panels for the divider (top left). A few pocket screws in the receiver's side pieces (top center) will make this subassembly easier to tack into place on its side panel. Drill bolt holes in the ends/blocking (top right) before assembling the receiver.**



**With the side panel and receiver machined, fasten them together with glue and pocket screws (left), then reinforce this joint from the dadoed side of the panel with more screws. Next, find the centerpoint for the cap's pivot bolt hole by clamping it to the receiver temporarily and pricking the cap with the tip of a 1/2" brad-point bit (right).**

Sheet goods can be hard to manage, especially in a small-shop setting. They're cumbersome, space-hogging and usually end up stacked in a ragtag pile against a wall. Most home shops don't have room to store 4x8 panels horizontally like a lumberyard or home center can, so we resort to the only other option: standing them on end or edge. Still, that doesn't solve the problem of how to pick from the back of the pile for the piece you need without unstacking everything. And there's always the danger of a heavy stack of sheets toppling over. What to do?

Well, we think this roll-out organizer takes a few big steps in the right direction. Made from 5 x 5-ft. sheets of Baltic birch plywood, it's just big enough to fit 48"-wide material. The cart's back side holds full sheets, and two pegs fit into a series of holes in the cart walls to keep them safely upright. The front bin stores loose cut-offs. When it comes time to load or unload the big stuff, just roll the cart out on its pivot and two casters and flip down a couple of toggle clamp "brakes" to park it. But take note: your shop ceiling should be at least nine feet high to stand full sheets upright on this cart.

## Preparing the Cart Parts

Get this project underway by cutting panels for the divider and two sides (pieces 1 and 2) to size and rounding over their top corners with 1" radii. Then head to your table saw to plow 1/4"-deep dados down

the length of the sides, 6" from one edge (the pieces must mirror each other). Set the dado width to match the thickness of your plywood stock for a snug fit. Next, cut a bottom panel (piece 3), and lay out and cut the angles on one end as shown in the *Drawings* on the next page. Set these parts aside for now.

The "receiver" portion of the pivot mechanism consists of two sides, two ends and blocking pieces (pieces 4 through 6). Follow the *Material List* to cut them to size, and glue and clamp a piece of blocking to each receiver end, centering the blocking on the faces of the ends. While the glue dries, drill several pocket screw bores into one face of each receiver side; pocket screws will hold the completed receiver in place as it is attached to the side panel. Before assembling the receiver parts with glue and screws, step to your drill press and drill 1/2"-diameter centered holes through the ends/blocking for pivot bolts.

**Once the receiver subassembly is completed, you can assemble the sides and divider by spreading glue in the dados and pulling the joints together with long clamps. This is easier if you install the sides one at a time. Once the glue dries, reinforce these joints with screws.**





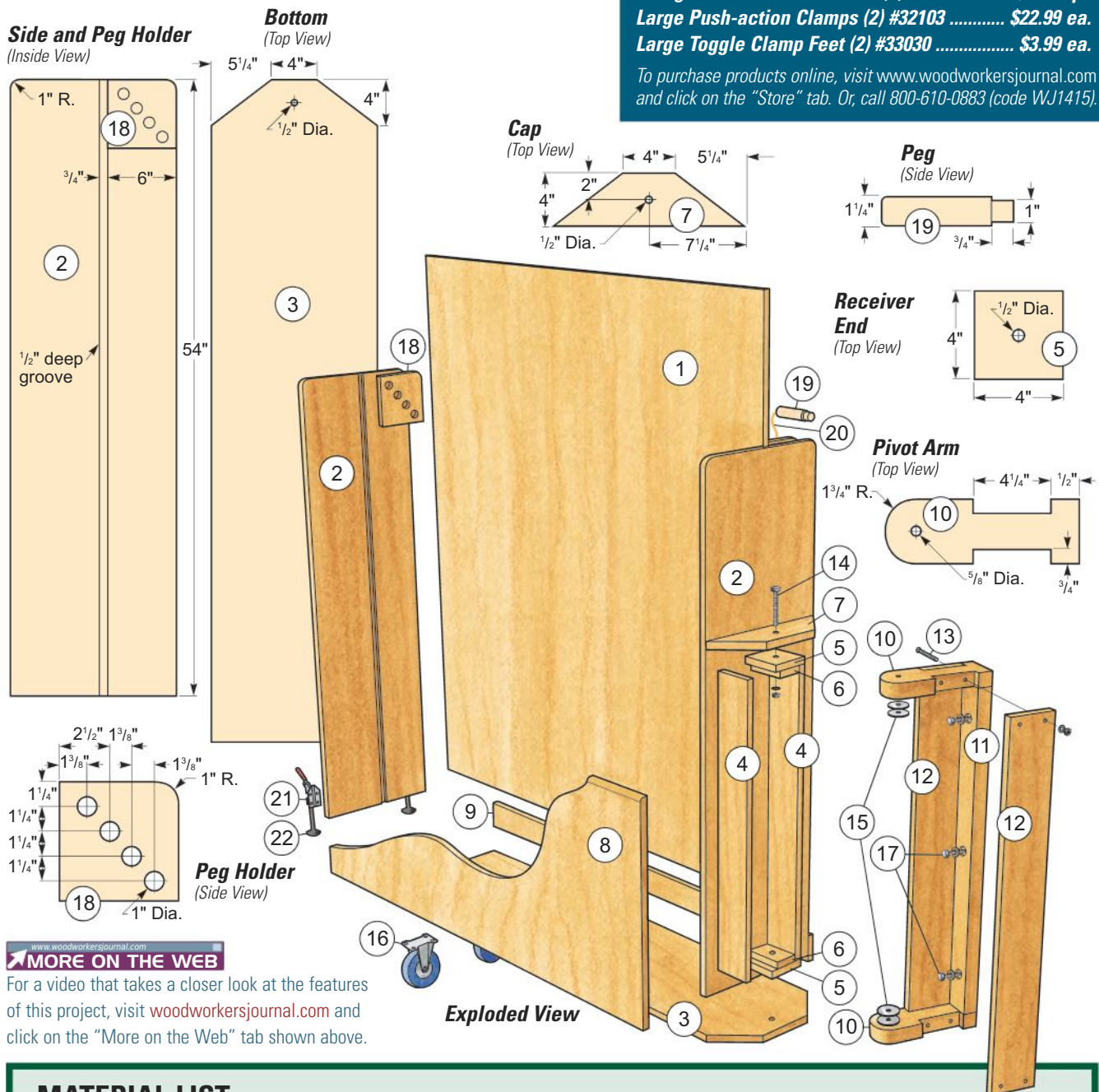
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### MORE ON THE WEB

For a video that takes a closer look at the features of this project, visit [woodworkersjournal.com](http://woodworkersjournal.com) and click on the "More on the Web" tab shown above.

## MATERIAL LIST

|                      | T x W x L                 |                                     | T x W x L                 |
|----------------------|---------------------------|-------------------------------------|---------------------------|
| 1 Divider (1)        | 3/4" x 53" x 60"          | 12 Bracket Braces (2)               | 3/4" x 4 1/4" x 35 5/8"   |
| 2 Sides (2)          | 3/4" x 14 1/2" x 54"      | 13 Carriage Bolt Assemblies (4 pr.) | 5/16" Dia. x 4"           |
| 3 Bottom (1)         | 3/4" x 14 1/2" x 58"      | 14 Bolts, Washers, Lock Nuts (2)    | 1/2" Dia. x 5"            |
| 4 Receiver Sides (2) | 3/4" x 4" x 31"           | 15 Fender Washers (4)               | 2" Dia.                   |
| 5 Receiver Ends (2)  | 3/4" x 4" x 4"            | 16 Casters (2)                      | 4" Dia., Fixed            |
| 6 Blocking (2)       | 3/4" x 2 1/2" x 4"        | 17 Lag Screws (3)                   | 3/8" Dia. x 6"            |
| 7 Cap (1)            | 3/4" x 4" x 14 1/2"       | 18 Peg Holders (2)                  | 3/4" x 6" x 6"            |
| 8 Bin Face (1)       | 3/4" x 24" x 54"          | 19 Pegs (2)                         | 1 1/4" Dia. x 6"          |
| 9 Bottom Trim (1)    | 3/4" x 3" x 54"           | 20 Chains and Screw Eyes (2)        | 12" Lengths (Hobby Chain) |
| 10 Pivot Arms (2)    | 1 1/2" x 3 1/2" x 10 1/2" | 21 Brakes (2)                       | Push-action Clamps (Lg.)  |
| 11 Bracket Back (1)  | 1 1/2" x 3 1/2" x 32 5/8" | 22 Toggle Feet (2)                  | Toggle Clamp Feet (Lg.)   |



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**Before moving on to the pivot arms, ease the top edges of the bin face and bottom trim pieces and screw them into place.**

Now check the *Drawings* for locating the receiver on the “undadoed” face of one of the cart’s side panels. The side panel you choose determines which storage bin of the unit will be against the wall, so plan carefully. Center the receiver on the panel’s width, and drive the pocket screws home to “tack” the receiver in place. Reinforce this joint with 2" countersunk wood screws. Be liberal with the screws: they’ll help the receiver support the bulk of the cart’s weight and storage load. Wrap up work on the receiver by cutting the cap (piece 7) to shape, marking and boring a 1/2" hole through its center and fastening it to the side panel 1 3/4" above the receiver to accommodate a pivot arm.

## Assembling the Cart

You’re nearly ready for some big-component assembly, but first cut the bin face and bottom trim piece (pieces 8 and 9) to size, and give all the parts you’ve made up to this point a final sanding. Now glue and screw the divider into the side panel dados. Set

this big assembly onto the bottom panel in order to mark the receiver’s pivot bolt hole position. Extend a long brad-point bit through the receiver hole to prick a centerpoint, then drill the bottom panel’s hole. With that done, install the cart bottom on the sides and divider with countersunk flathead wood screws.

Chuck a chamfering bit in your handheld router to ease the top outside edge of the bin face and trim piece. It’ll help prevent these edges of the cart from splintering during use. Install them with screws so they overlap the cart bottom and sides.

## Making the Pivoting Bracket

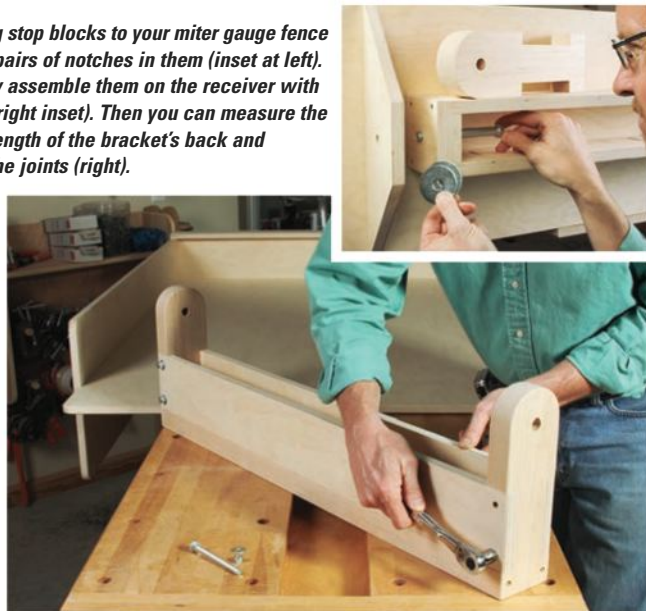
Find some 1 1/2"-thick, sturdy stock for making the pivot arms and bracket back (pieces 10 and 11). There’s no special trick to forming the pivot arms: cut one end to a 1 3/4" radius with a jigsaw or bandsaw, and mill a pair of 3/4"-deep, 4 1/4"-long notches into both edges of each arm to house a pair of plywood braces (pieces 12). You also need to drill 5/8" holes for the pivot bolts; note that they are 1/16" larger than the rest of the pivot holes to allow some “play” in the mechanism. It’ll help the cart shift up or down slightly at the pivot connection to roll over an uneven shop floor.

Before you cut the bracket back and braces to length, temporarily install the arms on the cart with bolts and two pairs of thin fender washers (pieces 14) situated against each end of the receiver (bottom right inset photo). Measure the pivot arm span carefully for the back and brace length. Take the time now to drill three counterbored mounting holes in the bracket back for lag screws, later. With this work done, put the bracket together: glue and screw the arms to the ends of the bracket back, then glue and clamp the braces in their notches. When the joints dry, drill all the way through the braces and bracket arms for pairs of 5/16" carriage bolts. Install them with washers and nuts (pieces 13).

*Small Shop Journal continues on page 72 ...*



**Machine the pivot arms by clamping stop blocks to your miter gauge fence to set the endmost cuts for milling pairs of notches in them (inset at left). Once they’re machined, temporarily assemble them on the receiver with pairs of fender washers and bolts (right inset). Then you can measure the span (bottom left) to find the final length of the bracket’s back and braces. Carriage bolts strengthen the joints (right).**



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*To help stand the project up and level it on the floor, clamp a pair of “L”-shaped spacers to the cart (left). Find the pivot bracket’s location on the wall by mounting it on the cart temporarily and marking its height on the wall. Fasten it to a wall stud with sturdy lag screws (center) before hanging the cart permanently on its pivot bolts (right). Remove your spacers and load it up!*

## Mounting the Cart on the Wall

There’s not much work left to do before you can hang this project on the wall. Now’s the time to fasten a pair of non-swiveling casters (pieces 16) to the cart bottom on the end opposite the receiver. And, since the project is probably lying flat on your bench or sawhorses, do yourself a favor: clamp an “L”-shaped spacer to each end of the cart bottom. Make them about 1/16" wider than the casters are tall; this will allow you to stand the project up level and without the casters rolling. Then bolt the pivot arm temporarily to the receiver, and stand the project up. Move it into position on its installation wall, and locate the wall stud for attaching the pivot bracket. Mark the bracket height on the wall, and free the bracket from the receiver again. Drill pilot holes into the stud for the three 3/8" lag screws (pieces 17), and drive them home to mount the bracket. Next, hang the cart on it permanently with the pivot bolts, washers and lock nuts. You only need to tighten the hardware enough to take up the extra bolt length; in reality, the pivot bolts just act as hinge pins.

## Wrapping Up with Pegs and Brakes

The full-sheet side of the cart will need two peg holders (pieces 18) mounted at the top corners of the sides for a pair of pegs (pieces 19) that will keep sheets upright and secure. The holders are 6" x 6" plywood squares with one rounded corner to match the cart sides. Bore four 1"-diameter holes through each one with a Forstner bit at the locations shown in the *Drawings*.

We turned the pegs to shape on a lathe, starting from scrap stock. (You could make them from 1" dowels if you don’t have a lathe.) Attach each peg to a 12" length of hobby chain with a screw eye (pieces 20), and hang these chains from the two holders with a second pair of screw eyes. Fasten the holders to the cart with short screws. The chains will keep the pegs within easy reach when you’re loading or unloading sheets.



*You can turn the pegs to shape from scrap (left), or just use 1"-diameter dowels. Chain these pegs to their holders (above) to keep them within easy reach. They’ll do a good job of holding your sheet stock upright.*

A pair of large, push-action clamps (pieces 21), mounted over the casters and pointing down, serve as “brakes” for this project. You can flip them up or down with your foot without bending over. However, their standard threaded versions won’t be long enough to reach the floor. Fortunately, Rockler offers 6" versions (pieces 22) with oversized heads that make a perfect retrofit here. Hacksaw the posts down to 3 3/4" long for an easy reach to the floor. Extend the clamp feet so the “brakes” just barely raise the wheels off the floor when engaged; that’s all the stopping power you’ll need.



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# Finishing Thoughts

## The Finisher's Top 10 List

By Michael Dresdner

*Here is our long-time contributor's top ten list of "must-have" items for the finishing room: a guide for the neophyte finisher, and a handy reminder for everyone else.*



Finishing expert Michael Dresdner shares more knowledge on the **Step-by-Step to a Perfect Finish DVD**, available through the store at [woodworkersjournal.com](http://woodworkersjournal.com).



### Sandpaper

Sanding is the first step in finishing. For raw wood, I stock 80-, 120- and 180-grit open coat aluminum oxide and 180- or 220-grit garnet. For sanding between coats of finish, I keep self-lubricated or wet-and-dry paper, including 320-, 400-, 600-, 800-, 1,000- and 1,200-grit.



### Good working conditions

This is the catchall for decent lighting; workbench protection, like newspaper or resin paper; proper ventilation; an apron or old clothes, and your favorite accessories, like hooks and hangers, Bench Cookies®, and Painter's Pyramids.



### Applicators and wipers

I love hand-applied finishes, and I use both grey and white nylon abrasive pads to apply stain, filler, the first coat of almost every finish, and all the coats of oil-based finishes. I wipe off with those ubiquitous blue paper shop towels. For higher build, and finishes that can't be wiped, add brushes, pads, aerosol cans or spray gear. Don't forget the 0000 steel wool, paired with paste wax, for the final rubout.



### Bloxygen®, plastic wrap or marbles,

Remove some varnish, and the oxygen atop the finish will crust what remains. Before you shut the can, chase out the oxygen with Bloxygen, block it with a layer of plastic wrap atop the finish, or raise the finish to the lip by filling the can with marbles.



### Touch-up equipment

Color putty spots or hide an error. Of course, you will not need a touch-up kit if you are like me and never make mistakes! (Just ignore that man behind the curtain wearing a Hawaiian shirt and toting a heavily used touch-up kit.)



### Solvents

Mineral spirits or paint thinner for oil-based coatings, alcohol for shellac, and lacquer thinner for lacquers comprise the big three cleanup and thinning solvents. Buy specialty thinners if and as you need them.



### Finishes

Yep, you need finish to finish. For simple wipe-on finishing I keep boiled linseed oil, Danish oil, oil varnish, and oil-based polyurethane, and apply one coat per day. Other common options include shellac, lacquer and water-based coatings.



### Safety and protective gear

Vinyl gloves are fine for finish, but you'll want neoprene for paint remover. Keep eye protection goggles and respirators handy as well.



### Painter's tape

Mask areas like drawer sides, glue surfaces when pre-finishing, and any other area you plan to leave unfinished. Painter's tape (usually blue or green) will release cleanly without leaving adhesive residue on the surface.



### Pigment stains and dye stains

Stains are optional, but even if you prefer the natural look, they come in handy to even up sapwood and enhance grain. The simplest custom stain: any color of latex wall paint reduced by half with water.



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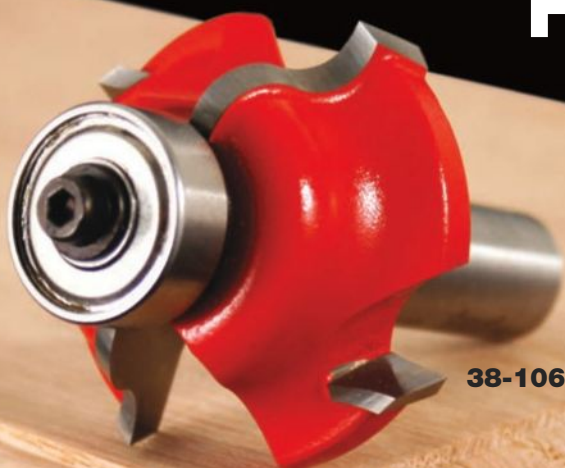
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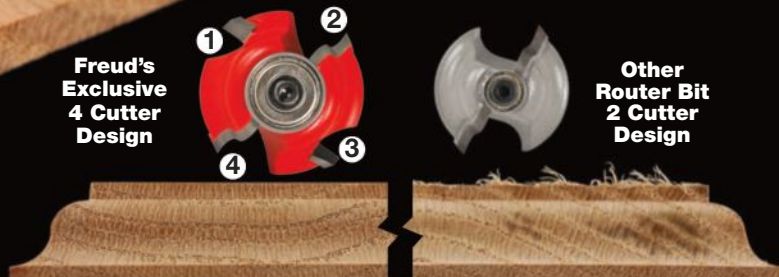


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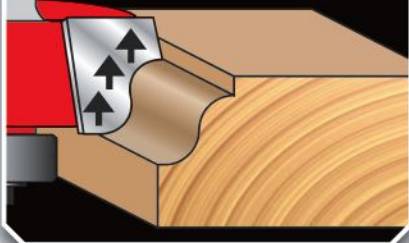


U.S. Patent No. 8,899,252

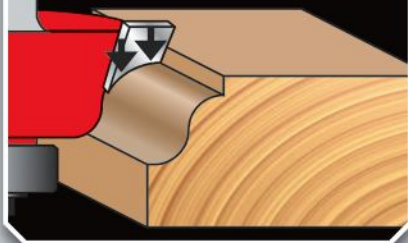
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Edge Profile



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