MULTI-TOOL MANIA — ALL YOU NEED TO KNOW! (page 48)

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(page 68)

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Woodworker's Journal

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How Do You Create Endless Cabinet Door Making Possibilities?

Profile Shown:
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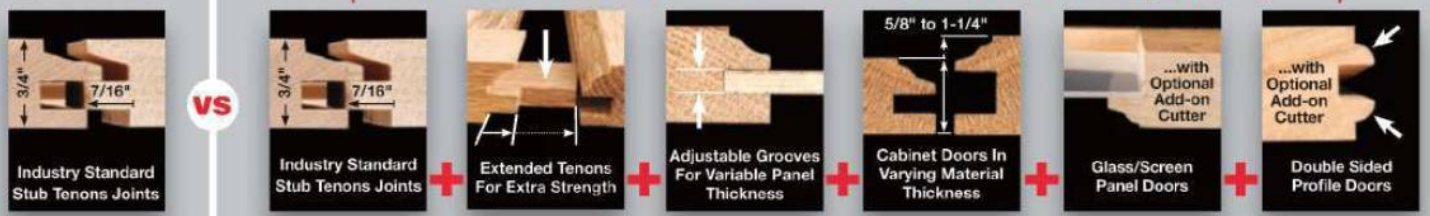

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Letters

Lifelong Learning in the Shop

COOKING, EATING AND SLEEPING . . .

As I look at the projects I selected for this issue of the Journal, I'm a bit concerned that my personal biases are too much on display. There is a project to enhance a bedroom, the *Arts & Crafts Blanket Chest*, a project that will find its home in the kitchen, the *Three-Sleeve Rolling Pin*, and one that actually lives in my dining room, the *Built-in Cabinet Makeover*. There you have it — cooking, eating and sleeping — that just about covers my whole life! Alas, the truth hurts, but somehow I am thinking that I am not completely alone in this matrix. Maybe I should reach out for guidance from you, readers … which room do we cover next?

—Rob Johnstone

Un-Sticking Router Bits

In the "Tricks of the Trade" column of the December 2009 *Woodworker's Journal* issue, reader Oneil Long presented a tip for freeing stuck router bits. I'd like to offer a somewhat quicker and much easier solution.

A year or so ago, I purchased one of those collet extensions. It worked great, but I had trouble getting the inner sleeve to release the bit. I emailed the company where I purchased the extension to ask for advice (MLCS), and they offered a solution that worked really well and was quick to boot:

After you loosen the collet nut, simply rap (tap or hit) the side of the collet (I aim for the nut). This quick blow to the collet releases the router bit from the internal sleeve easily. You don't need to hit it hard, just a quick blow.

Standard collets: This works easily on my collet extension because I need to have it above the table to use the double wrenches, so I just hit the nut with the side of the wrench. But I've found the same basic technique also works on the standard router collets where the collet is below the base. In this case, I use a 3/16" flat-ended punch to reach into the collet from the side (just like you do with the wrenches). I set the punch on the collet nut, then rap the punch with the flat side of the collet wrench. Bingo! The bit pops loose!

John E. Brady
East Berlin, Pennsylvania

The reason that router bits get stuck is that the collet does not always spring loose when the collet nut is released. Use a bit of paraffin wax and rub it inside the tapered receiving sleeve. This allows the collet to expand as the nut is released. The bit is easily removed with one's fingers.

Rich Flynn
Huntington Beach, California

One can avoid stuck router bits by leaving space between the bit shank and the bottom of the collet. If the bit doesn't release, a simple tap with a nonmetallic mallet or even a piece of wood will release it. By leaving this space, you allow the bit to slip down and release the collet grip. I've used this method for many years and have never had to use a vise.

Anton Hansen
Paradise, California

End of Shop Classes

I, too, am a retired shop teacher. Taught machine shop and tool and die makers on the college level. I went to college because of my high school I.A. teacher. Two of the major reasons school districts are dropping shop classes are liability and the high cost of equipment. We could solve both of these problems for a district if we would shake loose a few bucks and make a donation to our schools. Recently, at my 52nd class reunion, my wife and I donated a SawStop table saw to my old high school.

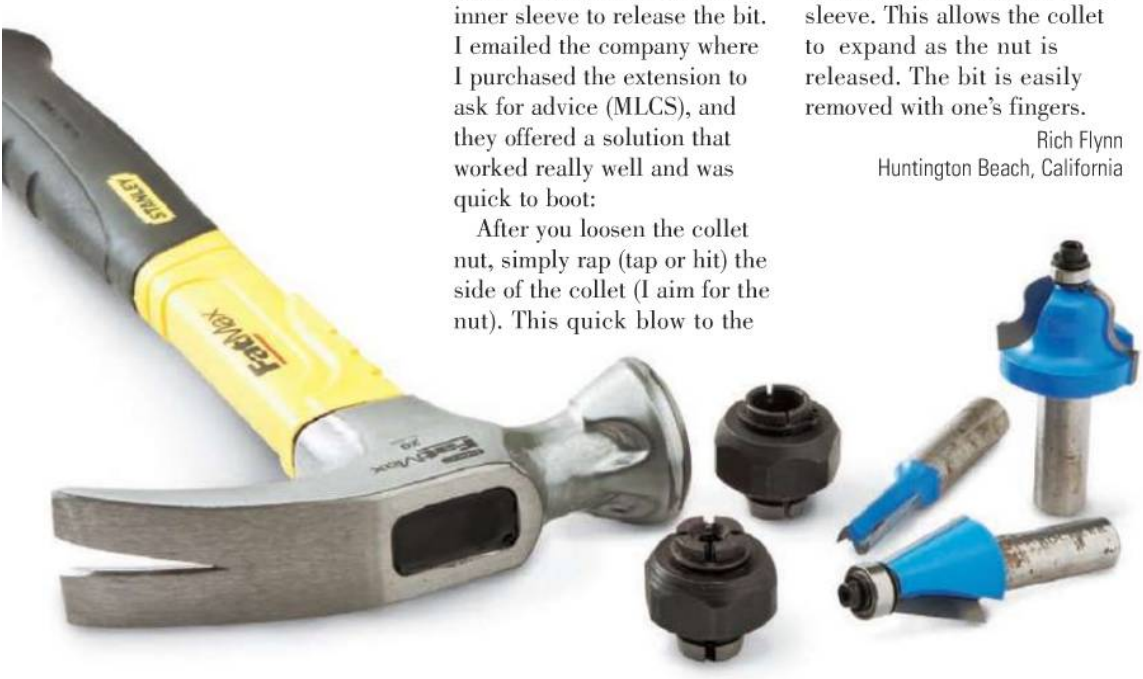
If we show an interest in these programs, the districts will be more inclined to keep them in place.

Mike Hausmann
Poynette, Wisconsin

Shop Memories

I have attached a photo of my grandson in my shop. It is a favorite memory that John (my grandson) and I share. He is four, and one rule I failed to enforce: he is not wearing safety glasses.

Dan Humphrey
Mount Vernon, Ohio



Left-Out Router Jigs?

I just got the latest edition with the dovetail jigs in it. ["Dovetailing Outside the Box," *December 2009*] One jig you missed is the Rout-R-Jig from Woodline USA. You will notice the unit from MLCS and Peachtree is a copy of this jig. The original, made by Woodline, has templates made of UHMW material, rather than PVC. I have had mine for over eight years, and it works great. There are more templates available from Woodline, too.

Richard Burbick
Sebring, Florida

John, the four-year-old grandson of reader Dan Humphrey, is already enjoying some quality time in his grandpa's shop.

Chris Marshall's tool review overlooked one very important and frankly superior outside the box alternative: the INCRA LS Positioner system. The incredibly easy to use INCRA LS Positioner fence system for router tables (and table saws) puts an unparalleled high level of

Letters continues on page 8 ...

Mail Call!

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We ask that all letters, including emails, include a mailing address and phone number. We reserve the right to edit for length and clarity.

Letters continued

One reader felt that Incra Jig was an important omission from our article on non-traditional dovetail jigs.

precision into the hands of any woodworker. No collars, special dovetail bits with bearings, or finger templates are required! With nothing more than a standard router bit, a router table outfitted with one of the INCRA fence systems, and the INCRA supplied plastic alignment reference guides and right angle fixture, anyone can easily and quickly create dovetails that are as tight and precise as any finger template-based system. The system is flexible, too; with it, you can create a number of unique decorative dovetail and other joints, not possible with the majority of finger template-based systems.

Alan Schaffter
Washington, North Carolina

Horizontal Router Table

I agree that a tilting table can add "versatility" to a horizontal router table; however, it also comes with two problems, both of which can be fixed with a different approach that will yield the same results.

First, with that fence, if the table is tilted at moderate to high angles, the stock will tend to wedge between the table and the fence. The top edge of the stock will contact the fence while the bottom edge, especially of thick stock, will be forced away from and may not even contact the router bit.

Secondly, a table that tilts is not the safest nor most user-friendly configuration. Stock will have a tendency to fall into the bit, if the table tilts up as in Mr. Nagyszalanczy's design, or fall away from it, if the table tilts down as in the case with (and a common criticism of) the Shopsmith.

The relatively simple solution is a design where the table is fixed in the horizontal position, has a low fence and the router (mounting plate) tilts. An added benefit to this design is that the locking device does not need to be as robust as the one in the article since it only supports the weight of the router (and plate) and not that of the table, stock and operator pressure.

Alan Schaffter
Washington, North Carolina

Letters continues on page 10 ...

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Thank you, Mr. Nagyszalanczy for your project ["Horizontal Tilt-top Router Table," *December 2009*]. It arrived just as I was about to begin a project that would make great use of a horizontal router table.

Jim Riley
Via Internet

WJ Responds: We're glad you liked it, Jim, and if you or any of our other readers missed it in the last issue, be sure to check the "More on the Web" December 2009 portion of our website for the corrected drawing of the threaded insert hole locations.

"Turn of the Century"

In T.C. Knight's response to the diameter statement in the *December 2009* issue ["Letters"] he referenced an American chestnut being 17' in diameter at the turn of the century.

I am also a forester (old, I might add) and frequently used the same "turn of the century" comment as a baseline in discussing forestry issues. That is, until the past few years when I have to stop and remind myself the turn of the century occurred just a relatively short time ago (2000). I've never heard of a chestnut this size in North Carolina in the last 10 years, so I'm sure in this case Mr. Knight meant the turn of the last century — that is, 1900.

Dean Carson
Lexington, South Carolina

American chestnut

Stumpers winner Jack Raybourn was delighted with his prize.

Thanks for the Winnings

Thank you, *Woodworker's Journal*, for creating two weeks to truly remember!

Less than two weeks ago, I received a letter from you informing me that I was picked as the winner in "Stumpers" for the November/December issue of *Woodworker's Journal*. You noted that I had won a Porter-Cable Compressor Combo Kit which would be sent by Porter-Cable within six to eight weeks.

I was indeed surprised when the gift arrived the following Saturday. I am a retired wildlife biologist and continue a lifelong hobby of woodworking (now a little more seriously). I own several Porter-Cable tools and knew that they manufacture several compressor combo kits. Imagine my surprise when I saw that it was their top kit containing a compressor and three different nail guns.

I want everyone at *Woodworker's Journal* to know how thankful I am for your generous gift. Believe me, it will receive a lot of use. Incidentally, I don't know if the magazine purchases its prizes, or if they may be donated by tool manufacturers. Should the latter be true in this case, I would appreciate an appropriate Porter-Cable contact so I can express my appreciation to them as well.

Again, thank you for your generous gift. I will no longer be able to read "Stumpers" without thinking of the joy you bring to each issue's winner.

Jack Raybourn
Mechanicsville, Virginia

Photo courtesy of the American Chestnut Foundation.

Questions & Answers

Taking Woodworking's Measure

THIS ISSUE'S EXPERTS

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

Chris Marshall is field editor of *Woodworker's Journal* and author of several books on woodworking.

Sandor Nagyszalanczy is a writer/photographer of several woodworking books and a frequent contributor to *Woodworker's Journal*.

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

Q We are often advised by the experts to measure diagonally to determine if a project is square. Why is this? Wouldn't it be easier and more accurate to put a square on the corner?

Stephen Danago
Merritt Island, Florida

A In small boxes and very simple assemblies, using a square would probably be sufficient. When projects get larger and more complex (for example, a cabinet that has several internal compartments), checking a couple of corners with a square does not give you a reading of the overall project — just those specific sections of the piece.

The corner-to-corner diagonal measurement technique is not only fast and extremely accurate, but it is also very helpful during the assembly process. As many of us have discovered, when you are in the middle of gluing up a project — a step that, as Ian Kirby likes to point out, is not easily reversible — it is not uncommon that the clamping pressure is applied unevenly and can actually distort the project out of proper alignment. One big advantage of measuring from corner to corner across a clamped-up subassembly is that you can quickly check to see if that is the case. If your project is a bit out of whack, you can change your clamp positions and clamping pressure while the glue is still wet and get the assembly square and true before the glue cures.

— Rob Johnstone

Q I am looking to buy my first miter saw. Is it worth the extra money to get a saw with dual bevel? If I buy a single-bevel saw, how will it limit the saw?

Jason Schultz
Englewood, Ohio

A If you're planning to install lots of crown molding requiring compound miter cuts, a dual-bevel miter saw will give you the full range of compound angles, both right and left, without having to rearrange your moldings on the saw to cut them. But, for general woodworking, a single-bevel miter saw might be all you need. That's the type I own, and I've used it for more than 10 years without wanting for more. Generally, they're less expensive than dual-bevel models. Either way you go, buy a 12"-diameter saw to maximize your crosscutting width and thickness.

— Chris Marshall

Q I have heard that keeping rechargeable batteries in the cold is damaging to them. My shop is only heated in the cold months when I am doing a project.

Should I continue to bring the batteries and chargers in, or can I keep them in the cold and continue to charge them?

LaMar Burns
Bountiful, Utah

Measuring diagonally across an assembly is a fast and easy way to see if it is square.

A The recommended temperature range for charging rechargeable power tool battery packs is typically between 40°and 105° Fahrenheit. Attempting to charge a pack that's hotter or colder than this can disturb the chemical reaction inside the battery's cells and permanently reduce the pack's performance and runtime. As I'm sure that Utah winters commonly dip down into the low 30s, you definitely don't want to recharge your packs when the mercury drops down this low. Further, for optimum performance it's best not to store batteries in places where the temperature dips below 40° F.

To avoid the hassle of lugging your packs between your house and shop during the winter, try keeping them in the shop in an insulated container, like a foam ice chest, fitted with a heating pad (the kind you'd use to ease a sore back). Set the pad to its lowest heat setting.

If you do end up with a cold battery pack, all you have to do is warm it up before you recharge it. Once the temperature of the internal cells is in the recommended operating zone, the battery should perform up to par, regardless of the outside temperature.

— Sandor Nagyszalanczy

Continues on page 14 ...

Winner!

For simply sending in his question on determining square, Stephen Danago of Merritt Island, Florida, wins a Steel City Bench Mortiser (Model 25200).

Each issue we toss new questions into a hat and draw a winner.

Stumpers

Woodcutter's Wedge

Woodworkers wedge in a few answers to our recent mystery tool.

"What's THIS?" echoed **John Stinchfield** of Phillips, Maine, in response to our mystery tool from *December 2009*. "It is a wood cutter's wedge for felling trees with a buck saw so the blade will not bind in the tree."

In fact, when **Dur Seible** of Durham, Connecticut, purchased the pair of cast-iron items, "The seller claimed they were wedges used when sawing a sizable log." Dur wasn't quite sure about that — but other readers' responses mostly confirmed it, with a few clarifications.

Lloyd Schenk of Abrams, Wisconsin, explained that the woodcutter would "Start cutting the tree, and as you cut about halfway through or so, you drive the wedge in the cut to make the tree go the way you want it to fall."

"There are two of them," said **Keith Stogdon** of Bellflower, California, "because originally there was a piece of chain connecting the two wedges." According to **Russell Ellis** of Springfield, Massachusetts, "The example you show is a bolt pattern or Eastern style. Smaller wedges were used by high toppers."

Some readers did have interesting alternative uses. **Bob Lafferty** of Richmond, Kentucky, thought "it was used as a lime squeezer in bars to mix drinks." More likely was **Griffin N. Reynolds** of Lenoxville, Pennsylvania's thought: "This tool looks like a 'pitch.' They were used to locate and split seams of flagstone [in quarries]. Several would be used along the edge until the seam opened up and the flagstone was lifted."

And a fascinating alternative came from **John Humont** of Franklin, Wisconsin, who said, "The wedge was used to break the cope (top half) from the drag (bottom half) of large molds" in a foundry. According to John, whose grandfather's foundry closed in 1965, the cope only needed to be lifted half an inch, and the wedges would be made from the metal poured by the foundry. "They would not be for sale, but might bear an asset number. Several wedges would be used at the same time, to lift a large cope."

—Joanna Werch Takes

What's This?

Jim Eslinger's mystery tool (and case, below) comes from the Lionel Company and has two dials that count to 100. Do you know what he has in Bismarck, North Dakota? Send your answer to stumpers@woodworkersjournal.com for a chance to win a prize!

Winner! Russell Ellis, Jr. of Springfield, Massachusetts, wins a DELTA 13" Portable Thickness Planer. We toss all the Stumpers letters into a hat to select a winner.

Questions & Answers
continued

Q I have been turning small objects on my lathe and have been using a combination of cellulose sanding sealer, which dries almost instantly, friction polish and carnauba wax stick with good success. However, the labels on these products do not indicate what is in them. What ingredients are in cellulose sanding sealer and friction polish? Can they be made or purchased from the large home center stores, or can I make my own?

Thomas Plackowski
Houghton Lake, MI

A In all likelihood, the cellulose sealer is actually nitrocellulose sanding sealer, which is basically nitrocellulose lacquer mixed with zinc stearate to add body. You can buy nitrocellulose lacquer sanding sealer at most any home store or industrial coatings supplier, along with lacquer thinner for thinning and cleanup. Friction polish is almost always a mixture of shellac and wax. These are usually not sold at home stores or paint stores. You could mix your own, but it's a bit tricky, since not all waxes will mix readily with shellac, and it is best done with professional paint mixing equipment, which I am guessing you do not own.

— Michael Dresdner

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Tricks of the Trade

Make Your Own in the Shop

Wooden cases protect the chisels and the woodworker.

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.

Safer Way to Pocket Your Chisels

Storing chisels in my tool bag has been a real challenge. I tried keeping them in athletic socks and leather wraps, but getting them out was a hassle. Left unwrapped, the blades cut holes in the pocket of my bag and exposed the sharp edges. I solved the problem with these rigid cases, made from scrap. I cut a couple of shallow dadoes in a piece of pine a little longer than the length of the chisel blades, then glued a piece of hardboard over it to form a secure case. I rounded the bottom corners of the case to make it easier for them to slide into my bag pockets. Now my chisels are ready whenever I need them, and there's no danger to the bag, the cutting edges or me.

Stephen M. Hoffman
Salina, Kansas

Clamp Extender

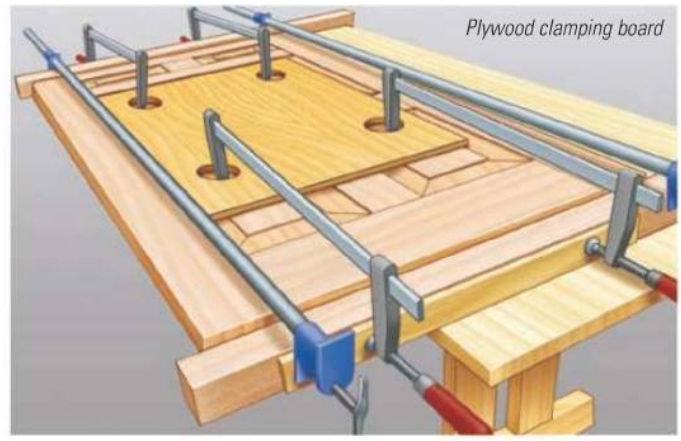
Recently I had to clamp a long project glue-up. The overall clamp length I needed was 74". I tried using long pipe clamps, but there was so much flex in the 3/4" pipe that the clamping pressure wasn't being exerted parallel to the pipes' axes. So, I fabricated the cheap and quick plywood aid shown below with a few large holes for the clamp heads. It allowed me to use 24" bar clamps and keep the pressure square to the workpiece. Worked like a charm.

David M. Grosz
Stamford, Connecticut

Tool Parts Grab Bag

Here's a simple solution for storing all of the spare parts, small attachments and wrenches you get with a new tool. I put each tool's "extras" in a Ziploc®-type plastic bag. On a piece of paper, I write down the name of the tool associated with the bag's contents and slip it inside so the tool's accessories are always easy to identify.

Serge Duclos
Delson, Quebec



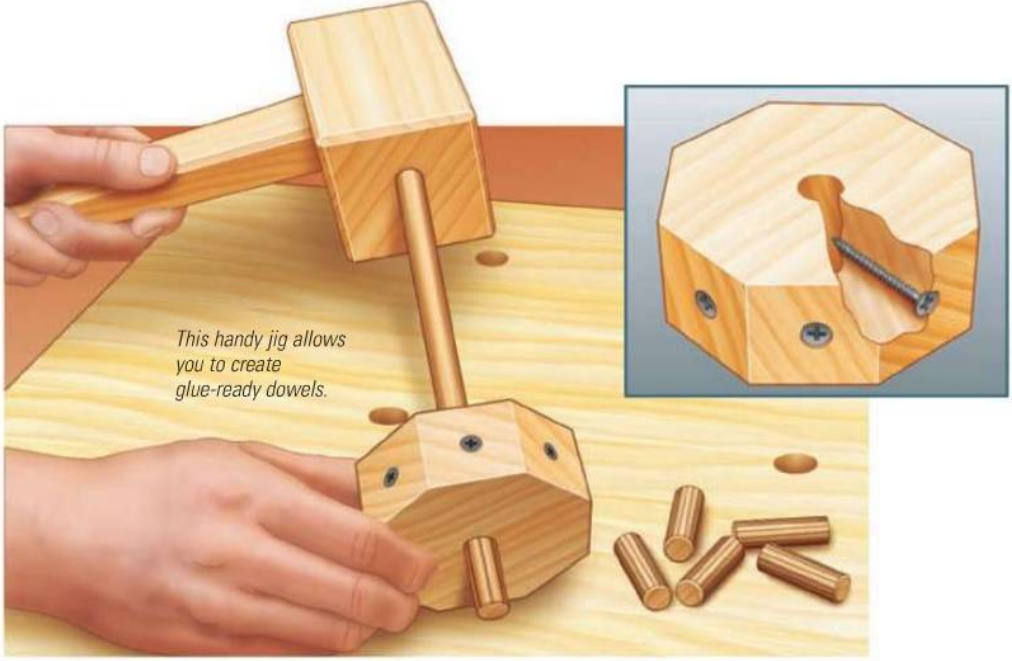
Plywood clamping board

PICK OF THE TRICKS

Make Your Own Adjustable Feet

I build most of my benchtop tool stands and was searching for a source of sturdy adjustable feet. It occurred to me that hockey pucks would be an inexpensive way to make them myself. The rubber is very tough, and it band saws easily. I cut two 1½"-diameter feet from each puck and drill a bolt hole about three-quarters of the way through them. Then, I install a length of threaded rod in the hole with epoxy. Add a washer and nut to complete a pair of very rugged feet.

Gil Singer
Enola, Pennsylvania



Octagonal Dowel-fluting Jig

With this jig, I can buy plain dowel rods and flute them myself. To make one, take a block of 1½"-thick scrap that measures 3½" square. Cut it into an octagon shape and bore a 3/8"- or 1/2"-diameter hole through the center (depending on the dowels you plan to use with the jig). Then drill a 1/8"-diameter hole, centered on each of the flats, going through to the dowel hole. Drive a 1⅝" drywall screw into each hole until just the tips of the screws protrude into the dowel hole. That's it! Pounding a dowel through the hole cuts eight flutes in a single pass. Use a length of spare dowel to drive the end the rest of the way through. Then, give the dowel a little twist and cut eight more flutes with another pass.

Jim Vasi
Williamsville, New York

Winner!

In addition to our standard payment (below) Gil Singer of Enola, Pennsylvania, will also receive a Stanley-Bostitch CPACK300 Combo Kit 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. Submit your Tricks to Woodworker's Journal, Dept. T/T, P.O. Box 261, Medina, MN 55340. Or send us an email: tricks@woodworkersjournal.com

Turning to the Unexpected

Photos courtesy of Michael Serpa

Woodturner Denise DeRose's previous specialty was bowls — including a 30" walnut one made with turner Michael Serpa.

Denise DeRose

Turns to Purses

When woodturner Denise DeRose saw a woman carrying a small bandsawn box, about the size of a paperback book, as a handbag, "a light went off in my brain: why couldn't it be a vessel? Woodturners make vessels. I started thinking about it, and I got consumed by it."

The first purses Denise made were canteen shaped, with a flat wood front and a channel for the strap inside the bag rather than outside. Lately, she's started experimenting with therming, a traditional turning technique that's been used for centuries to turn multiple objects mounted parallel on a lathe. Denise is using the technique for clutch style purses: she turns the two flat sides of the bag using the therming technique, band saws the edges, then cuts the pieces in half lengthwise and hollows out the inside by hand or with a Forstner bit.

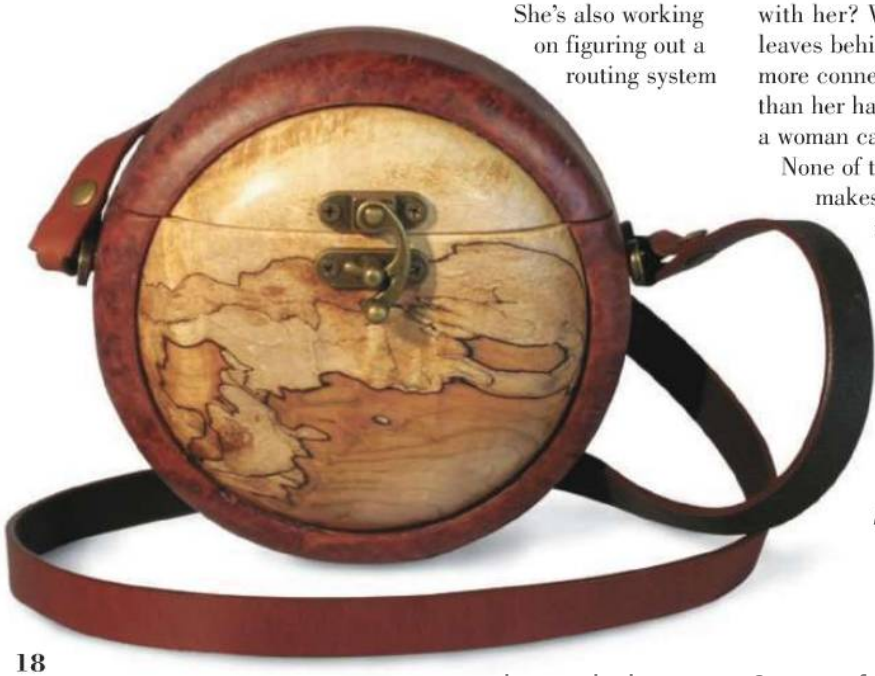
She's also working on figuring out a routing system on a track for use in constructing her handbags. "You've got to be able to rout a shape that's roundish but not round and has nice, clean lines," she said.

Denise herself is not a purse person. "I am the last kind of person you would think about when you think about handbags," she said, with her focus being more on the functional than a fashion collection. As an art piece, though, "I think about handbags as a metaphor. What is it a woman brings with her? What is it she leaves behind? Few things are more connected to a woman than her handbag. What does a woman carry?"

None of the handbags she makes exceeds 12 inches in diameter, and her source for many of those 12" pieces of wood is cutoffs from instrument companies. Like the wood used in a violin or guitar, handbag wood needs to be stable, and companies who sell billets for construction of those instruments often have cutoffs she purchases. "I do a lot of glue-ups, or turn two discs and hollow and laminate them together," she said.

One reason Denise likes the fiddleback maple she often gets from the instrument cutoffs is because of the way it takes a finish. "A handbag finish is crucial. It's not something to just sit on a shelf; it's in someone's hands all the time."

She likes to use fabric dye, in a variety of colors, on the wood for her handbags, and fiddleback maple lends itself well to dying because of its chatoyance. Her Flower Drum Song bag, made from fiddleback maple dyed with red fabric dye with a lacquer finish, is one of her favorites: "It looks like wood and you can see that it's wood, and it's elegant and attractive."



Maple, whether fiddleback as in Flower Drum Song (top of page) or spalted as in Landscape (left) is one of Denise's favorite woods to work with.

Denise's Saratoga Bag was made from bleached ash and wenge.

She also uses pyrography in completing the finished designs on her purses. "It's a good way of defining areas, especially if you use dye or paint. It burns fibers of the wood and keeps the paint or dye from traveling, so it will stop where the burn lines are."

Prior to her focus on handbags, Denise turned many salad bowls — including one, upon request, that was 30 inches in diameter, made from walnut. Getting that up on her lathe, Denise said, required "a jack and three teenage boys" — and it's one reason she has rigged up a winch system from the I-beam of her garage shop. Mostly, though, the challenges of salad bowls focused on design elements: "Is it going to be deep, is it going to be shallow, is it going to have a big foot?"

These days, in addition to design, she has to turn some of her focus to hardware. Since she can't find hinges for some of the shapes she makes — she needs them to open round, rather than flat — she's been doing some metalsmithing to make her own, such as those for a Bentou Box purse.

She hasn't counted all the purses she's made so far, but says she has a long way to go. "I think creativity arises when you limit yourself. You don't walk in the door of the shop and say, 'What am I going to make today?' You know what you're going to make, and you work within the parameters."

For Denise, woodturning helps define those parameters. "Woodturning is my passion," she said. "I'd much rather work with the lathe than with any other tool in the shop.

To see more of her work, visit *www.denisederose.com*.

— Joanna Werch Takes

Shop Talk continues on page 20 ...

Tight Economy Leads to Price Drop

Leigh's New "Super" Jig

Recently, Matthew Grisley of Leigh Industries dropped by the WJ shop to demonstrate their new Super FMT Jig. The jig forms both mortises and tenons with one setup, much like their original FMT jig, but at almost half the cost (about $449). Why the price drop? "The parts are made from punched and formed steel or injection-molded plastic," Matt explained, "which is considerably less expensive than the machined or die-cast aluminum we use on the original."

They also changed the clamps: twist-action F-clamps on the Super; cam-action speed clamps on the FMT. But, since the Super FMT is the same size and accepts the same bits as the regular FMT, it, too, can produce over 70 sizes of mortise and tenons, ranging from 1/16" x 18" to 1/2" x 5" — including square tenon, louver and y-axis joints.

The tenons are actually formed with a climb cut — cutting in the opposite direction than a person would usually use with a router — something I learned as I watched Matt put the tool through its paces.

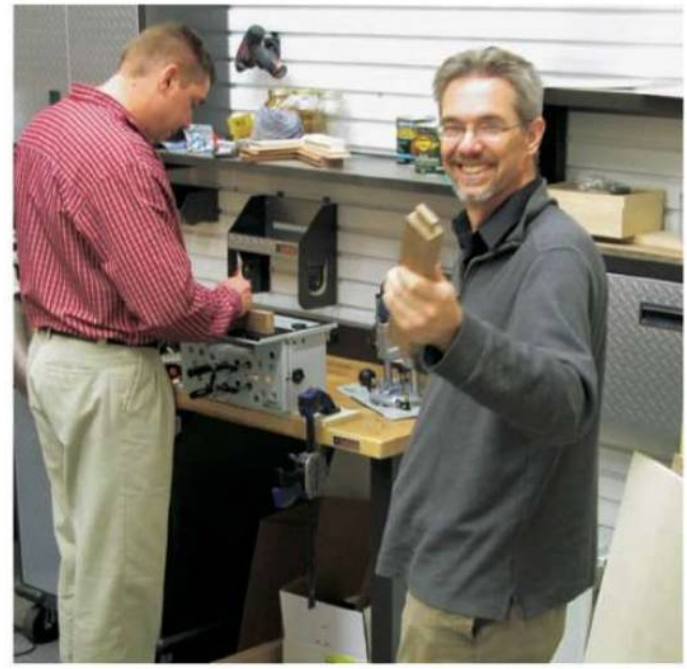
I also found out about the rare earth magnets: one helps align the tabletop, another stores the sight (which snaps to a window on the tabletop to align your stock), and still others hold the clamps in place on the jig so you can have both hands free to locate your stock.

It takes some time to set up the Super FMT jig, but I had the advantage of standing around and watching Matt do all that. Once it's set up, you can start a new project, with repeatable results, in seconds.

The new price point was key to Leigh's development of the Super FMT. According to Matt, "many people wanted one, but just couldn't justify the higher price, especially in a tighter economy." Matt's dad, Ken Grisley, the founder of Leigh Industries, took that info to heart in his research and development work on the Super FMT — and some of the first shipments to retailers sold out before the product had even gone on the market.

To find out more, visit *leighjigs.com/superfmt.php.*

— Rob Johnstone



Editor in Chief Rob Johnstone shows off the results of Leigh Industries' new Super FMT Jig. Matthew Grisley prepares to form the mortise.

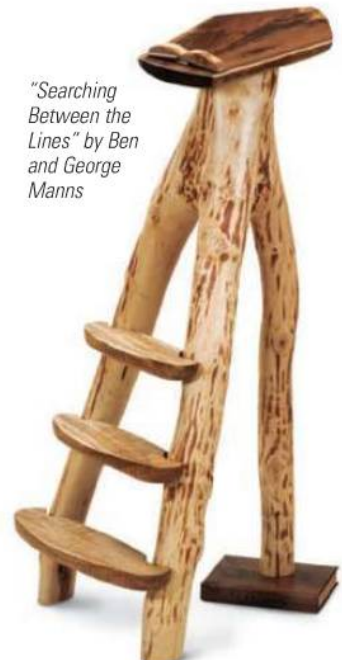
"Steps" by Paula Garbarino

Getting a Leg Up

Variety of Library Ladders

The theme of the 16th annual woodworking competition sponsored by the Wharton Esherick Museum in Paoli, Pennsylvania, was "library ladders."

Woods used in the entries ranged from walnut, oak and maple to Eastern hophornbeam and macassar ebony. For more information, including entry regulations for next year's contest, call 610-644-5822 or visit *whartonesherickmuseum.org.*



"Searching Between the Lines" by Ben and George Manns

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Vacuum Chucking

By Betty Scarpino

Sometimes, there just doesn't seem to be a reasonable way to attach something to the lathe. Enter the vacuum chuck!

Cincinnati turner John Lannom demonstrates his vacuum chuck for the author. John uses his chuck regularly and demonstrated several applications of the system.

Of the many ways to attach something to a lathe, vacuum chucking stands out as particularly useful for objects that seem to defy any other method of attachment. Two such types are 1) bowls that have already been finished but need a bit of touchup and 2) spheres. I don't own a vacuum chuck, so I did the next best thing: I visited John Lannom in Cincinnati. He owns a vacuum chucking system, and he uses it regularly. He showed me several applications of his system, carefully explaining the finer points and drawbacks of each step.

John's vacuum chuck is a commercially purchased system, made by Oneway Manufacturing. There are others. Many turners have also put together their own vacuum chucking system, and you certainly could, too, given a bit of research (look up "vacuum chucking for woodturning" on the Internet). Either a commercial or a homemade system works well, and both alternatives have their good points.

Vacuum chucking systems have their limitations. John pointed out that very thin-walled vessels can be crushed, even with a small amount of air pressure from a vacuum chuck. Also, a vacuum system does not hold as securely as do scroll chucks and faceplates. Additionally, turned items with holes in them (such as those made from wormy ash) are not good candidates for vacuum chucking: the holes simply let the air flow through rather than creating a vacuum.

Basic Concept of Vacuum Chucks

Vacuum chucks basically hold an object to a lathe so that it can be lightly turned or sanded without leaving any marks from being attached. Such a system provides total accessibility to sand and

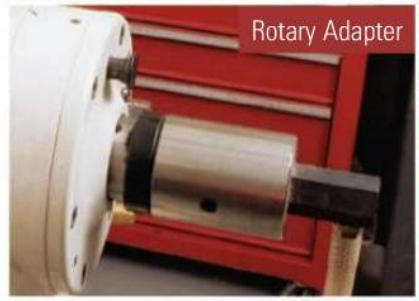
finish objects. The contact point between wood and cylinder is a soft seal, often made from neoprene. Use of this type of material lets you avoid any marks on your turned objects. Different size cylinders allow for attaching variously sized objects.

Commercial systems come with a vacuum pump, rotary adapter, air hose, vacuum gauge (or regulator) and vacuum cylinders. Each item can be purchased separately, or the complete package can be ordered with the cylinders threaded to fit your lathe's spindle size.

Finishing the Bottom of a Shallow Bowl

After explaining his vacuum system, John showed me the steps involved to reattach a shallow bowl to the lathe in order to turn the bottom. The bowl was originally attached to the lathe using a scroll chuck grabbing a tenon (or foot) on the bowl's bottom. John needed to clean up the inside of the tenon to create a finished base.

With the bowl turned and sanded and still attached to the chuck, John removed that assembly from the lathe. He selected the medium-size vacuum cylinder and threaded it onto his lathe's headstock spindle. The vacuum system was already set up on the lathe, so the next step was to somehow reattach the bowl to the cylinder, getting it centered.

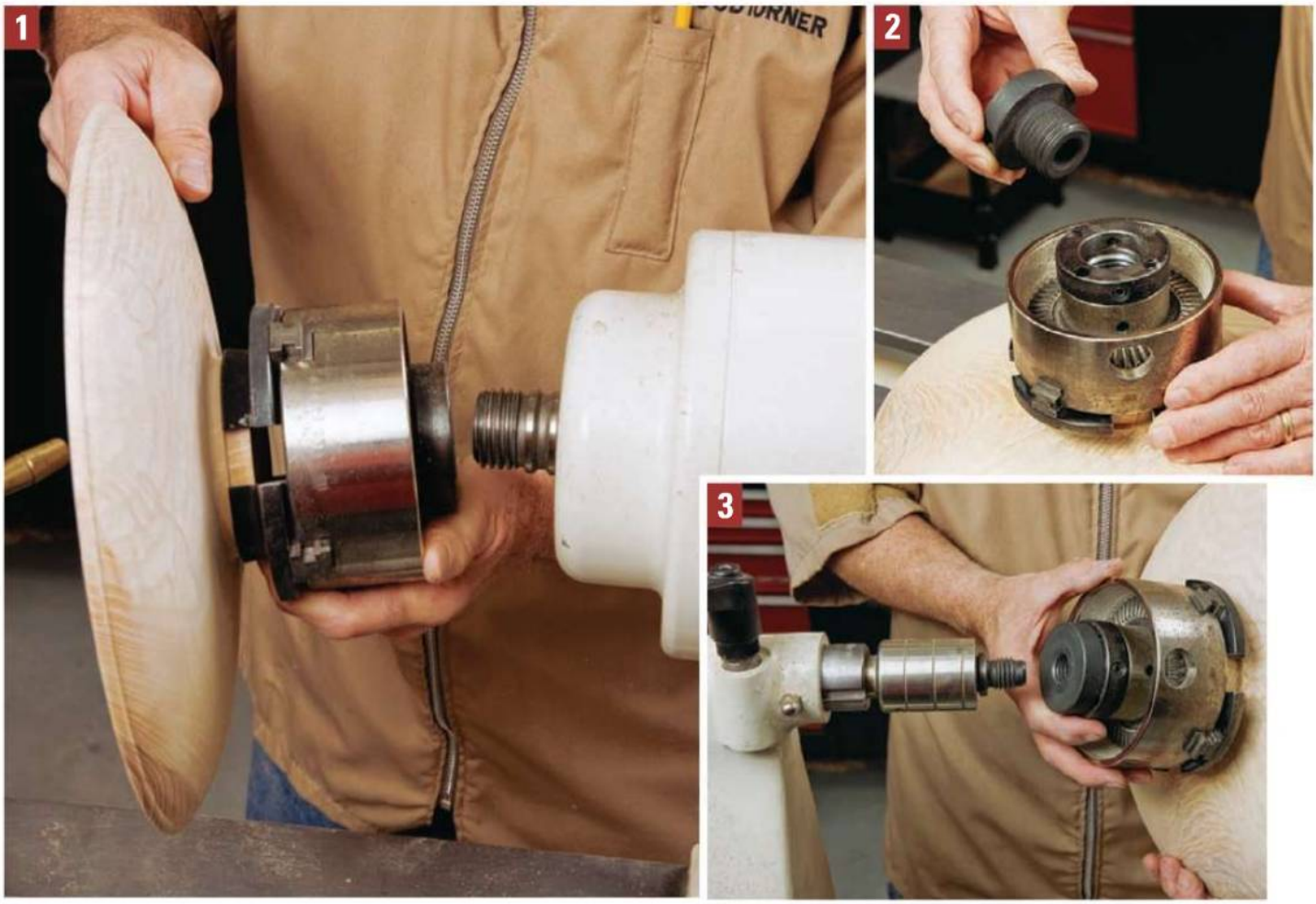


This is where things get a bit tricky: the object must be reattached to the lathe, keeping in mind that there are three axes, each of which could be out of alignment. It can be done, but it might take awhile. Or you can get lucky and hit it right on the first try.

A Solution to Centering

The folks at Oneway Manufacturing have figured out an ingenious solution to getting something centered back onto a lathe in a vacuum chuck: it's an adapter that screws onto a chuck. This adapter allows the turner to keep the bowl or plate in the original scroll chuck, yet be able to reattach it to the tailstock spindle. Doing so ensures that the plate or bowl will be aligned with the lathe's axes. Since John's bowl was already attached to a scroll chuck, he simply removed the chuck-and-bowl assembly from the lathe and affixed an adapter to the chuck. He then threaded the chuck onto the tailstock spindle. Presto ... immediate centering! From this point, he moved the tailstock down the bed of the lathe so that the inside of the bowl made contact with the vacuum cylinder. He opened the valve on the vacuum system, which attached the bowl on the headstock. It was centered! John removed the chuck from the back of the plate, and the result was complete access to turn the bottom of the bowl.

Critical Components: There are several critical components (above) to this chucking system: a vacuum pump and regulator, a rotary adapter and air hose and the vacuum cylinders. Complete packages are available, or the parts can be purchased separately.



Properly centering a bowl on a vacuum chuck can be a bit of a trick. Oneway developed a system where you mount the chuck on which you turned the bowl to the tail stock. Put the vacuum chuck in place, then slide the tailstock and bowl down the ways until the bowl contacts the vacuum chuck — it's centered. See photo sequence next page.

Oneway's six-step locator system provides turners with a fail-proof method for keeping their work centered while transferring it to a vacuum chuck.

Try It with a Sphere

John turns a number of spheres of various sizes. Previous to acquiring a vacuum chucking system, he hand sanded the ends where they were last attached to the lathe. With the task of hand sanding eliminated, the time it takes John to make and finish a sphere is dramatically reduced. Simply turn a sphere between centers (or by using a variety of other methods). Remove it from the lathe and attach it to a vacuum cylinder. Centering a sphere is a cinch. Because it's already basically round, it self-centers. You can now make finishing cuts and sand the entire ball.

Touching Up Your Bowl

John travels to a number of craft fairs throughout the summer season, and invariably a finished bowl or plate will get scratched. Touchup is easy with the bowl attached to the vacuum chuck. Select a cylinder that's appropriate to the size of the object, then turn on the system so that it will hold the bowl but not hold it too tightly. Move the object around slightly to get it centered. You might have to turn on your lathe to a slow speed to accomplish this.

Once the object is centered, you can lightly sand the surface to repair the damage. Blend the sanded area with the finished area. Reapply finish, either on or off the lathe.

Vacuum Chuck Cylinders

Cylinders in a variety of sizes for your vacuum system can be made from PVC pipe and O-rings, foam, chamois, or a used mousepad. Attach the PVC pipe to a backing board which can be made from any type of lumber, even MDF. If you use foam, don't use a porous foam, as that will make the chucks too spongy, and they won't hold.

John keeps his cylinders stored with the neoprene side down to avoid the neoprene separating from the cylinder. This neoprene will have to be occasionally replaced, as it doesn't hold up forever with continued use.

Various Considerations

John has an internal filter in his pump, helpful for keeping dust out of the system. Most homemade systems have in-line filter systems. If you are creating a lot of sawdust, you might find it to be a good idea to install an in-line filter, even if you have an internal filter on your pump.

A vacuum chuck works by

Once the bowl is properly centered onto the vacuum chuck, the next step is to engage the vacuum pump and then release the original chuck — the bowl is now ready to have its base completed.

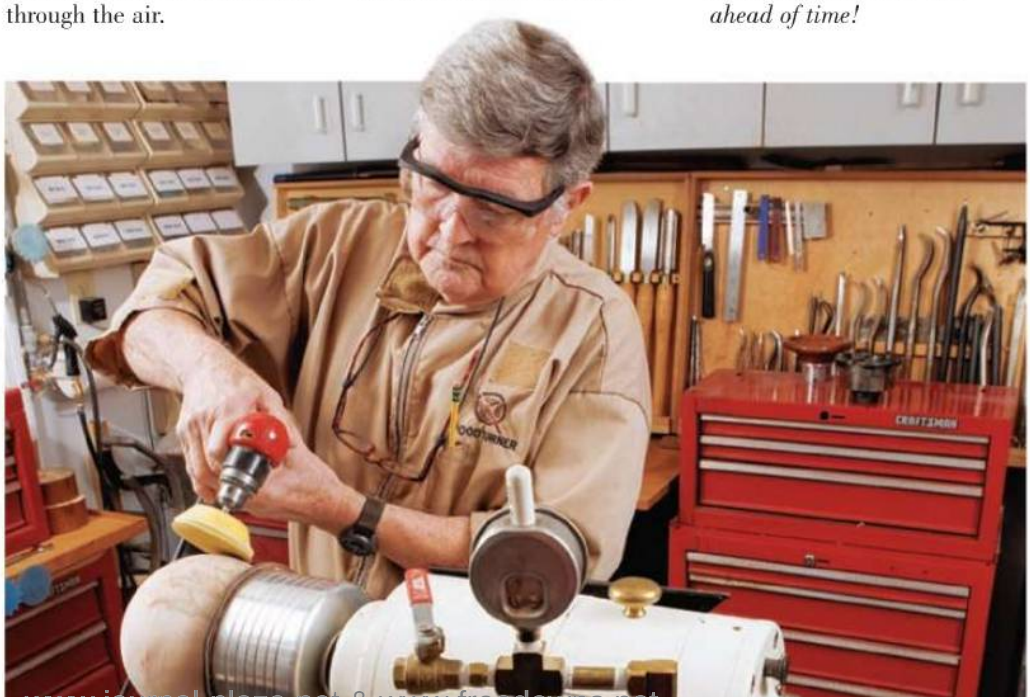
removing the air inside the bowl or vessel. Then the air pressure outside pushes the turned object onto the cylinder. Since air pressure varies in different parts of the world and with different weather conditions, the amount of pressure you'll need will vary. In general, manufacturers call for about 20 to 25 PSI on the gauge, but you'll most likely discover that the amount you need will vary within a greater range than that.

Having something fly off the lathe from a vacuum chuck is, for the most part, not particularly dangerous to the operator, but it certainly could cause the object to be damaged. A more worrisome problem would be a vessel imploding from too much air pressure. If that happens, the bowl could disintegrate with pieces flying everywhere. As with all woodturning operations, wear a faceshield!

Larger objects attached with a vacuum chuck are actually more safely held than small objects. This is somewhat counterintuitive, but it has to do with the amount of vacuum pressure required to hold small objects: the smaller the object, the more pressure it takes to hold the piece in place. If an object is small and thin, that's a potential recipe for a cracked vessel or parts flying through the air.

If you are going to make your own vacuum system, be aware that you could end up with something that doesn't work and in the end costs more than a commercial system. Do your research first on vacuum systems and the requirements for holding objects onto a lathe. With that said, however, I realize that many readers enjoy making and tinkering with new devices. If that's the case, enjoy!

Betty Scarpino's only vacuum is the one she does not use regularly to clean her house. All visitors must call way ahead of time!



Vacuum chucks make sanding a sphere a much easier operation. Because they are spheres, they are virtually self-centering.

Arts & Crafts

Inspired by the designs of Gustav Stickley, this blanket chest is made from quartersawn white oak. The piece is constructed using frame and panel techniques — with a twist, or should we say, with a curve.

Blanket Chest

By Frank Grant

Solomon, who was acclaimed as the wisest man to ever live, is famous for saying that "There is nothing new under the sun." Who knew that the ancient king was a woodworker? (He may have even been a fan of the Art & Crafts style — it seems like it has been around for at least that long.) So I was really intrigued when editor in chief Rob Johnstone asked me if I wanted to help his staff at the *Journal* work out a design for an Arts & Crafts blanket chest that would include a couple of twists. After all, the style is well-established ... what sort of twists could he have in mind? Some aspects of the project were not at all a departure from the Arts & Crafts genre: its quartersawn white oak lumber is strictly Stickley in its origin. We also worked out a stain and finish that closely mimicked existing Stickley finishes. (See *Finishing Thoughts*, page 72.) The exposed breadboard end joints are a step away from traditional Stickley construction — although the concept of exposed joinery is right in the Arts & Crafts sweet spot. The "corner posts" are one area where we took our own path. In an early 1900s piece, these posts would have been full thickness chunks of wood — we chose to miter 3/4" stock to create the look of a solid leg. You might think that the arched cathedral panels were a bit of extracurricular design, but you would be wrong. That look is pure Stickley — but how we went about constructing those panels with their adjacent curved stiles is a 21st century take on the look. As a result of our design process and decisions, I think this blanket chest not only turned out to be a solid representation of the Arts & Crafts style, but a really fun project to build.

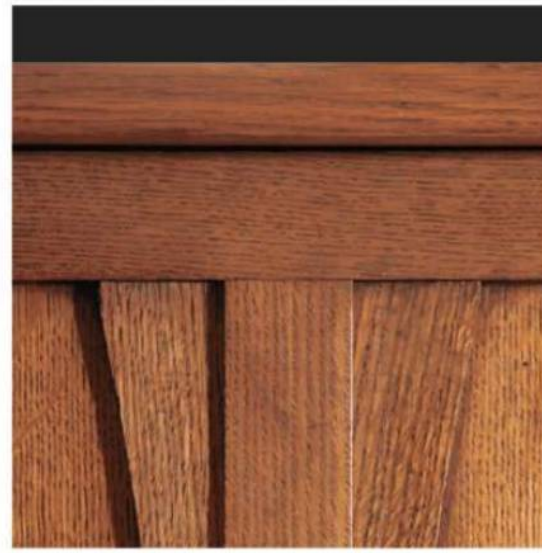
It Starts with the Wood

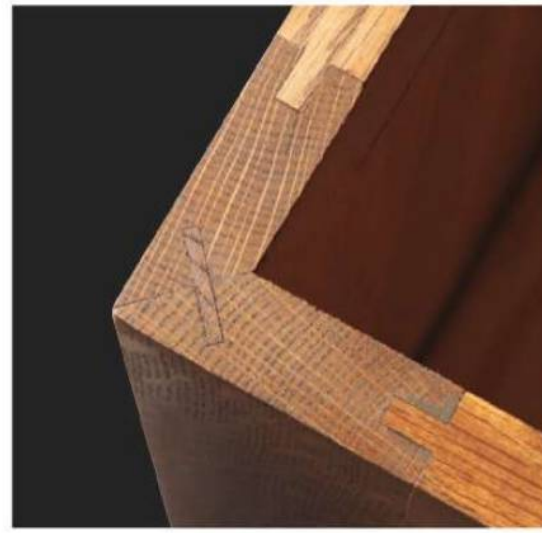
While you might just possibly be able to get away with cherry lumber for this project, the choice of quartersawn white oak lumber is absolutely the way to go. And be certain to select your stock so that its figure is shown off to its best advantage. All quartersawn stock does not display equally. Some has regular straight grain without many medullary rays — but other boards show off the classic quartersawn flake (the rays mentioned earlier) with serious flair. Work out in advance where you want each type of grain to be most prevalent. I wanted the dramatic flake to be most visible on the book-matched flat panels and in the aforementioned corner posts. One of the big advantages of building up the posts is that I was able to show quartersawn figure on both exposed faces of the posts.

The whole of the chest is made, or resawn from, 3/4" stock. The significant exception to this is the lid, which is formed from 1¼" stock. There are a couple of lid supports that hold the top in an open position, and I chose solid brass butt hinges to attach the top to the chest, although other options would have been fine (see the hinge sidebar on page 33). One important note: As this chest is configured here, this is not a toy box. The lid is heavy, and the hinges and lid supports do little to hold back the momentum of the top when closing. Little children and this chest should not mix.

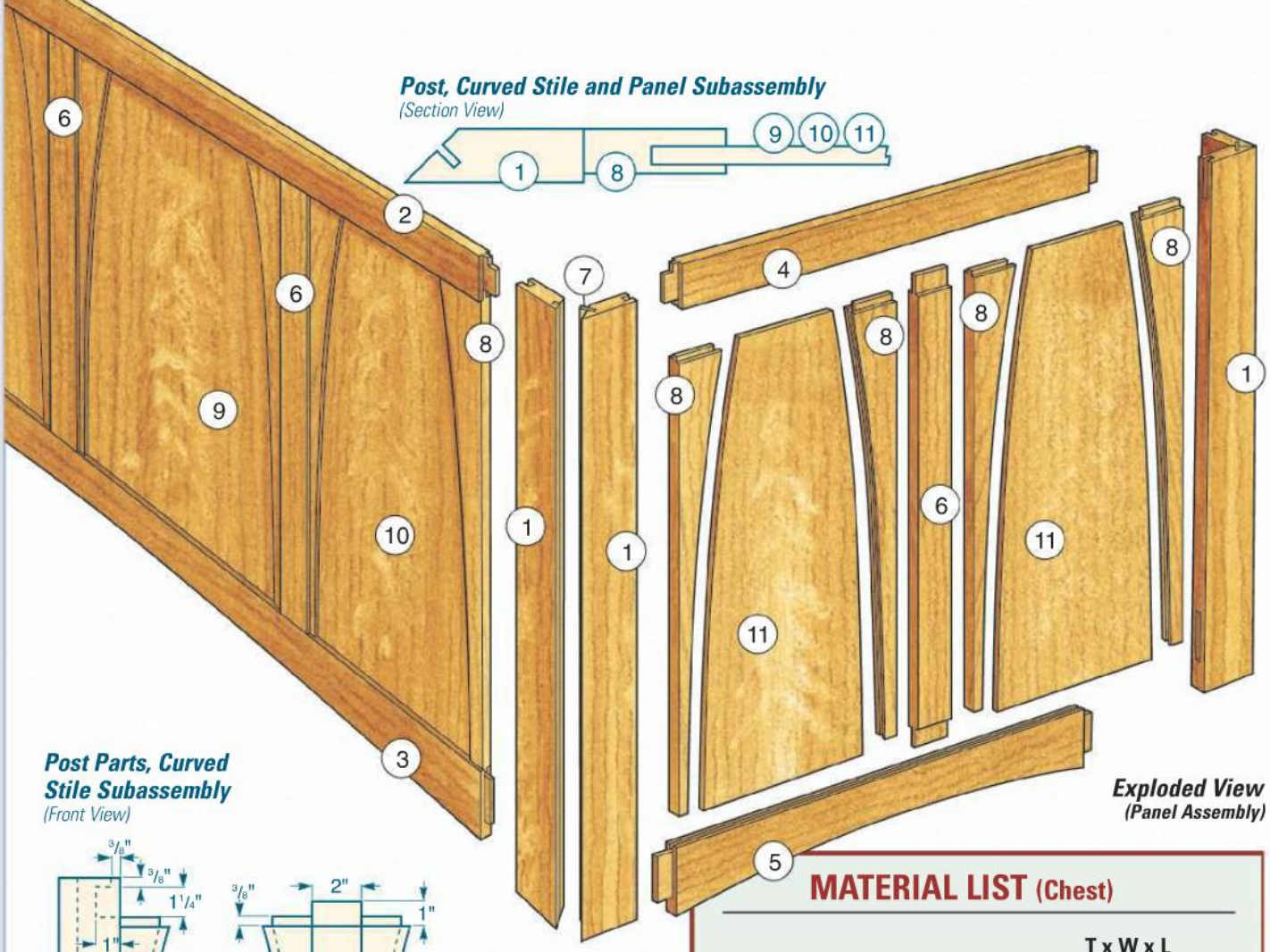
Frame and Panel and Then Some

This chest is constructed using frame and panel joinery and, in that regard, it is pretty much bread-and-butter woodworking. Where it starts to get a bit tricky is that some of the rails are curved, and that means the panels must match that shape. But before you have to worry about that, you need to start with the posts and rails. Start by cutting the post parts to width and length from prepared stock (pieces 1).



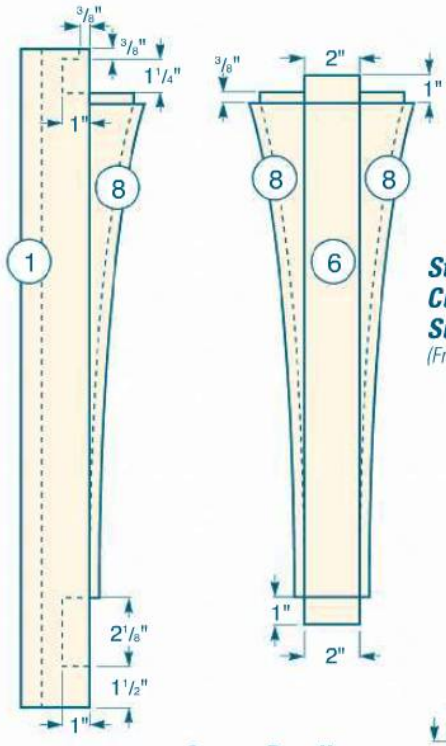


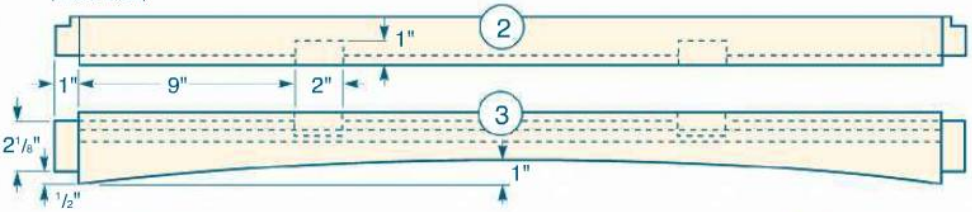
Frame and panel construction, splined miter corners and ultra-traditional breadboard ends are details that combine to create a significant woodworking project.

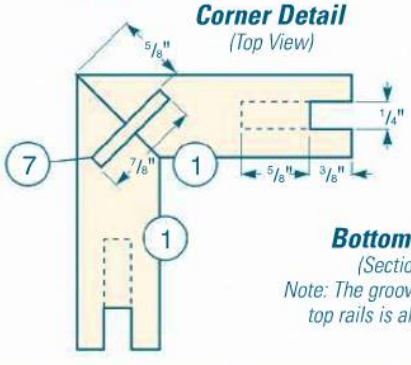


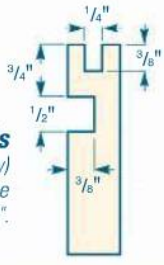
MATERIAL LIST (Chest)

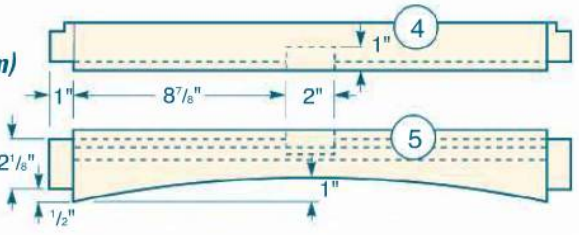
		T x W x L
1	Post Parts (8)	3/4" x 2½" x 24"
2	Front and Back Top Rails (2)	3/4" x 2" x 37¾"
3	Front and Back Bottom Rails (2)	3/4" x 3" x 37¾"
4	Side Top Rails (2)	3/4" x 2" x 21¾"
5	Side Bottom Rails (2)	3/4" x 3" x 21¾"
6	Straight Stiles (6)	3/4" x 2" x 20"
7	Splines (4)	1/8" x 7/8" x 24"
8	Curved Stiles (20)	5/8" x 2" x 18⅜"
9	Front and Back Center Panels (2)	1/4" x 14" x 18¾"
10	Front and Back Outer Panels (4)	1/4" x 9" x 18¾"
11	Side Panels (4)	1/4" x 8⅞" x 18¾"
12	Bottom (1)	1/2" x 24" x 40¼"





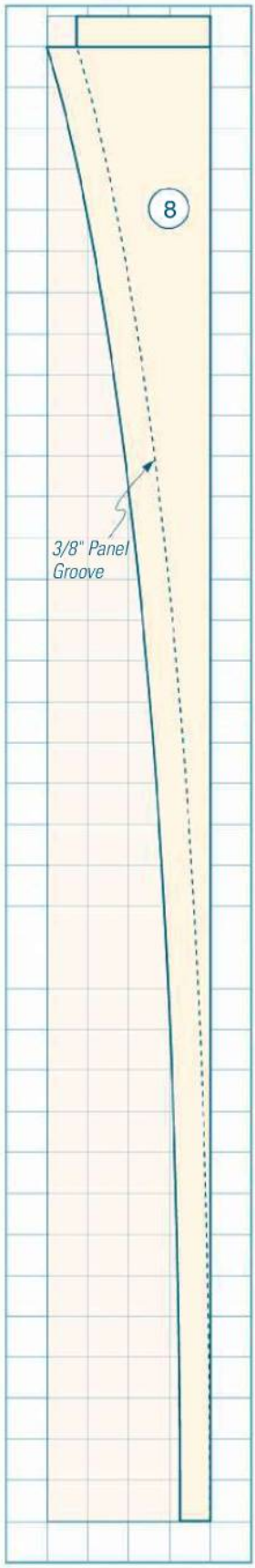






Curved Stiles
(Front View)

Use this curved profile to create a routing template. Note: Waste is removed after curved stiles are glued to posts and straight stiles (pieces 1 and 6)



NOTE: Each square equals 1/2".

"You might think that the arched cathedral panels were a bit of extracurricular design, but you would be wrong. That look is pure Stickley ..."

When you use solid hardwood like this, it is a good idea to get it into your shop a week or so before you start to work it. That lets it settle into the environment and stabilize. Now that you've started selecting and cutting out the frame pieces, go ahead and machine all the rectilinear rails and stiles to length and width (pieces 2 though 6). Although it is easy to get into a routine when cutting these pieces, take time to select the appropriate figured wood for each of these parts and to mark them to indicate their position on the blanket chest. In an additional bit of machining, all of the bottom rails have a gentle curve scribed and cut on their lower edge. I used a thin flexible piece of wood, which I flexed using a long pipe clamp. I traced the curve onto one of the front and back bottom rails and a complementary curve form in the same basic manner onto one of the bottom side rails. Then I stepped up to the band saw and sliced the curve onto the rails. After I had trued up the shapes using a sander, plane and a bunch of elbow grease, I transferred that shape onto the remaining two rails and repeated the procedure.

The post parts also need a bit of machining. In addition to the groove on one long edge, they are mitered along the other edge (see the *Drawings* for con-

Form the mitered edge on one long edge of the post parts. Once that has been done, you can set up the table saw to cut a spline groove into the mitered edge of the piece. This spline setup will be very useful as you assemble the various subassemblies later on.

struction details) and then have a spline groove cut into the mating edges. (The splines will help a great deal when you align the post parts during glue-up.) All of this is done on the table saw. (See the photos on the previous page.) Once you have the spline grooves cut, go ahead and cut the splines (pieces 7) and fit them to the spline grooves. The post parts also have stopped grooves plowed, top and bottom — see the *Drawings* for details — that are 1/4" wide and 3/8" deep. I formed these on my router table with a 1/4" straight bit.

Mortise and Tenons

The next step to consider is machining the various mortises and tenons on the stiles and rails and post parts. It is my habit to form the mortises first, so that I can fit the tenons to match them. First, I carefully marked where each mortise was to be cut. My technique is to clamp the stock that I will be machining between two pieces of wood in my bench vise. In this case, I used a plunge router with a 1/4" straight bit chucked into the collet. After setting the cutting depth on the router (I like the depth to be slightly greater than the length of the tenons), I use an edge guide attachment to locate the placement of the mortise. (See the top photo, left.) I highly recommend testing your setup on scrap material. When you are pleased with your setup, go ahead and form the mortises. I square up my mortises with a sharp bench chisel.

To help form the tenons on the ends of the straight stiles, I made a simple little jig that slides over the fence on my table saw. It is made from MDF and is sort of H-shaped (center photo, left). The upright

The author forms the mortise and tenons by using a plunge router with an edge guide attachment (top photo).

The tenons are then raised by using a shop-made tenoning jig (middle photo).

The tenon shoulders are formed using the miter gauge with a small auxiliary fence attached (bottom photo).

stop on the long side holds the stiles square to the table saw blade. Clamp the stile in place and you can start the tenons with just one cut per side. (If you own a factory-made tenoning jig for your table saw, it will do nicely as well.) Set up and test your cuts with properly sized scrap lumber. When you have the cuts dialed in, cut all the cheeks and then move on to the shoulders. The shoulders are formed using the miter gauge on the table saw as shown in the bottom photo at left. Be sure to use a hold-off block to be safe. Cut the shoulders and set them aside.

Curved Stiles

The most striking visual aspects of this chest are the arched stiles and panels. The most complicated joinery on the project is fitting those two components to each other. If you've read any of my previous articles, you probably already know that pattern routing is going to be the key to solving this conundrum.

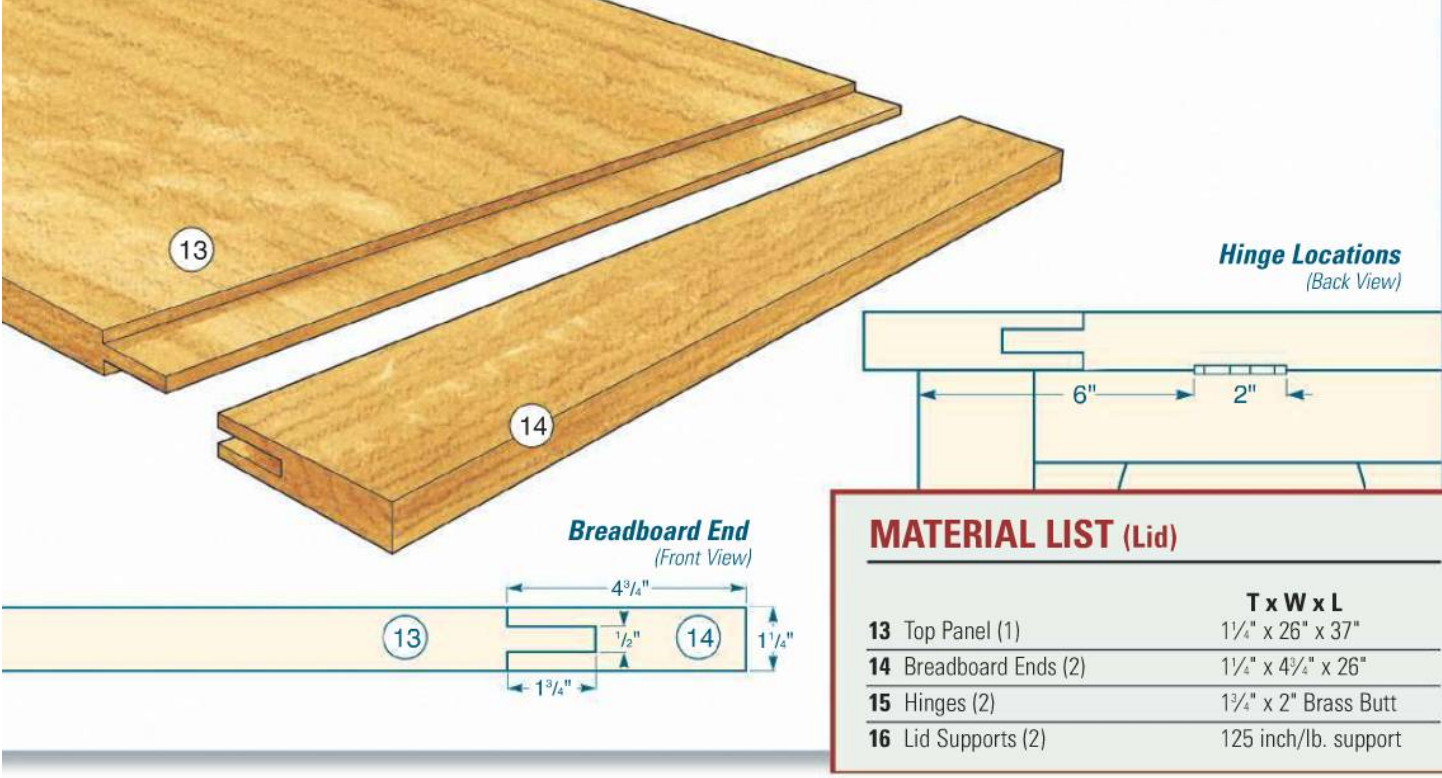
Begin this process by cutting the curved stile blanks to size (pieces 8). I selected stock that had a similar grain pattern for all these parts, and I recommend that you do the same. Next use the gridded pattern found in the scaled *Drawing* on page 29 to form a template for the curved edge on the stile from 1/4" hardboard or MDF. Take care to keep this curve fair and true, because you will be routing that shape onto all the curved stiles. Before you start cutting the shape onto them, you will need to glue the curved stile blanks into their common straight stiles (it is a simple butt joint ... see the *Drawings* for details). Once those subassemblies are done, trace the curved line onto the curved stiles using the template you made earlier. When you've got all the parts properly marked, go back to your band saw and rough out the shape. Stay just outside of the pencil line as you make your cut. The less material you need to trim while pattern routing, the easier that task will be.

As you can see in the photo at right, I used a pattern routing bit (bearing at the end of the bit) in my router table to machine the curved stiles to their final shape. Attach the template to the workpieces with double sided carpet tape. In cases like this, where you are removing just a small amount of material and where any tearout will be a disaster, I use a climb cut to do the deed. It can be a little bit hairy, but in this case it is the way to go. Take your time and machine all the curved stile subassemblies, then set them aside for now.

In order to make the book-matched flat panels (pieces 9 - 11) at the center of each of the frame sections, you will need to resaw 3/4" stock and machine it down to a final thickness of 1/4". I resaw wide panels in a two-step process that I think adds some control. First, I cut kerfs into the edges of the board on my table saw (photo, next page). Then I step to the band saw and complete the cut. The saw kerfs make it much easier to keep the band saw blade perfectly on track. It works really slick. When the pieces are all resawn, I mark them so that I don't mismatch them later on, and then take them to the planer to remove the saw marks, surfacing them to just a bit thicker than their finished dimension. With great care, edge glue these pieces together with their mates.

While the glue cures, grab some 1/4" MDF or hardboard. Lay out and make full-size templates of all three flat panels. Once again, the curves must be fair and true. That curve is the reciprocal shape that you made on the curved stile template. Use that template to make the lines on your panel templates. Go ahead and cut the template to the rough

Here the author uses a template and a pattern routing bit to accurately shape the curved stile pieces. These curved shapes must be made to exacting detail.



MATERIAL LIST (Lid)

		T x W x L
13	Top Panel (1)	1¼" x 26" x 37"
14	Breadboard Ends (2)	1¼" x 4¾" x 26"
15	Hinges (2)	1¾" x 2" Brass Butt
16	Lid Supports (2)	125 inch/lb. support

shape and then use a combination of a sander and a file to get the shape just right. (You could just make one template and use it to make all the curved pattern cuts, but I found it easier to have one for each of the panels.)

Take the glued-up panels out of their clamps and clean up the glue line. Surface the panels to their final thickness — I used a hand plane for this task. When all the panels are ready, mark the curved lines onto them using your templates as a guide. Now, step back to the band saw and do some careful cutting as you rough out the shapes on the panels. This is exacting work — cut close to the line, but not into it. With that task behind you, take your pile of pieces over to the router table and pattern rout the final edges onto the panels. Once again, I used carpet tape to adhere the templates to the workpieces, and used a climb cut to avoid tearout. When you are done shaping the panels, go ahead and give them a final sanding — I went up to 180-grit.

Now that the panels are basically done, you can cut grooves into the edges of the curved stiles. I used a bearing-guided slot-cutting bit on my router table to plow those grooves. I needed to make two cuts per groove, so I was able to control the fit just as I wanted it (see the *Drawings* for the groove details).

Frame and Panel Subassemblies

I won't sugarcoat this: the dry fitting stage of this project might be a bit trying. There are a lot of parts, and some of them are curved. But at the end of the day, you just need to fit and adjust the pieces like any other frame and panel project.

Dry fit the front and back as well as the side components. When they fit properly, glue them up in subassemblies of a front and back, and side panels. Once these are ready, take them out of the clamps and set up a dado cut that will capture the bottom (piece 12) on all four subassemblies. Plow the dado, cut out the bottom and, once again, do a test fit of all these components. These are big pieces, so an extra set of hands may be of help here. I took the time at this point to pre-finish the flat panels. They are going to float in their housings, so I wanted no stain line to show if and when they shrank a bit. When everything is ready, assemble the pieces using the splines in the corners to help align the miters. Check for square, and allow the glue to cure.

The author uses a thin kerf saw blade to start the resawing process. After both saw kerfs have been formed in the board, the author switches to a band saw to complete the resawing effort. The two existing saw kerfs help keep the band saw blade aligned during the cut.

"I won't sugarcoat this: the dry fitting stage of this project might be a bit trying. But at the end of the day, you just need to fit and adjust the pieces like any other frame and panel project."

Topping it Off

With the case in clamps, you can move on to building the lid. Made from 1¼" thick lumber, it is a fitting crown for a substantial piece of furniture. I glued up the top panel (piece 13) and once again chose to flatten the piece using my bench plane. I cut it to overall dimensions and then formed the tongues using a router and a straightedge. Next, I machined up the two breadboard ends (pieces 14) from the same thickness of stock. I plowed the deep grooves to accept the tongues using just a full kerf table saw blade and multiple cuts. I nibbled away at the opening and kept it centered by flipping the piece end for end with each operation ... making two cuts per effort. When I was satisfied with the fit, I glued the breadboard ends onto the top panel. Look to the *Drawings* for the machining details for these joints.

With the components of the blanket chest completed, I started in on my final sanding and applying the finish. A case this large and with as many different levels (or planes) to deal with means that you really must be methodical in your sanding procedure. I worked from the "highest" to lowest plane as I sanded the piece. I also worked around the perimeter in a set pattern — all this just to help me be sure that I got every piece and aspect smoothed exactly the same. For more discussion of the finish we chose and how it is applied to this project, turn to *Finishing Thoughts* on page 72.

After the finish had cured, I mounted the lid to the case with three solid brass butt hinges. Because the lid is so heavy, I felt it was important to add some good quality lid supports to the mix.

I hope that you take the opportunity to build this blanket chest. It is a sweet little project that nicely evokes the heart of Arts & Crafts style. While there are a couple of challenging details, nothing here is so complex as to move beyond just plain woodworking. Which, in itself, is what makes the Arts & Crafts style so appealing.

Frank Grant is a professional woodworker from Minneapolis, Minnesota. He regularly contributes to the Woodworker's Journal.

In line with historical norms, this project has a thick, very heavy lid. To make it as safe as possible, we recommend heavy-duty lid supports. Rockler.com has a pair that will work well. Order items #26203 and #26179 (left and right lid supports).

Hinges in the Mix

Choosing hardware for a project is often an arm-wrestle between style and function. In the case of this chest, Rob and I debated about using Rockler's new Lid-Stay Torsion Hinges, because they allow nearly any size lid to open smoothly and stay open without additional support hardware. If we had gone that route, the Rustic Bronze color could have worked. Instead, we decided to go with more classic hardware styling for this period piece, to keep it closer to its Arts & Crafts roots: three antique brass butt hinges and a pair of matching lid supports. You could also use a piano hinge or even no-mortise hinges to keep things really simple.

Whatever style of hinges suits your fancy, keep in mind that, at 1¼" thick, this is a very heavy lid. You'll need some sturdy means of stopping the lid when it's fully opened or to help slow it down during closing. Rockler sells a variety of lid support options. Buy a pair that are rated for around 125-inch/lbs. of support each to play it safe. Pinched skin and fingers is nobody's idea of a good time!

Multi-sleeve Rolling Pin

By Ralph Bagnall

When our author's lathe broke down during this project, he was undeterred. The jig that he came up with as a workaround is one of the more fascinating projects we've featured in our pages!

Back before you could buy one of those fancy and expensive pasta machines for your home, cooks used a simple set of specialty rolling pins for the same purpose. A traditional smooth-bodied roller was used for rolling out the dough, then rollers with various sized grooves were rolled through the flattened dough, cutting it into strips that became pasta! For this project, I decided to create a roller core that can share three or more sleeves. One is for rolling, and the rest are for forming the various sized strips of pasta.

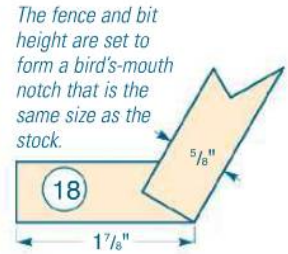
Then, just as I got "rolling" on this project, my lathe decided to go on strike! Most of us would agree that woodworking is a proving ground of the old saying, "necessity is the mother of invention." That is what drove me to create my rolling pin jig. I managed to mill the sleeves round, cut the grooves and even make the handles with a table saw, router and this new jig. In the next few pages, I'll show you how it is done and, along the way, I'll introduce you to the bird's-mouth router bit and teach you how to make large diameter dowels on the router table.

Fashioning the Sleeve Blanks

Everything in this project is determined by the size of the rolling pin sleeves, so they need to be made first. Six segments (pieces 18) form a hexagon that gets milled round in the jig later (top inset photo, next page). Mill your stock flat and straight. Remember that you are making three sleeves, so you need 18 pieces for your three-roller set. You will certainly want to make up a few extras for setups. My sleeves were to be 9½" long, so I cut 20 pieces a bit long — 10".

I set up the bird's-mouth bit in the router table. Into one edge of the piece, this ingenious bit cuts an angled notch, which mates with the square end of the next, forming a 60° angle. Setting the bit is not difficult: the top part of the notch should be 5/8" long (the same as the thickness of the end it mates with, as shown in the photos and illustration at the top of the next page). The peaks of the hexagon will get milled off, so the joint only needs to be close. Mill one long edge of each part, then dry-fit them together.

A bird's-mouth bit in the router table (left) forms the necessary cutouts to join six sleeve segments into hexagonal blanks. Glue them together using rubber bands as clamps (first inset). Crosscut them to rough length after the glue dries (second inset).



The width determines the overall diameter of the finished sleeve, which should end up just about 3" at the smallest point. Spread glue into the notches and assemble them. For clamping, I used several rubber bands wrapped around the assembly (first inset, above). After they are done drying, trim off the ends, but leave them a bit long (second inset, above).

Creating the Core

The sleeves you just made will slip over a core that also holds the handles. Since the interiors of the sleeves are hexagonal, the core needs to be as well. It also needs a hole through the center to house one of the threaded rods (piece 19). Rather than try and drill a straight hole through the core, I made it in two parts (pieces 20), with a groove along the center of each. Carefully measure the inside of the sleeve along the widest point. That is the overall width of the core halves, with the thickness being half the small width of the sleeve. Mill the groove (see the *Core Half Drawing* on page 39) down the center of both halves. Then set the bevel angle on the saw to a 30° tilt, and bevel each long edge of the blanks (photo at right). Test the fit inside the sleeve before gluing these pieces up (inset photo at right), and be sure to err on the side of too large. Later, you can joint the faces of the core to adjust the fit.

The rolling pin's core consists of two half hexagons with a groove milled along their lengths to house a threaded rod (above). These cores must fit the sleeve interiors snugly (right).

Routing the HDPE End Caps

The end caps (pieces 21) keep the sleeves in place on the core. I milled them from 1/2" HDPE (high density polyethylene). Inexpensive plastic cutting boards are a great source for this material. I drilled a 1/4" pilot hole in the plastic, then used a router and trammel to cut a circular groove halfway through the plastic. The inner ring formed this way (bottom photo, right) was cut to fit close inside the sleeve. I then reset the trammel and cut their overall 2⅞" diameters.

The author used a small trammel and straight bit to mill the round end caps from HDPE plastic. The trammel's center pin seats in 1/4" pilot holes, which also form through holes for the threaded rod.

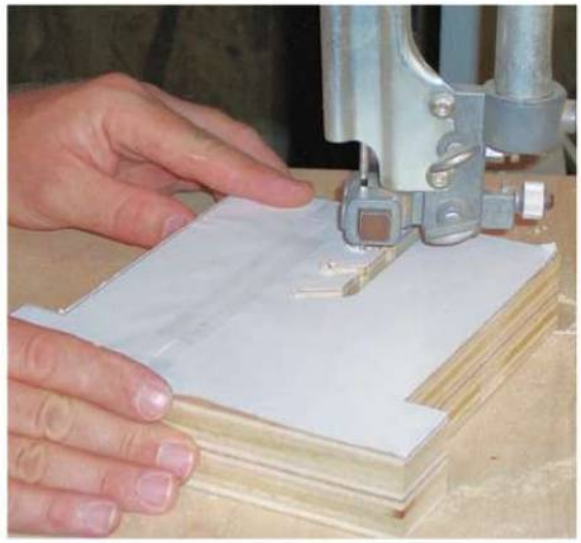
Assembling the Jig Box

The trick to milling the hexagonal sleeves round is a box-style jig. It holds the core and sleeve assembly so it can be turned underneath a router bit. On top of the box, a sliding plate guides the router back and forth along the length of the box. Although I only needed one point to turn the rolling pin under the router, I made the ends with slots at three levels so I could use the jig for other projects with different diameters (see *Drawings*, next page). The ends (pieces 1) are cut to size and notched for the sides. To make the slots, I used a 1/4" drill bit at the endpoints and I cut the slots at the band saw (top photo). I then cut the sides (pieces 2) to length. Assemble the jig with glue and screws, and add the clamping blocks (pieces 3).

Building the Router Slide

The router slides across the top of the jig box on a custom base. It needs to slide easily but be snug enough to not shift, spoiling the grooves during milling. I used 1/2" Baltic birch for the base and attached a fixed fence to one side (pieces 4 and 5). To keep it snug, I attached a spring-loaded fence (piece 6) to the other side of the base (center photo). It consists of a base part with offset spacers and face strips to provide a stiff spring action, keeping the slide tracking smoothly (see *Drawing* below).

To be sure that the router is properly centered, I mounted the slide on the jig box and transferred the center lines. Then I drilled the mounting holes and through hole for the router (bottom photo). Bore the through hole large enough so you'll be able to see your work.



The two ends of the jig receive several slots to fix the rod and sleeves for milling. You can gang-cut these at the band saw.

The router slide fits over the top of the jig and is guided by a pair of fixed and spring-loaded fences.

Use the baseplate of your router as a template for positioning it on the slide plate and for drilling mounting screw pilot holes. Bore a through hole in the center for your router bit.

Adding the Indexing System

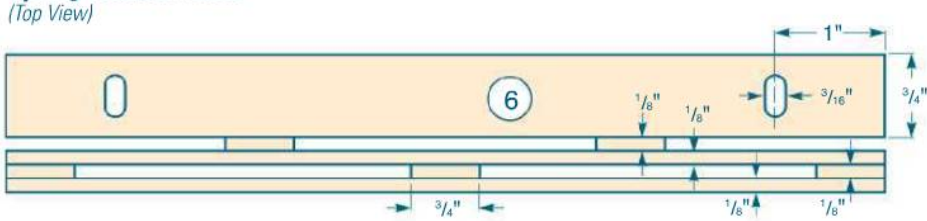
Rounding the hexagonal sleeve is smoother and easier with the router drawn fluidly along the length of the jig. Cutting evenly spaced grooves on the other two sleeves is impossible without an accurate indexing system. Both of these are accomplished using a threaded rod system mounted to the outside of the jig (see *Drawing*, next page).

Fix one of the rods (piece 7) to the jig side with steel angle brackets (pieces 8). The outer hole in the bracket is drilled out to 1/4". Set jamb nuts and washers (pieces 9 and 10) to either side of the bracket so that the threaded rod does not slide side to side. Add a cross dowel (piece 11) between the brackets to connect the slide to the indexing rod, and fabricate the small crank (pieces 12, 13 and 14) for the end. Use two nuts tightened against one another (top left photo, next page) anywhere the nuts must stay tight.

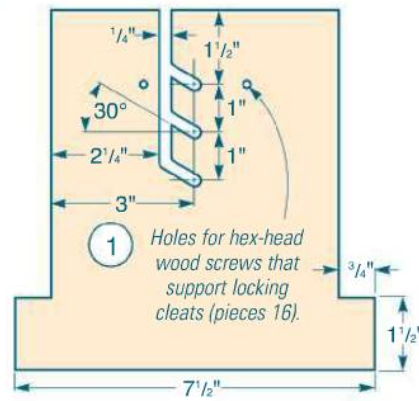
Drill a hole into the bottom of the cross dowel bracket (piece 15) of the slide plate. The cross dowel fits into this hole, allowing the indexing system to move the slide back and forth (top center photo, next page).

The last pieces of the jig to add are a pair of locking cleats (pieces 16) as shown in the top right photo, next page. The assembly will be mounted on a threaded rod resting in one of the slots at the ends of the jig box. You'll fix these locking cleats in place on the jig with pairs of hex head wood screws and washers, to trap the rod in its slots.

Spring-loaded Fence
(Top View)

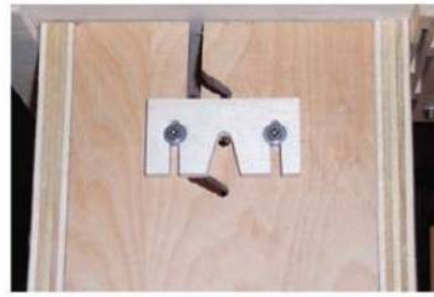


End
(Front View)



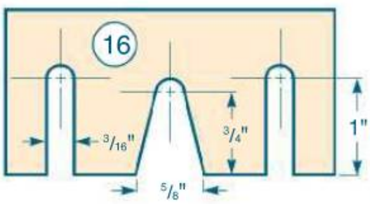
Jamb nuts and washers lock the handle and sleeve blanks on the threaded rod for milling. The whole assembly seats in the jig slots.

A cross dowel nut, engaged in a hole in the cross dowel bracket, moves the router slide back and forth on the indexing rod.

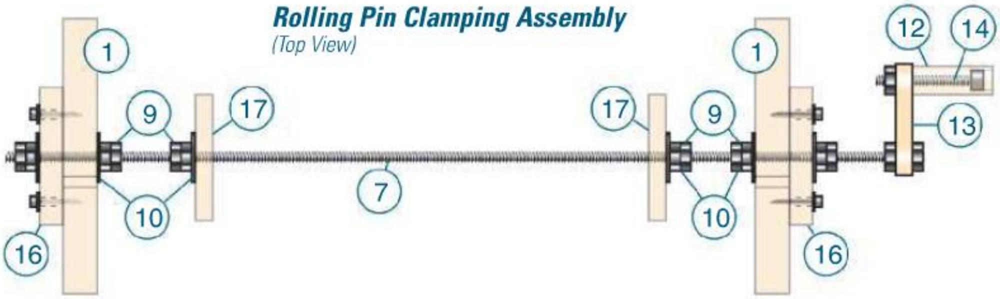


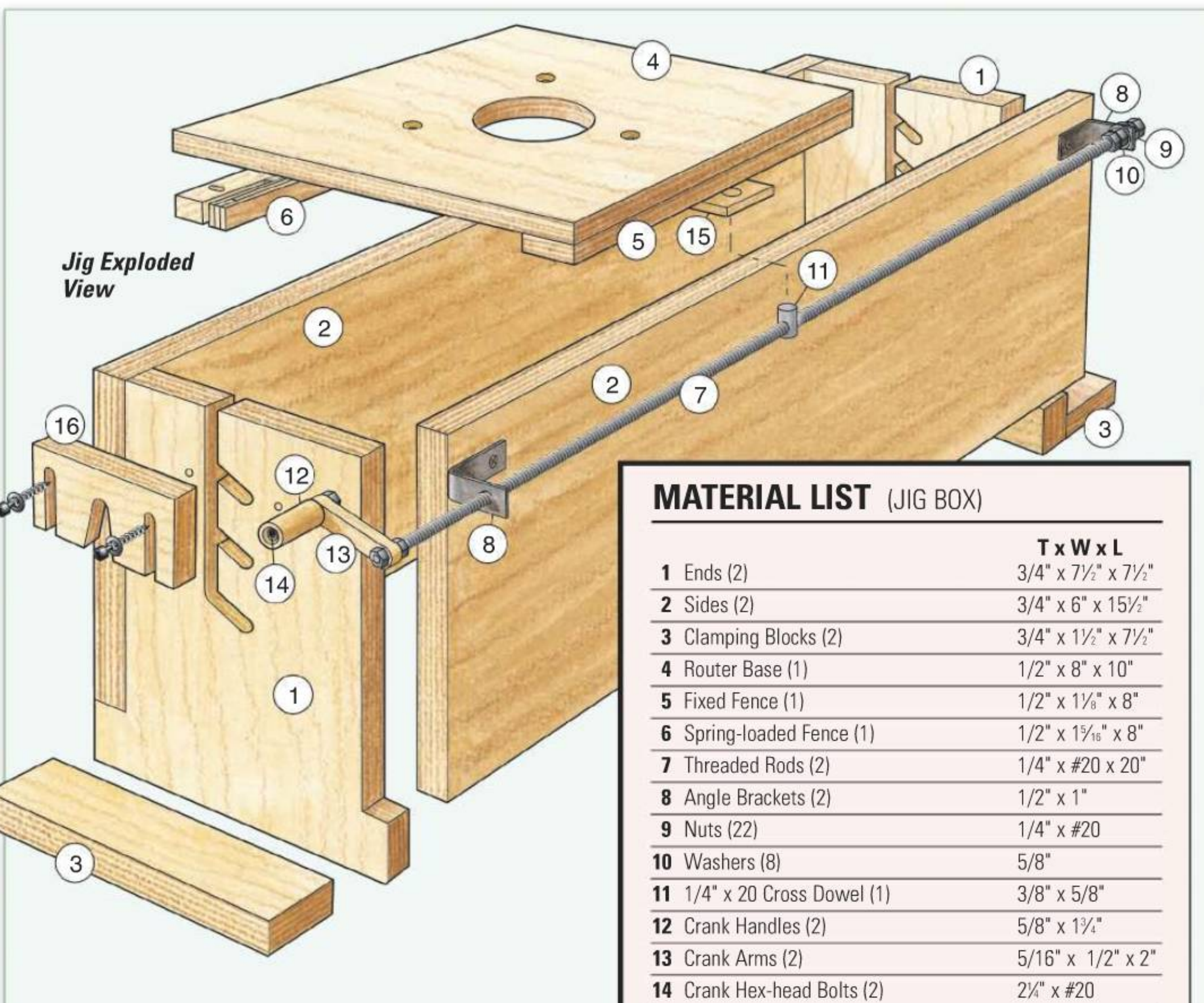
Locking cleats, hex-head wood screws and washers capture the sleeve rod securely in the jig slots during the routing process.

Locking Cleat
(Front View)



Rolling Pin Clamping Assembly
(Top View)

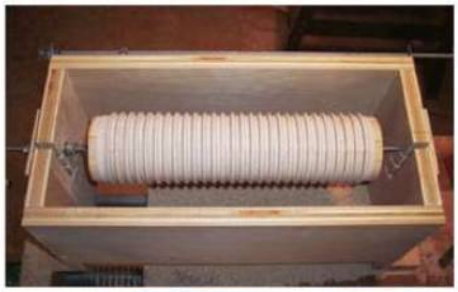




MATERIAL LIST (JIG BOX)

		T x W x L
1	Ends (2)	3/4" x 7½" x 7½"
2	Sides (2)	3/4" x 6" x 15½"
3	Clamping Blocks (2)	3/4" x 1½" x 7½"
4	Router Base (1)	1/2" x 8" x 10"
5	Fixed Fence (1)	1/2" x 1⅛" x 8"
6	Spring-loaded Fence (1)	1/2" x 1 5/16" x 8"
7	Threaded Rods (2)	1/4" x #20 x 20"
8	Angle Brackets (2)	1/2" x 1"
9	Nuts (22)	1/4" x #20
10	Washers (8)	5/8"
11	1/4" x 20 Cross Dowel (1)	3/8" x 5/8"
12	Crank Handles (2)	5/8" x 1¾"
13	Crank Arms (2)	5/16" x 1/2" x 2"
14	Crank Hex-head Bolts (2)	2¼" x #20
15	Cross Dowel Bracket (1)	3/16" x 1" x 1¾"
16	Locking Cleats (2)	1/2" x 1½" x 3"
17	Sleeve Clamp Discs (2)	5/16" x 2¾"

Shaping each sleeve into a cylinder is a process of slowly moving the router slide across the jig while simultaneously turning the sleeve. It's a two-crank operation.



Forming the grooved sleeves involves plunge-routing each groove one at a time, then turning the indexing crank a specific number of turns to set up for the next groove (top and center). You can power-sand all three of the sleeves easily without removing them from the jig (bottom).

"The best bit is a dish carving bit. It has the same smooth cutting properties as the core box, but a wide flat in the center means that the cuts overlap leaving a very smooth finish."

Mounting the Rolling Pin

The second piece of threaded rod, along with two sleeve clamp discs (pieces 17), jamb nuts and washers (see *Rolling Pin Clamping Assembly Drawing* on previous page) are used to hold the rolling pin assembly in the jig for milling. Another crank handle assembly is attached to one end, then sets of jamb nuts and washers are placed at each side of the jig box ends to keep the assembly from moving back and forth. Set the rolling pin in the center of the jig box with the clamp discs and jamb nuts and tighten to keep the assembly from slipping on the threaded rod as you move on to turning it.

Rounding the Sleeves

For rounding, a standard straight cutter can be used, but there are better choices. A round-nose (or core box) bit cuts more smoothly, since the rounded end takes a shallow cut at the edge and deeper toward the center. This really reduces the possibility of tearout. Because of its round tip, the core box bit needs to be moved in small increments to leave a smooth surface behind. The best bit is a dish carving bit. It has the same smooth cutting properties as the core box, but a wide flat in the center means that the cuts overlap, leaving a very smooth finish.

With the rolling pin mounted in the jig, and the router mounted on the slide base, turn the indexing handle until the router is off the end of the sleeve. Plunge the router down and lock it. Only take a shallow cut at first. With the router running, begin slowly turning the rolling pin assembly and the indexing handle at the same time (top photo, left). The router will begin shaving the high spots off the hexagonal sleeve. Do not let go of the rolling pin handle, or the rotating bit will tend to spin it fairly rapidly! Keep moving the slide across the jig evenly until you reach the other end. Then lower the bit and mill back across. Continue this process just until the sleeve is round.

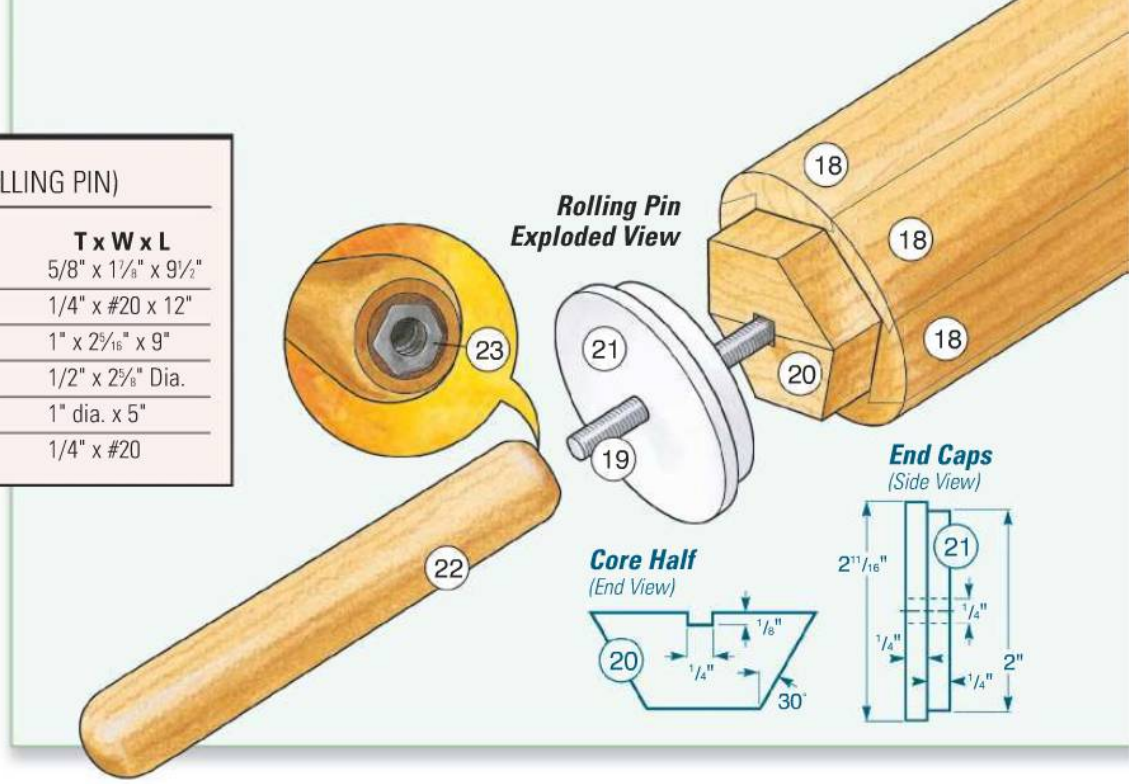
Cutting the Grooves

Obviously, one of the sleeves will be left as a smooth cylinder. The other two get grooved, and the indexing system allows you to cut evenly spaced grooves. The threaded rod has 20 threads per inch, so each full turn of the rod moves the router bit by 0.05". For the narrow strips, we want 1/4" grooves spaced 1/8" apart. So center to center, the bit needs to move 3/8", or 0.375". That means 7½ turns per groove. In order to ensure even ends, mark the center of the sleeve length, and start there. With the router unplugged, plunge the bit down to the surface of the sleeve. Now set the depth stop to 1/8" deep. With the router running, plunge it down slowly as you turn the rolling pin assembly. Be sure to turn the assembly so that the groove is an even depth all the way around (second photo from top). With the center groove done, move the bit over by turning the indexing handle 7½ turns, and start the next groove. Work from the center to one end, then return to the center and work across the other half (second photo from bottom).

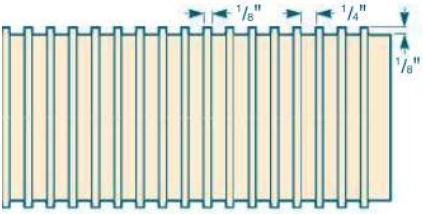
The last sleeve is grooved wider, but the process is the same. I used a 1/2" round-nosed bit and cut no more than 3/16" deep. Center to center, these grooves should be 5/8" apart, or 0.625". This works out to 12½ turns. (In either case, you can actually just do eight or 13 turns and ignore the half, since you will be trimming the ends of the sleeves later, making the grooves even. You can use a small sander to smooth the sleeves while they're still in the jig (bottom photo, left).

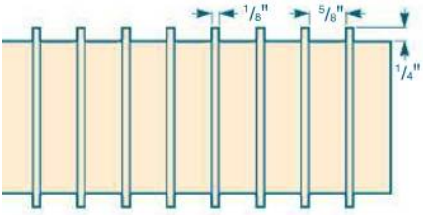
MATERIAL LIST (ROLLING PIN)

		T x W x L
18	Sleeve Segments (18)	5/8" x 1⅞" x 9½"
19	Threaded Rod (1)	1/4" x #20 x 12"
20	Core Halves (2)	1" x 2⅝" x 9"
21	End Caps (2)	1/2" x 2⅝" Dia.
22	Handles (2)	1" dia. x 5"
23	Handle Jamb Nuts (4)	1/4" x #20



Sleeve Grooves
(Front View)





The author milled handles for the rolling pin by routing four 1/2" roundovers into a piece of 1" x 1" stock (top). He then rounded over the ends of each handle with the same bit (bottom).

Shaping the Handles

The last parts to make are the handles (pieces 22). You may be able to find handles at a craft store, or you can buy 3/4" or 1" dowels. I chose to make my own in the shop. I started with a 1" x 1" piece of stock and installed a 1/2" roundover bit in the router table. For safety, I made the stick several inches longer than needed. Leave the ends square and rout the center section only, rounding over all four long edges (top photo, right). Cut the handles 5" long, then round their ends. I used the same setup to do this, but I moved the fence in a little and added a block to rest the handle against as I rolled the end over the bit (bottom photo, right). Then I drilled a 1/4" hole three inches in to each handle, followed by a 1/2" counterbore deep enough to house two jamb nuts (pieces 23).

I finished all of the wood parts with three coats of salad bowl finish, lightly sanding between coats. Wax the core to ensure that the sleeves will slide smoothly on and off.

Final Project Assembly

Trim your three sleeves to final length. Mine were 9½", but it can vary a bit to even out your grooves. All three do need to be the same length. Cut the core section 1/2" shorter, to account for the step in the end caps. Now cut the threaded rod to length (add up the sleeve plus the endcaps, plus three inches for each handle. (In my case, this was 16 inches overall.)

Now thread two nuts onto one end of the threaded rod, about 3" in from the end, and jam them together there. Use epoxy to glue this end of the rod into one of the handles. Wax another scrap of threaded rod, turn two nuts onto it, and epoxy them into the other handle. As the epoxy begins to harden, carefully unscrew the threaded rod from the second handle, leaving the nuts behind, glued in place in the handle. You now have one handle with 13 inches of threaded rod in it, and another with just the nuts embedded in it.

To assemble the rolling pin, slide one end cap down the threaded rod, then the core, one of the sleeves and the other end cap. Thread on the other handle. To change sleeves, simply disassemble the parts, slip the new sleeve in place and replace the endcap and handle.

Use the smooth sleeve to roll out the pasta, then switch to one of the grooved sleeves to cut the pasta into strips. *Bon Appetit*!

Ralph Bagnall, a former CNC salesman, installer and trainer, is a woodworker and shop consultant based in Murfreesboro, Tennessee. His website is www.consultingwoodworker.com.

Built-in Cabinet Makeover

By Rob Johnstone

How do you give an old cabinet a new look and a new life? Some veneer and pre-made doors are part of the answer.

The built-in wall cabinet was perfectly serviceable; well-made, nicely proportioned with subtle touches in its construction that really appealed to the woodworker in me. It had served the families that had lived in my house well, standing as a mute witness to the flow of personal history that is played out in every home — everything from inspired comedy to extreme tragedy. But sadly, the times had passed it by. What had been a very groovy look at the heart of the 1970s was just not making the grade 10 years into this new century. The red oak lumber and plywood, stained dark and varnished and outfitted with stained glass upper door panels, needed to be changed and upgraded, but the question was "how."

As a person who made cabinets for many years, my first inclination was to yank the cabinet out of the wall and build a brand-new one. I could draw up a new design and knock it out in my shop — it would be no problem. Well, there might be just one problem ... where would I find the time to take this task on? My list of "urgent" home maintenance projects was long and not getting any shorter. And, as editor in chief of a woodworking magazine, my schedule is pretty demanding — no help there.

So I decided to try something that I had never done before. I would take advantage of all the various pre-made products on the market: reface the cabinet with veneer, purchase pre-made cabinet doors and hang them with new face frame style European hinges and slap on some new modern-looking pulls. In essence, I would get a brand-new cabinet built around the core of the existing unit.

Starting with the Veneer

The first basic decision I approached was what species of wood did I want to cover the cabinet with ... how did I want it to look? I have been transitioning the cabinetry and woodwork in my living room and dining room area to maple and birch, all finished with a natural clear top coat, so that was my first inclination, but the great thing about considering veneer products is the wide variety of options that are available. In terms of light-colored wood species that would complement my room, there were of course the birch and maple options — but even within those two species there were selections to be made: water white birch, yellow birch, red birch, plainsawn maple, curly maple, fiddleback maple, spalted maple ... well, you get the idea. Add to those species the likes of aspen, cypress, ash — white or black — and the list goes on. And, of course, I am not even considering exotic species that would fall into that same color category.

In the end, despite the variety of selections on the market, by considering all the other components I would need in the makeover, I decided that procuring pre-made maple doors would be easier than finding anigre doors. (Although I did not actually test this theory extensively.) So I settled on run-of-the-mill, plainsawn maple veneer.

The next decision confronting me was what sort of maple veneer product to use. Maple is a highly desired hardwood and, for that reason, you can find maple veneer in several different permutations: the traditional flitch-cut raw veneer, paper-backed veneer sheets and pressure-sensitive peel-and-stick veneer sheets, just to name three options. I went with the paper-

Transformed from an old-school workhorse (left) to a modern-looking showpiece (right), this built-in cabinet has a new lease on life that will last for years to come. The author gave it a 21st century facelift with the use of veneer and pre-made wood products.

After

While making your own custom doors is always an option, a refurbishing project is just the place to try pre-made doors. The author ordered his from *rockler.com*. You must determine the size of the doors, the edge treatment and the panel style (raised, flat, solid, etc.). Doors can also be ordered with an opening for glass panels (as in this project), and glass retaining strips can be specified to come along as well.

Old doors, shelves and the hardware that went with them were removed and set aside to be recycled some day for shop projects and various other non-display uses.

backed veneer sheets, which I purchased in a 48" x 96" size. It allowed me to cut the various strips I needed to size on my table saw, and the paper backing made the strips a bit less fragile to work with. Pressure-sensitive sheets might have been OK, but it is my hope that this makeover will last for the next 40 years or so, and I was concerned that the pressure-sensitive adhesive would just not hold up.

Additional Project Details

I used contact adhesive to apply the veneer to the face frame and other areas. You can choose from water-based contact cement (less odor) or a more traditional solvent-based product. I went with the stinky stuff because I have used it for years in plastic laminate work and have always been pleased with the results. I just kept the work area well ventilated. I applied the veneer to the cabinet's face frame (edges and front face) and to the bottom panel (the floor) of the upper cabinet. When it came to the interior walls and top of the cabinet, I chose to switch to a 1/8" maple plywood to cover the oak. Fitting the rigid 1/8" plywood panels to those interior spaces was much easier than working with the more flexible veneer pieces. In addition, as those of you who have worked with contact cement are aware, if you misalign your glued and prepared veneer by just a little bit and accidentally touch it to the surface, there is nothing you can do about it — it is stuck tight. I was able to handle the 1/8" plywood panels easier and with more accuracy during the glue-up phase, as well as during the dry-fitting phase.

Another important detail in this retrofit was the cabinet "counter" or open display surface. The original cabinet had an odd feature for a dining room cabinet — it had a slide-out breadboard shelf. I got rid of that shelf, but I wanted a horizontal shadow line to break up the look of the piece. In

Mask off the cabinet to protect the paint and walls around the project. It is a good idea to have some touch-up paint ready — just in case there is a sanding or trimming accident. With luck, you won't need to use it.

". . . sadly, the times had passed the old cabinet by. What had been a very groovy look at the heart of the 1970s was just not making the grade 10 years into this new century."

addition, the doors and drawer fronts were changing from standing 3/8" proud of the cabinet face, to a full 3/4" proud. For that reason, I made a solid wood maple "countertop" that fit into the central opening of the cabinet. On that piece, I added a lip that extended by 1" past the face of the cabinet. That solid maple surface will hold up better than veneer over the years, and it looks great.

Two final design and construction details. While I could have swapped the stained glass section of the original upper doors into my new maple doors, I thought it would look too dated. Instead, I chose a non-colored textured glass panel for the upper doors. The reeded glass interacts with ambient room lighting and really adds to the modern feel of the new look.

The last construction detail to determine was what type of hinges to use to hang the doors. For me, self-closing European hinges were the best option. These days, there are versions that mount easily to face frames, so it is just a snap to use them.

Initially, I had thought I would remake the drawers entirely for this project. It would take little time and they would be brand spanking new. But after a bit, I decided to keep the old drawer boxes — for sentimental reasons. They would be a small piece of the old unit that moved into the future. The trick was that the drawer faces were nailed to the drawer boxes. So I used a small sliding jig on my table saw to cut off just the forward 3/8" thick section of the existing fronts. Then I glued and nailed new drawer faces to the remaining section. It worked very well.

Getting Started

To begin this sort of project, the first step is demolition. Remove all the parts that you will not be using going forward (doors, shelves, etc.). Then clean all the surfaces to which you will be applying veneer or some other sort of covering (like my 1/8" maple plywood). I wiped the entire surface with a solvent to remove the years of built-up oils and polishes. In addition to that, I scuffed the surfaces with a good sanding. I didn't worry about removing the existing finish completely, but I did give it a thorough treatment. When I was done with that, I wiped away the sanding particulate with a tack cloth.

Now I was ready to apply the veneer. Approach this with the same methodology that you would plastic laminate work. Cover the narrow (outside) edges of the face frame with veneer first. Apply a coat of the contact cement to the veneer strips and to the edges of the face frame. Allow the contact cement to dry. Carefully place the veneer strips in their proper alignment — you won't get a second chance at this. Stick the veneer to the

Before veneering, clean the cabinet surfaces completely. Follow behind the cleanup with a strong solvent of some sort to remove oils, polishes and years of grime that might interfere with your contact cement.

The author took a power sander to the front surface of the face frame. He did not try to remove the finish completely, but scuffed it up well. Following sanding, he wiped it down with a tack cloth.

After applying the thin strips of maple veneer to the edges of the face frame, the author trimmed them flush to the wide face of the frame. He used both a block plane (above) and a power sander (left) to complete this task.

When applying the paper-backed maple veneer to the wide aspect of the face frame, the author started with the uprights and moved to the horizontal face frame pieces. This mimics traditional face frame joinery.

"As a person who made cabinets for many years, my first inclination was to yank the old cabinet out of the wall and build a brand-new one."

A laminate trimmer is a handy tool for this step of the process. The author followed behind the laminate trimmer by hand sanding the corners where the veneer pieces met.

edges and press it on with a J-roller. That's it ... it is secure and in place. Now trim the edges of the veneer flush to the face of the face frame. I found a block plane, followed by my sander, to be a quick and efficient means to do this. Next, go through the same steps to apply the wider veneer pieces to the front of the face frame. I used a laminate trimmer to clean up those edges, and it worked great. I put the veneer around the perimeter of the face frame first, then I applied the crosspieces. In this way, the components of the veneer mimic the look of traditional stiles and rails seen in face frame construction.

Now it was time to cover the interior faces of the cabinet with the 1/8" maple plywood. I tried a traditional construction adhesive (Liquid Nails®) for securing the panels, but was not happy with the results. I moved back to the contact adhesive and could not have been more pleased. Take a moment to plan the sequence of which plane of the interior compartments you will cover first, second and third ... etc. Trust me, sequencing the panels properly will make a good deal of difference as to which joint lines are most visible. For example, I covered the bottom of the compartment first (I chose to put a piece of paper-backed veneer on the bottom of the compartment rather than the plywood), then the top, and then the back. Next, I put the two side panels in place. It looked very good when I was done.

For the interior of the cabinet, the author switched from paper-backed veneer to 1/8" maple plywood. When faced with interior tight fits, the 1/8" plywood is much easier to manipulate. A couple of test fits, and it was ready to be applied.

In order to reuse the drawer boxes, the author sliced 3/8" off the front of the drawer face on his table saw. He used a basic sliding jig (left inset) to control the cut. The jig has a runner that fits into the miter gauge slot.

New drawer fronts made from 3/4" maple were glued and pin-nailed to the front of the modified drawer boxes. Both drawer fronts were made from one piece of maple lumber so the grain would flow from one to the other.

Doors, Drawers ... Done

I had ordered the doors before I started the whole process so they were ready as soon as I had completed all my veneering work. Right after they arrived, I put a coat of clear sealer on them ... just to keep them from moving on me. I also ordered the glass earlier, but as is my practice, I did not order it until I had the doors in hand and could measure the openings. The upper doors that I chose came with glass retaining strips pre-cut. That was a nice touch. I bored the holes in the doors for the cup hinges, mounted the clips on the face frames and did a test fitting. The drawers were completed, as I mentioned earlier, so all that was left to do was apply the finish. Using a good quality brush, I put two coats of Zinsser® SealCoat™ onto the raw wood. I sanded down the nibs and followed with two wiped-on coats of polyurethane.

That is about it. I installed the glass in the upper doors, hung them and adjusted them evenly. I drilled some holes to mount the hardware ... brushed nickel pulls and some wide drawer handles — and I was done. In the lead "after" photo (page 41), the shelf in the upper compartment is made from solid maple. Having lived with it for a few weeks, I have decided to replace it with a tempered glass shelf. Hmm, maybe this project will take a while to be "absolutely" done. I've been looking at interior shelf lighting lately ...

Rob Johnstone is the editor in chief of the Woodworker's Journal. *He has been a cabinetmaker since childhood but admits that he found cabinet refacing to be kind of fun.*

European-style cup hinges that are specially designed to work in a face frame application were used to hang the pre-made, special-order doors.

The Role of Reveals

By Sandor Nagyszalanczy

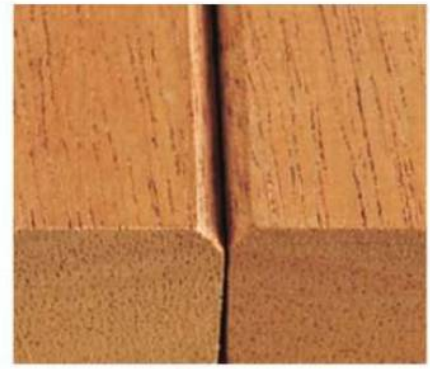
This simple little shadow line can add a lot to the look of your project. Our author takes you through the basics of creating reveals on your furniture and cabinetry.

What the heck is a reveal anyway? Think of the dark lines in between the doors, hood and trunk, fenders and other inter-fitting parts on your car's body. Imagine how difficult it would be to make the body if all those parts had to fit snugly together, leaving no gaps where the doors or trunk lid closed. The tolerances would be very tight and incredibly difficult to maintain. The little gap, known as a reveal, offers automakers a bit of a "fudge factor" (and these days, they need all the help they can get), while creating a clean look in their final products.

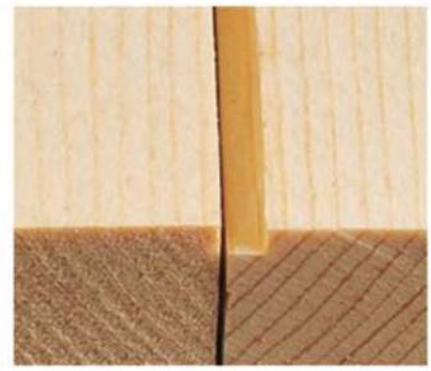
Where can woodworkers put this little detail to use in their work? Pretty much anywhere two parts or surfaces meet. Just as with an auto body, the simple shadow line created by a reveal hides irregularities in the fit between adjacent surfaces; say, for example, the sides of two cabinets that are butted together or between the extension leaves on an expandable dining table top.

Making a reveal is as simple as shaping a shallow rabbet, chamfer, bead or cove on a part's ends or edges. You can cut a reveal with hand tools (planes, scrapers, etc.), with a bit/cutter in a router or shaper, with a dado or molding head in a table saw; or shape it with abrasives using sanding blocks, a powered disc or drum sander, etc.

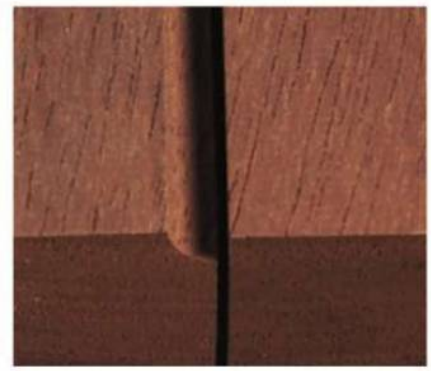
Reveals are commonly used in traditional millwork and cabinet assemblies, to not only conceal slight fit irregularities, but also to give large surfaces a look of greater depth and make them more visually interesting. For example, say you have flush-front drawers in a desk, table, entertainment center or kitchen cabinet counter. By shaping a small reveal on the edges of the solid-wood drawerfronts using a piloted bit in the router, the resulting edge recesses add a nice little shadow line where the drawers meet the face



Chamfer



Rabbet



Cove

The same 1/8"-wide shadow line on each of the samples at right creates a different reveal depending on how it's shaped. In the author's table below, the radiused edge on the breadboard ends adds a lovely reveal — similar to those surrounding and accenting the inset drawer face.

frames, making an otherwise ordinary flat surface look more dimensional.

Another great place to use a reveal is where two parts that fit close together may expand and contract, shift or sag. Consider how the lid of a solid-wood chest or box fits over or (in the case of a flush-mounted top) into the sides. In the photos shown center right, I formed a reveal by chamfering the top edges of the box's sides before fitting a hinged lid. The chamfer creates a wider shadow under the lid to help hide any unevenness between the lid and the top of the box. Similarly, you could use a reveal on the ends and edges of adjustable shelves, to hide irregularities of fit where they meet bookcase or cabinet sides and backs.

Reveals also help conceal little mistakes and unsightly gaps that may occur in joinery. For example, by rounding over or chamfering the edges of ill-fitting dovetails on, say, a large blanket chest or furniture carcass, you'll get a look that's cleaner and more pleasing than by simply filling the gaps with filler putty. I've employed reveals not only to improve poorly cut joinery, but also to enhance the look of shaped furniture assemblies.

Take a look at the nightstand I built from Douglas fir, shown below right. The parabolic-curved profile of the legs mating with the lower shelf assembly didn't look too interesting with the parts cleanly cut and joined. Using a bench chisel, I added a very slight chamfer to the areas where the shelf joined the legs. The resulting reveal made the legs look like they were actually "piercing" the shelf, making the connections look more dynamic (OK, I admit it, the reveal also helped hide a little unevenness in one leg's fit, where I cut the shelf a little too far with my band saw).

Sandor Nagyszalanczy is a furniture designer/craftsman, writer/photographer and regular contributor to Woodworker's Journal. *His books are available at* www.sandorsworkshop.com

In this frame and panel assembly, the author created a predetermined space around the perimeter of the panels. Although the panels are in the same plane as the frame, their reveals set them apart and add an attractive pattern to the piece.

A small chamfer forms a nice shadow line. That dark line, intentionally placed on the box, is called a reveal and is useful in many different construction circumstances.

The reveals that surround these parabolic shaped legs add drama to the look of the table. The legs look as if they are piercing the shelf. The author added the reveal after fitting the legs, carving the gap with a sharp chisel.

Today's Shop

Multi-tools

By Chris Marshall

While no tool is truly a "jack of all trades," multi-tools sure come close. Their versatility seems a perfect fit for DIY, but do you need one for woodworking?

Many woodworkers are also DIYers, and I'm certainly one of them. While the finish is drying on a woodworking project, I've always got the perpetual home improvement list to keep me busy. In my shop, woodworking and remodeling tools occupy the same space.

If you're like me, today's expanding assortment of multi-tools probably has your curiosity piqued, and for good reason: one tool and a handful of attachments can help you complete dozens of different project tasks. What's not to love about versatility?

Just a few years ago, Fein Tool's MultiMaster was the only kid on the block. But then the company's patent expired, and four other manufacturers — Bosch, Craftsman, Dremel and Rockwell — were quick to follow suit with their own multi-tools. Now there are six primary models. We've received many letters from you over the past year inquiring about them. So, consider this article to be your official welcome to the brave new world of multi-tools.

What Makes Them Tick

Key to a multi-tool's versatility is its oscillating motion. The shaft of the tool, onto which a multitude of different attachments mount, moves side to side in a tight flurry of motion. Depending on the tool, this can be from 5,000 to 21,000 oscillations per minute (opm). But, while the attachment only moves a few degrees right and left, it's enough action to cut, grind, scrape, sand and polish.

Unlike a circular saw or router, a multi-tool doesn't generate rotating forces during operation that invite kickback, so it's safe to use and easy to control. All of these tools allow attachments to be articulated and locked into various positions for tight-quarter work.

When equipped with a narrow blade, a multi-tool can make plunge cuts in boards, flooring or drywall. Outfit it with a detail sanding pad and you can squeeze into tight spots when, say, you're removing finish between chair spindles or cleaning out some dried glue on an inside corner joint. Offset flush-cutting blades enable you to undercut door casings without removing them or work adjacent to other finished surfaces without damage. Install a scraper blade, and you've got a power chisel for peeling up vinyl flooring or removing paint. The fine, linear cutting action also makes it possible to steer an abrasive blade along a grout line for removing it without chipping tiles. Name a reasonably soft material—nonferrous metal, thin sheet steel, plastic, hard or soft woods, rubber, foam board — and there's probably a multi-tool blade that can cut it. You

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One Tool, Four Core Functions ... Many Project Possibilities

CUTTING: Offset end-cutting blades enable a multi-tool to make plunge and flush cuts without the risk of kickback.

GRINDING: Since these tools cut in a linear motion, they offer precise grinding capability for grout and mortar removal.

SCRAPING: Side-to-side oscillation also functions for scraping tasks, such as paint removal, with a scraper blade.

SANDING: Install a triangular or teardrop-shaped sanding pad on a multi-tool, and it becomes a detail sander for many applications.

Bosch PS50 Multi-X

Bosch's cordless Multi-X comes with two 12-volt Li-ion batteries that charge up in 30 minutes.

can even buy carbide- or diamond-coated blades for cutting and grinding grout, masonry, tile and stone.

To help you understand the particulars of each one, here's an overview of all six tools.

Bosch PS50 Multi-X

Unveiled about a year ago, Bosch's Multi-X is powered by a 12-volt lithium-ion battery and is one of two cordless multi-tools here. It uses the same Max Litheon™ battery platform as Bosch's other Ultra Compact tools. Two batteries and a 30-minute charger come with it.

Weighing only 2.2 lbs., this machine has a compact barrel grip, appointed with soft overmolds. Variable speed allows you to adjust it from 5,000 to 20,000 opm, to handle everything from slow metal cutting to high-speed sanding or polishing.

Bosch packages the Multi-X in two hard-cased kits. The Cutting Kit ($160 to $170) comes with a hook-and-loop sanding plate, several grits of sandpaper and a plunge-cutting blade for wood. A more expanded Carpenter Kit (shown above) includes everything in the Cutting Kit plus three narrow plunge blades for wood and a semi-circular segmented blade for wood, metal or drywall. This bigger kit sells for around $189 to $199.

Unique to both kits, Bosch provides a round adapter disk that covers its 12-pin attachment head. This enables the Multi-X to accept accessories from Fein and Dremel with their different mounting configurations. That way, you've got a wide range of blade options, including those Bosch doesn't currently offer. Another nice little detail I like is an on-board "fuel gauge." Just push a button to see instantly how much charge is left in the battery.

Craftsman Nextec

Craftsman has entered the multi-tool category with its cordless Nextec™ ($99.99). Like Bosch, this tool powers up with a Li-ion DieHard® 12-volt battery, and it's one of several cordless tools in the Nextec™ line. The charger replenishes it in only 30 minutes, which is good, since you only get one battery.

Craftsman uses a four-pin connection for attachments, and smartly, the design also

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Nextec has an LED worklight that's powered by the tool's battery. It could be a plus for low-light worksite applications.

The attachment mounting pattern of Craftsman's Nextec also accepts Fein MultiMaster blades (left in photo).

Craftsman Nextec

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Dremel Multi-Max

Most multi-tools, including Dremel's Multi-Max, feature a pin-type mounting system. Blades can be set and locked to various positions for close-quarter work.

allows it to accept the mounting pattern of Fein MultiMaster accessories.

The Nextec™ is a single-speed tool, running at 15,000 opm. You might find that limiting for slower, careful detail work. But it's a featherweight at only 1.75 lbs., which should make it easy to handle for any user. Other amenities, including a built-in LED worklight, 1¼" dust collection port and a boatload of standard attachments-make up for the single speed. You get a sanding pad and several grits of paper, round and triangular carbide-coated grinding blades, round and straight flush-cutting blades, a scraper and a soft-sided carry case. Quite a bargain here.

Dremel Multi-Max

Sources at Dremel tell me that although the Multi-Max has only been out for a couple of years, the tool is selling like hotcakes to both DIYers and hobbyists. Maybe that's because at around $100, it has some features found on the more expensive Fein tools. The Multi-Max is rated at 1.5 amps, with a variable-speed (10,000 to 21,000 opm) motor and soft start. Electronic feedback circuitry (EFC) helps the tool maintain even power delivery under heavy loads. And, at under 2 lbs., it's comfortable in the mitts.

Dremel equips the Multi-Max with its Quick Fit™ accessory changing system. To switch blades and most other attachments, you don't need to completely remove the Allen bolt as you do with some other tools here. Just loosen it a few turns, and the attachment slips out through an open slot.

In addition to a hard case, Dremel packages the Multi-Max with a sanding pad, an assortment of sandpaper, a segmented circular blade for wood and metal, a flush-cutting wood blade and a flexible scraper. A variety of other attachments, including carbide- and diamond-coated grout and masonry blades, are also available.

Attachments Galore, and More to Come

Multi-tool manufacturers offer a variety of cutting blades and scrapers for wood, metal, drywall, flooring, vinyl tile removal and more (left photo). Tooth styles and sizes range from fine in-line teeth for delicate cuts to large, aggressive patterns for coarse cutting, and even hacksaw styles for metal. These tools also accept a range of abrasive attachments (right photo), including sandpaper, carbide- or diamond-coated plates for masonry, circular grout blades and felt polishing pads. More styles of attachments continue to come to market.

Fein SuperCut

Fein also builds a heavier-duty, premium multi-tool targeted to professional tradespeople and remodelers: the SuperCut. This machine features a 400-watt (3.6-amp) motor that drives an all-metal transmission, yet the tool still weighs about the same as the MultiMasters. Soft start, a speed range of 11,000 to 18,500 opm and EFC are other important details. The SuperCut also has a contoured grip, similar to a right-angle grinder. It comes with the QuickIN attachment interface. A special adapter allows the machine to accept SuperCut-specific attachments, plus pages' worth of MultiMaster blade styles in Fein's catalog.

There are five different professional kits for the SuperCut, with attachments and accessories selected for specific trades. The one most applicable to woodworking is

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(Circle No. 31 on PRODUCT INFORMATION form)

Fein's SuperCut multi-tool includes an adjustable depth stop for controlling plunge cuts.

the Carpenter Kit ($896). It comes with 10 wood-cutting blades of different widths and tooth styles, a sanding pad and various paper grits, depth stop and a hard storage case. It also has a dust extraction accessory. Other SuperCut kits focus on flooring work, window repair, tile renovation and caulking/sealant removal.

Fein MultiMaster

Now in its 24th year of building the MultiMaster, Germany-based Fein Power Tools offers two models of the venerable MultiMaster and three packaging kit options. In terms of common features, Fein's FMM250 and FMM250Q tools are fairly close cousins. Both have 250-watt (2.3-amp) continuous duty motors. You can ramp them up or down between 11,000 and 20,000 opm for a wide range of tasks. Soft start, EFC and overmolded barrels should make these 2.6- and 3.1-lb. machines easy to manage for extended uses.

What principally sets the two MultiMaster models apart is how you install the attachments: the FMM250 uses an Allen screw, like other multi-tools here. The FMM250Q features Fein's QuickIN tool mount. It's a flip lever that unlocks a post, holding attachments in place. Blade swaps are easy to do.

In terms of kit options, Fein's "Start" kit ($259) includes the base model FMM250, sanding pad and paper, flush-cutting wood blade and a scraper. Or, you can step up to the FMM250Q model in the "Select" kit

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The QuickIN lever system on Fein's FMM250Q and SuperCut enables tool-free attachment changes.

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Rockwell SoniCrafter

Dust extraction comes standard on the SoniCrafter and on the Fein FMM 250Q and Craftsman tools.

($389) and get the Start attachments, plus a segmented round blade and a grout blade. The $499 "Top" kit (previous page, bottom) comes with the FMM250Q, dust-collection accessory, all of the aforementioned attachments of the other kits, more sandpaper and a hard case. You also get a nifty profile-sanding accessory. It works like a clothespin to hold six different-shaped rubber blocks and small sheets of sandpaper. This could come in real handy for sanding routed profiles and trimwork.

Rockwell SoniCrafter

Rounding out this lineup is a relative newcomer to the handheld power tool scene: Rockwell. The company's SoniCrafter multi-tool comes in two styles — a single-speed (20,000 opm) version and one with a variable-speed range of 11,000 to 20,000 opm.

The SoniCrafter weighs under 3 lbs., and it draws an impressive 2.3 amps, which rivals Fein's MultiMaster for power delivery. This tool has a larger grip, but an overmold makes for secure handling.

Rockwell offers three SoniCrafter kits. The Deluxe Professional kit ($179.99), shown above, seems very well appointed for the price. You get the variable-speed tool, a 71-piece assortment of attachments, a dust extraction accessory and a duffel case. It's the broadest assortment of attachments of any kit here.

A smaller 37-piece kit for $149 also buys you the variable-speed SoniCrafter and 37 attachments. Or, you can choose the single-speed tool and 20 attachments as a starter kit for around $119.

Do You Need One?

Here's that million-dollar question, and to be blunt, I can't answer it for you. But, going back to my original premise, if you're a DIYer, these multi-tools can tackle tasks that are tough to accomplish with other power tools: flush-cutting casings and trim, controlled cutting or sanding in cramped spots, plunge cutting and powered scraping or grout removal.

With prices starting at around $100, a multi-tool could be worth its cost, even if you only use it now and then for those big home improvement projects. Cash outlay is not that outlandish. Then, on the woodworking side, consider how nice it would be to have a dedicated detail sander, a flush-cutting tool for trimming plugs and a scraper for dried glue. In other words, there are some interesting possibilities here. While these are not core woodworking tools, I think any crossover task makes your purchase that much sweeter.

Chris Marshall is Woodworker's Journal's *Field Editor.*

Multi-tool Sources

Bosch: *boschtools.com; 877-267-2499*

Craftsman: *craftsmantools.com; 800-349-4358*

Dremel: *dremel.com; 800-437-3635*

Fein: *feinus.com; 800-441-9878*

Rockwell: *rockwelltools.com; 866-514-7625*

Shop Test

Countersink Options for Woodworkers

By A.J. Hamler

Whether it's achieving the clean look of a flush-set screw or creating perfectly plugged screws, a reliable countersink is a workshop must-have. Here's a preview of what's available.

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For utility shop furniture or other quick-and-dirty projects — especially temporary items — we often don't care much about the screws. They can be visible or not, proud of the surface or not; sometimes, it just doesn't matter.

But for most of our work, if a screw is going to be visible we want it to look good, seated smooth and flush with the surrounding surface whenever possible. Sure, you could forcibly drive a flathead screw flush, but that almost always tears the wood surface fibers and looks terrible. In hardwood, you might not even be able to set the screw flush.

This is where countersinking (or its close relative, counterboring) comes in. When you top off a pilot hole with a countersink, the screw head seats perfectly: all its surfaces contact the wood with the same amount of force, making for a strong attachment and a clean look.

When we want those screws to disappear entirely, a properly sized deep-drilled countersink can accept a wooden plug that can then be cut and sanded flush for a smooth surface and an accented appearance.

Handling these tasks, and more, is the job of a dedicated countersink. But there are a lot of them out there: one piece or a combination of drill bit and countersink, single-fluted or with multiple flutes (or none at all) and a wide range of chamfer angles make for tricky selection. As with just about all woodworking tasks, countersinks work best when correctly matched to the job at hand.

Types of Countersinks

One-piece countersinks come in two main flavors, the most commonly recognized being a fluted countersink, which has a short shank with an elongated cylinder topped with a conical tip. (The shape always reminds me of the old Apollo command module.) The most typical fluted countersink used to have four cutting edges on the cone, although one-piece fluted countersinks today more commonly have an odd number of cutting edges — usually one or five.

Fluted countersinks come in several sizes, able to cut conical holes intended to fit screws of varying head dimensions. A pilot hole is first drilled for the screw, followed by countersinking the hole to allow a flathead screw to seat flush with the work surface. It's always best to use a countersink with a body diameter that closely matches that of the screw head; using one too narrow won't create a big enough countersink to accept the screw head, and using one too wide runs the risk of creating a crater-sized countersink that completely swallows the screw.

A fairly recent type of one-piece countersink called a cross-hole countersink has no flutes. Instead of sharpened cutting edges, the bit has a hole bored through the cone at an angle. As the bit spins, the trailing edge of the hole makes the cut. Used the same way as fluted bits (pilot hole first, countersink second), cross-hole countersinks cut very smoothly and remove material quickly, and they excel at ejecting chips as they drill. These bits generally cost a bit more than their fluted cousins.

Countersink Options: Countersink bits (above) come in a wide variety of styles and sizes to suit particular woodworking tasks and personal preference.

Getting the Angle

Countersinks are available with cones shaped to create six distinct chamfer angles — 60°, 82°, 90°, 100°, 110° and 120° — designed to match a particular screw's head angle. The two most commonly used angles in woodworking are 82° and 90°. Those two particular angles are based on the standards to which the screws are manufactured and used. Screws with 90° heads are made to the ISO Standard; they're usually metric and far more common overseas. Most recognized in North America is the Unified Thread Standard of 82°, which matches just about all woodworking screws you might encounter in the U.S. and Canada. However, both standards of countersinks are readily available here.

Since chances are good that you'll only use screws with 82° heads, does it make a difference which countersink you buy and use? Well, that depends. If you take at look at the *Illustration* (next page), you can see how the typical 82° woodworking screw seats in a countersink. With the 90° countersink on the left, because of the 8° difference the very bottom of the screw head makes contact with the wood first, leaving the sides and top of the screw unsupported. The screw must be further tightened to bring the rest of the head into contact with the countersink, creating a greater force on the wood at the bottom. Essentially, what you're doing is forcibly elongating the countersink by overdriving the screw. With the 82° countersink on the right, all surfaces of the screw head make contact with the wood at the same time and with an equal amount of force.

Common sense will tell you that matching the screw to the

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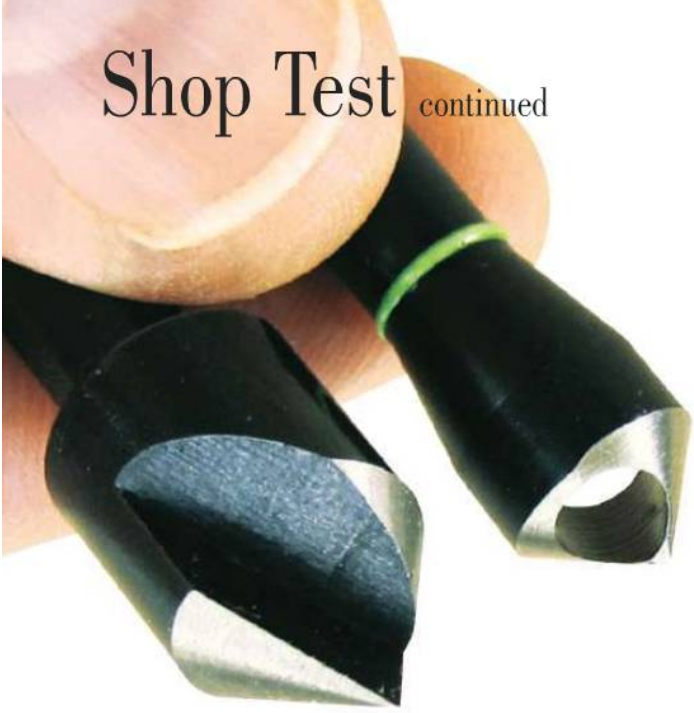
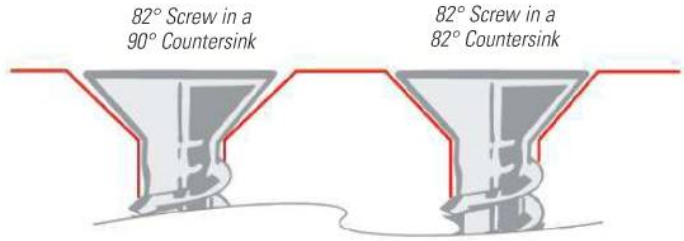


A fluted bit (left) has one or more straight cutting edges. Cross-hole countersinks have an angled hole through the conical tip; the trailing edge of the hole acts as the cutting edge.

countersink is the correct way to go. This is especially true with hardwood, as forcing the screw tighter in an effort to properly seat the screw into the countersink puts a lot of stress on the head — try it with a brass screw, and the head will likely snap off. For hardwood, matching the countersink is always best. For softwood, however, not nearly as much stress is created when seating an 82° screw in a 90° countersink, and the difference may be unnoticeable.



The two most common countersink chamfer angles are 82° and 90°. Since most woodworking screws in North America have heads with an 82° angle, a countersink of that angle is best for a properly seated screw.

Team Effort

With the bits I've described so far, countersinking is a two-step process: pilot hole first, followed by the countersink. It's effective, but time-consuming. However, a wide variety of combination countersinks do both tasks at the same time. Going by several names — countersink drills, pilot screw countersinks and piloted countersinks are just a few — these bits wrap a fluted countersink around an adjustable drill bit. (Cross-hole countersinks aren't used for these.)

The original idea for these was around years ago with piloted countersinks made of a single piece of flat steel with the ends rolled to form a shank. They looked like arrowheads. There was nothing adjustable about these — you either had the right size or you didn't — and the holes and countersinks they made weren't much to look at, but they did the job quickly and in a single step. They sold by the thousands, and chances are good that anyone who's been woodworking for a few decades has a couple rattling around the bottom of a toolbox somewhere. (I did, as the photo attests.)

Today's versions produce better results and are far more versatile. Styles vary, but each works basically the same way. Each countersink is really a combination tool, and it consists of a separate drill bit centered in a through-hole in the body of the countersink and held in place by either a

Shop Test continues on page 64 ...

Countersink Versus Counterbore Clarified

Contrary to what some have suggested, a counterbore is not how the bartender referred to me at that Christmas party I went to a few months ago. Counterboring is a means of setting a fastener below the surface of the workpiece, just like countersinking. Although the terms are sometimes used interchangeably, the main difference lies in the shape of the bottom of the hole.

Countersinking creates a conical hole matching the angled shape on the underside of a flathead screw. This conical hole can be shallow, with the screw resting flush with the surface of the workpiece when driven in, or it can be made deep enough that a plug can be installed above the screw once it has been set at the bottom of the cone.

Counterboring creates a flat-bottom hole, which allows the head of a screw or bolt with a flat underside to rest solidly in the counterbore, often atop a washer. While the hole above a deeply set flathead screw is usually the same size as the screw head, the hole created for a counterbore is typically larger than the head, which allows room for both the washer as well as the driving tool, such as a socket wrench.

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Rare animals these days, old-style piloted countersinks were made of flat steel with the ends rolled to form a shank. They got the job done quickly, but the results weren't always very pretty.

Flip-style countersinks are double-ended — drill your pilot hole and countersink, then flip the body around and reattach to the drill to drive the screw.

setscrew or a collet action of the countersink body. The drill bits can either be straight or tapered, their drilling length adjustable simply by loosening the setscrew or collet, sliding the drill bit to the desired length and retightening. Most of these countersinks can be used with a stop collar that sets the depth of the countersink, and most come in sets that include varying sizes of matched countersinks and drill bits to accommodate the screws being used.

Nearly every major tool manufacturer that offers drills (as well as a few who don't) produces basic, inexpensive combination countersinks of this type. Many of these are constructed in a "flip" style, with a double-ended cutter. When it's snapped onto the driving body in the countersink mode, you can drill both pilot hole and countersink. Snap the countersink off, flip it around and snap it back in to expose the appropriate driver bit to set the screw.

Three typical examples of high-end countersinks are shown in the photo at right. From left to right are the Rockler Pro Tapered Countersink, the CleanStop countersink from Woodworker's Supply and the Jack Rabbit from Jack Rabbit Tool. Each has some unique features.

The Pro Tapered comes in a set of three complete countersink combinations, sized for #6, #8 and #10 screws. The bits are nicely tapered to match the profile of traditional woodworking screws, and each drill bit has a flattened shank for secure locking with the setscrew. A depth stop with two setscrews is included for each bit, and these countersinks have the largest main shank of 3/8". For cutting action, there are two extra-long flutes that extend up the countersink body to help eject chips through the depth stop. The three-piece set sells for about $60, but each countersink is also sold individually, with #5 and #12 countersinks also available.

Here are three typical styles of piloted countersinks. Each can be adjusted to create a pilot hole of exact depth, along with its countersink, simultaneously. The stop collar on each sets the optimal depth for countersink.

The CleanStop shares a similar pair of long flutes for chip ejection, but it uses straight drill bits instead of tapered. Four combination countersinks sized for #6, #8, #10 and #12 screws come in the set, but only two depth stops are included: they must be shared among the four countersinks. The depth stops are unique and feature a two-piece design with a polymer cap attached to the front of the metal stop. The cap spins freely but stops when it contacts the workpiece to help prevent marring or burning the worksurface. The main shank is a 1/4" hex design. The four-piece set sells for about $60, but countersinks are also sold individually.

The Jack Rabbit set includes the same four sizes as the CleanStop, but it uses a single body. Each countersink is a separate collet that screws into the driving body, tightening on the drill bit as it's put in place. The business ends sport four short flutes that do not extend past the depth stop in typical use. A single brass depth stop is included for the driving body. The Jack Rabbit countersink is a "quick-change" combination, using separate drive shanks sporting both Phillips and square-drive ends. In use, you drill the pilot hole and countersink, then just snap the driving body off the shank and drive the screws home in a quick one-two action. The set, which includes a pair of wrenches for tightening the collet-style cutters, two double-ended driver shanks and a magnetizing ring for the drivers, sells for about $50.

All three sets include a storage case, as well as Allen wrenches. Replacement drill bits are available for all.

Other Countersink Styles

Although there's not always a lot of call for it in many

What's All the Chatter?

A maddening defect sometimes caused when countersinking is called chatter. After drilling a pilot hole, the bit can vibrate when forming the countersink, resulting in a conical hole that's badly chewed up in a somewhat rippled pattern. While the sides of the cone are sometimes hidden by the screw head once driven in, the edges of the countersink still look ragged.

Chatter is caused when a countersink bit sets up a harmonic vibration as it spins, and it happens almost exclusively when a countersink is added to a previously driven pilot hole as part of a two-step procedure. Here are some tips for avoiding chatter:

- Piloted countersinks, like those with a drill bit that forms a pilot hole at the same time as the countersink, rarely chatter. Whenever possible, use a piloted countersink.
- Countersinks with an even number of identically sized flutes chatter more than bits with a single (or other odd number) flute. Newer fluted bits vary the flutes slightly, lowering harmonics. Likewise, cross-hole countersink bits — which essentially have only one cutting edge — chatter less than fluted bits.
- Slow down! High speed, especially when combined with light drilling pressure, can easily form harmonic vibrations. Using less speed and a bit more pressure will help minimize chatter.
- No matter what type of bit you use or how you use it, sharp cutting edges cut more smoothly and reduce chatter.

It's difficult to avoid chatter in soft pine, but notice the difference. A single-flute countersink at low speed made the countersink on the right; the other was the result of a four-flute countersink running at high speed.

woodshops, there's a specialized countersink for making rustic log furniture with round mortise-and-tenon joinery. Once a hole (the mortise) has been drilled to accept the round tenon of a furniture component, these wedge-shaped countersinks easily taper the top of the mortise to exactly match the tapered shape of typical round tenons. The mortise-and-tenon joint mates perfectly for a very strong connection. These countersinks are generally used with a heavy-duty drill.

Not all countersinks require a drill, however. Hand countersinks consist of a handle similar to a screwdriver's, with individual countersink bits that snap into the front. First, drill your hole and then, with a few twists, you have a basic, no-frills countersink ready to accept the screw. They're excellent to keep within arm's reach or stashed in the toolbox for making a quick countersink or two without taking the time to fetch your drill and regular countersinks. These guys do take a bit of muscle power, however, and your wrist will get its exercise if you make several dozen countersinks in oak with one of these. But for a quick one-off countersink, they can't be beat.

Using Countersinks

The most important thing to keep in mind when using a countersink is to match the size correctly to the screw being used. This goes for all aspects of both the pilot hole and the countersink itself. A too-large countersink will swallow the head of a screw in what will look like a moon-sized crater; a too-small countersink won't fit the screw head, and forcibly driving the screw in can tear the wood fibers around the countersink. If you don't drill the countersink deep enough, the screw will remain proud of the surface; go too deep and the screw will seat too shallow. With use, you'll quickly get the feel of particular countersinks, but until then it's wise to adjust all your settings (drill bit depth, countersink size, depth stop location) and make a test drill into a piece of scrap before drilling the real workpiece.

When countersinking, speed isn't always your friend. Drilling too fast can lead to too-deep or too-large countersinks, especially in softwood. High speed is also one of the main causes of "chatter," a countersink with a ragged edge and an inner surface that is chewed up in an undulated pattern. (See the top sidebar "What's all the chatter?" for more tips on avoiding this annoying and unsightly countersink defect.)

For traditional tapered wood screws, a countersink with a tapered drill is logically the best to use. Straight wood screws, such as those

Matched with a round tenon cutter and drill, this specialized countersink creates perfectly seated, tapered mortise-and-tenon joints common in rustic log furniture.

Shop Test continues on page 66 ...

Not only are these piloted countersinks depth-adjustable, but the drill bits can also be removed easily for cleaning, sharpening or replacement.

When you need a basic countersink in a hurry, no drill is necessary for this handheld tool. Various sized bits snap in and out of the comfortable-to-grip handle.

Instead of setting flathead screws flush with the surface, hide them completely by drilling the countersink deep enough to glue in a plug over the screw head.

ubiquitous black screws from the home center, work optimally with straight drill bits. However, in most uses except in the hardest of hardwoods, the type of drill bits used in countersinks are interchangeable. In softwood, the difference is negligible.

Keep a close eye on the drill bits in your combination countersinks. Like any bits, they cut inefficiently when dull. Remove them as needed and replace them. Just about all countersink manufacturers make replacement bits that are easy to swap in.

Same goes for the cutting edges of the countersink itself. Sharpen them as necessary or replace them. Again, all the manufacturers offer replacements. (In some cases, the replacement cutters are sold together with new drill bits.)

Other Countersink Uses

One of the biggest conveniences a good countersink provides is being able to drill a pilot hole and the proper countersink, and simultaneously put both at the bottom of a deeper hole that will accept a wooden plug. These deep countersinks are sometimes referred to as "counterbores," but that's technically not quite accurate (see the sidebar on page 60).

You can make deep countersinks easily by setting the countersink's depth stop to allow the countersink to drill more deeply into the worksurface. Be sure to measure the size of your plug to be sure your countersink's body will make the right-size hole. Likewise, set your depth stop carefully. As mentioned earlier, a quick test drill in scrap is always a good idea when making adjustments to countersink sets.

Speaking of depth stops, be careful with them. There's no need to ram that countersink down into the workpiece until the depth stop bangs to a stop. All that will get you is a marred surface. And if you don't stop drilling soon enough, the spinning depth stop can easily burn the wood surface to boot ... yet another reason to avoid high-speed countersinking. The most efficient way to make a countersink is to take it easy, and decrease the drill speed as the stop nears the surface. When it just barely kisses the wood, you're done.

It's likely that after you get used to how a particular countersink works, you'll leave the depth stop in its case. Once familiar, you'll be able to tell the correct depth instinctively.

There's one last task at which countersinks excel, and it has nothing to do with wood: they are the fastest, most efficient way to deburr a freshly drilled hole in metal. You might not think there's a lot of call for that in the woodshop, but think again. Drilling holes in hinges, metal angles, jig components, cast-iron for table attachments, shelf brackets and the like all leave an unsightly — and dangerously sharp — burr around the edge of the hole. One quick touch with a countersink removes this burr.

It's best not to use your regular woodworking countersinks for this task, however. Instead, pick up a couple of cheap, one-piece fluted countersinks just for the purpose. (They make expensive countersinks for metal drilling, but for occasional deburring, the cheapest you can find will do the trick.) Keep them with the drill bits you normally use for metal, and you can't go wrong.

A.J. Hamler is a woodworking author and former editor of Woodshop News.

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Upgrades for Your Shop

Stanley Sweetheart planes

Stanley is an old name in woodworking that's still making tools for the 21st century. In fact, their tools run the gamut from traditional — like their new launch of five premium *Sweetheart™ planes* — to totally new, like the *SquidBrite™ work light.* Stanley, in fact, cited the company's hand plane history dating back to 1872 at the launch of the new Sweetheart line, which includes a No. 4 smoothing bench plane, a No. 62 low-angle jack plane, a No. 92 shoulder/chisel plane, a No. 60½ block plane and a No. 9½ block plane, all of which have a limited lifetime warranty. Their thicker blades are constructed from A2 steel, and the plane bodies are cast from ductile iron to reduce chatter and dampen vibration. Each of the planes has a precision-machined base for accuracy and performance, with solid brass knobs to maintain the look of the traditional style. They also feature user-friendly adjustments and, in the case of the No. 4 smoothing bench plane, a patent-pending lateral locking adjustment. Stanley's Sweetheart planes are priced from $99.99 to $179.

As for the SquidBrite, it's an LED work light that lasts more than 10,000 hours, with rechargeable batteries (that operate up to six hours on a single charge) built right into it. It's also mounted on flexible, grooved rubber arms that can wrap around objects or sit securely on uneven surfaces, with the light head pivoted to the perfect angle. The light also detaches for handheld use, or to attach to a metal object with the magnet on its back. It has three light settings (high, low and flashing) and Constant Light Output technology so that the amount of light remains, well, constant, throughout your project. Suggested price on the SquidBrite is $29.99.

Stanley SquidBrite™ work light

Also offering multiple new tools is **Bosch**, with an 18-volt impact drill/driver and an entire new line of pneumatic compressors. The *26618-01 Multi-Function Impactor* brings drilling, driving and fastening into the capabilities of the same tool. It offers a two-speed motor (0-750/2,800 rpm) and 1,500 inch pounds of torque, all within a 7"-long tool. Soft-grip surfaces, a spring-loaded impact mechanism and Electronic Motor Protection are also part of the tool. It's powered by an 18-volt Litheon battery (compatible with Bosch's 18-volt Litheon SlimPack batteries). The 26618-01 is priced at $369.

Among Bosch's new *Full Force Technology™* line of compressors is the *CET4-20W*, a hand-carry compressor with a vertical tank that allows moisture to collect at the bottom of the tank, while also condensing the compressor's

Bosch 26618-01 Multi-Function Impactor

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center of gravity, so that it's easier to carry it close to your body (lessens the awkward knee-banging, one would hope...). The control panel — recessed to protect the regulator, gauges, couplers and drain valve — gives easy access to that drain valve. With pressure in the tanks, you can use a single valve to easily drain both tanks as often as needed, extending the life of the compressor. The CET4-20W has a two-pole electric induction motor and a contractor grade oil-lubricated pump. Its four-gallon capacity provides 4.9 cubic feet of air per minute at 100 psi. It's listed at a price of $667.

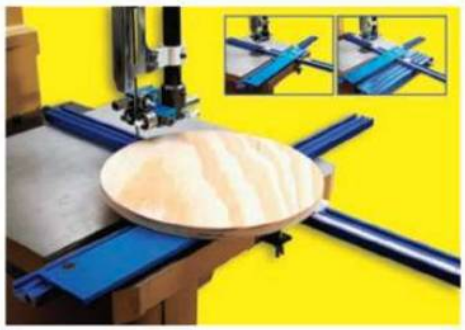
Bosch CET4-20W compressor

Adding upgrades to the T-7 sharpening system is what the **Tormek** company has been up to lately. In response to requests from customers, they've created a new *EzyLock* system that uses a self-tightening stainless steel knob to secure the grindstone — no tools and no pressure are needed, and the system also makes it easy to change grindstones from the standard aluminum oxide to new specialty stones: Blackstone Silicon and 4000 Grit Japanese Waterstone. They've also upgraded to an *Advanced Water Trough AWT-250:* the standard lip has been enlarged and an attachable water chute provided for sharpening long tools (like planer blades). Both of these changes were made to reduce the amount of water splashing around the shop. A pair of Tilt Shoes for the T-7's feet put the frame on a slight angle so that water that lands on the frame runs back into the water trough. Also incorporated into the new water trough is a magnet to attract the steel cut from tools and keep the stone cleaner and more free-cutting.

Ali Industries' Gator Ultra Power Sandpaper with Black Zirconium

Already part of new T-7s, the Advanced Water Trough with tilt shoes and EzyLock shaft system MSK-250 are also available as upgrades to current Tormek T-7 and 2000 owners: the AWT-250 Advanced Water Trough upgrade is priced at $22.99 and the MSK-250 EzyLock Upgrade Kit at $57.99.

As for upgrading your sandpaper, the *Gator Ultra Power Premium Series with Black Zirconium*, from **Ali Industries**, uses the same zirconium oxide that is known at the jewelry store as cubic zirconium — almost a diamond. It makes these sandpapers, designed for use on power sanders, sharper and harder than aluminum oxide grits, to cut faster and hold the cutting edge longer. They're also constructed with heavyweight paper for discs and sheets, heavy-duty cloth for the belts, and top-of-the-line phenolic resins as the glues. A special no-load coating on the discs and sheets reduces material loading so you don't have to change paper as often. The Ultra Power series comes in various configurations; pricing on packs for 5" random-orbit sanders, for example, starts at a four-pack for $4.99.



Carter Products' AccuRight™ Circle Cutter

Another enhancement for your woodworking is the *AccuRight™ Circle Cutter* from **Carter Products**, an attachment to your band saw that will cut perfect circles in any diameter up to 48" — although you may have to use some additional support, like a rolling stand, for those big ones. The Circle Cutter ships with a universal bracket that fits most band saws on today's market and works with all blade guides, full-block or bearing, except for the *Carter Stabilizer®*. You can add the Circle Cutter to your band saw with no drilling or external mounts. It's priced at $64.99.

While it might not make your shop look perfect, the *Solematte Adhesive Floor Mat* sold through **Rockler Woodworking and Hardware** can certainly contribute to keeping the rest of your home clean. The Solematte comes as a stack of 30 sheets measuring 24" x 36". They stick to the floor, and, after a protective film is removed, also have an adhesive side that lets the sawdust from your shoes stick to the Solematte — not wherever you walk next. Step down a couple of times, similar to stomping snow from your boots, to help the crud collection do its job. When stuff stops sticking, tear off the top sheet and use the next one in the stack. The old one, by the way, can be recycled like your household paper. Each stack of 30 sheets costs $19.99.

What have you been using to make all that sawdust? Possibly a table saw? You might be interested in the new *Shop Fox® W1811 10" Sliding Table Saw* from **Woodstock International**. It's a slider sized to fit in small shops, with a footprint (including the legs) of 60" x 28" and a sliding table 63" long and 12¼" wide. The W1811 is powered by a 5hp, 220-volt single-phase motor and can cut sheet goods up to 78½" wide by 63" long, as well as dadoes up to 13/16" and miters and bevels from 0 to 45 degrees. The W1811 includes a standard rip fence with up to 33" maximum ripping width, an independently raised and lowered scoring blade and two dust ports. Suggested price is $4,459.

— Joanna Werch Takes

Shop Fox® W1811 10" Sliding Table Saw from Woodstock International

Finishing Thoughts

Approaching a Stickley Finish

By Rob Johnstone

Here are a few simple steps that will provide a finish on white oak that evokes the Stickley furniture of years gone by.

Gustav Stickley was a finish fanatic. It is said of him that even as an old man — living at his daughter's house after his business had gone bankrupt — he continued to experiment with finishing. One can only wonder what his daughter thought about that.

So it is no surprise that when you think of Arts & Crafts furniture built in the Stickley style, that the finish is a critical component of the piece. White oak furniture manufactured in Stickley's factory was fumed with ammonia to create its rich, dark color. The ammonia fumes reacted with the tannin in the oak to create a deep hue that could then be topcoated with varnish or lacquer.

But when we decided to build a Stickley-inspired blanket chest (page 26), we did not really give the idea of fuming the chest much serious consideration. Fuming with ammonia is a nasty task that can actually be dangerous to do. (However, it is possible to do — as shown in the photo on the opposite page.) The other challenge is that every piece of white oak will not react to the ammonia to the same degree. Stickley addressed this problem by fuming his parts before he assembled the furniture so he could select out pieces that were not the right color. We would not have that option — so we came up with an easier staining solution.

A Simple Plan

There are a variety of products that can give you a good-looking Arts & Crafts type finish. Michael Dresdner often recommends asphaltum, which can be purchased as roofing tar and cut with mineral spirits. Or, there are stains that claim to be "Arts & Crafts" that might do the trick for you.

We chose to take a deliberative process to get to the look we wanted. First, we got our hands on a box of finish sample chips (available

By using a few products available on the market and taking a bit of time for trial and error, we arrived at a suitable color and finish for the Arts & Crafts Blanket Chest in this issue.

Ammonia fuming in a small shop is possible, but it's tricky and can be dangerous. Exceptional care and extreme precautions must be taken to perform this task. This article suggests an easier alternative.

from Rockler Woodworking and Hardware) to find a stain — in this case, we used a gel stain and polyurethane combination, but a traditional oil stain would work as well. The colors on the chips got us close, so after selecting three possible variations, we tried those stains on our white oak. It is important to sand your test pieces to the same grit level as you will your project, as the stain will be absorbed differently and potentially present a different color. We sanded up to 180-grit. After a few tests, we chose the General Finishes Antique Walnut gel stain with polyurethane. One coat of that — brushed on and wiped off — was followed by two more wipe-on coats of clear poly. At the end of that process, we de-nibbed the project with 0000 steel wool and applied a coating of ebony-colored Briwax, which we then rubbed out to a nice sheen. The end results were nice to look at and to touch.

You may be asking yourself if a finishing fanatic like Gustav Stickley would be satisfied with the result. That is something we will never know, but if you are looking for an easy-to-do, Stickley-similar finish, I think this one will do nicely.

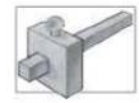
CONTACT US

with your "Finishing Thoughts" by writing to Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340, or by emailing us at: finishing@woodworkersjournal.com. Please include your contact information with your thoughts or questions.

Necessary Workbench

By Ian Kirby

Every woodcraft has its own version.



A proper workbench is essential for hand tool woodworking. The bench gives you feedback regarding your planing technique, allows you to chop mortises with vigor and holds your stock properly in its vise.

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MORE ON THE WEB

For a detailed article on building an Arts & Crafts workbench, go to *woodworkersjournal.com* and click on the More on the Web tab shown above. Or send a large SASE to Woodworker's Journal, Skill Builder 14, 4365 Willow Drive, Medina, MN 55340.

Every historic woodcraft has one thing in common: a bench. However, each skill had a bench that was peculiar to the work done on it. The cooper, patternmaker, coach builder, wheelwright, et al. could not operate without one.

If you are not an accomplished woodworker and decide to design and build a bench, you get stuck in a sort of chicken and egg situation. For that reason, I'll describe the bench shown above, which has evolved to work best for a furniture maker using solid wood and hand tools. You may be a furniture maker who believes that everything starts with a green button — this bench works well for you also. As yet, we haven't seen a bench design specific to the machining of MDF and veneer.

The Bench

No matter how you push, pull or pound on it, the structure is solid. This gives you the confidence that you can measure and work to fine limits, that you can clamp to it and extend its stability and that it will carry any load.

The top is flat in length and in width, and it is out of winding. Flat to a degree that can be achieved with an 07-plane set so fine that the "shavings" are like goose down. This means you can plane stock against the bench stop more effectively than any other way — the workpiece isn't distorted by being clamped in a vise or held between dogs as with an end vise. The simple holding device demands that you hold and push the plane in the most effective and efficient way. It also allows for instant "pick up" to check the work with square or straightedge.

Clamping up assemblies or butt joints on the bench is a good way to avoid twist in the finished piece. The pounding associated with chopping a mortise is done over the legs at the end away from the vise — every ounce of force goes into the work.

When sawing a joint, whether it is a variation of a tenon or a dovetail, the workpiece is held in the vise. In order to cut the joint accurately, the work must be held vertical. Its face should be at right angles to the bench top. The cheeks of the vise are aligned to make this so. They also toe in: that is, they come together parallel, but meet at the top edge first. So the vise, as tightened, deflects to effect a positive grip.

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