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October 2000 #117

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48


12


74


67

In This Issue

In Every Issue

On the Cover

Who is that masked man? Roy Underhill goofs off for the camera during his cover shoot. Warning: Chicken masks don't offer sufficient protection for woodworking.

Cover photo by Al Parrish

Popular Woodworking®

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Gimme Shelter

Get your project ideas ready, your materials in hand and your shop shaped up. This fall you'll have ample reason to spend plenty of time cutting wood.

It's not just that the load of yard work has tapered off, that vacations are over or that the weather has driven you indoors. It's not even that the little hope you still kindle each fall for just one new TV show that you might like is about to be squashed again.

No, this fall we have a presidential election. Now before anyone concludes I'm not a responsible citizen, let me say that I have informed myself on the issues, evaluated the candidates and voted in every election since Nixon/McGovern. And I strongly encourage every eligible reader to vote this fall.

But if past elections are any indication of what's in store for us, I suspect the shop will look like a good place to hunker down. And it probably won't matter much if you favor Mr. Bore or Mr. Gush — I mean Gore or Bush, pardon me — because your shop is the perfect bunker when the inevitable mud slinging crossfire begins.

But even without the big time election this year, the shop is always a refuge from whatever your problem *de jour* might be. Stock market drops? Go to the shop. Work getting you down? Go to the shop. Just need a break from the day's routine? The shop is the place to be.

Even if you don't have a project in the works, there's always something to do. Organize your tools. Sharpen a few edges. Do a little machine maintenance. It doesn't matter what you do so much as the fact that your world is a little better ordered and the job cleared some cobwebs from your head.

And after you've done all that, here's something else to look forward to this fall. Scott Phillips, the always amiable and longtime host of "The American Woodshop," will join *Popular Woodworking*'s growing list of esteemed contributing editors.

In every issue, Scott will share his favorite shop tips and tricks. And he has a toolbox full of them, gleaned from 30 years of woodworking experience. See his debut in our December issue (distributed mid-October). Look for Scott on the cover and his first lineup of tips and tricks inside.

And by the way, there's a bit of a reciprocal arrangement with Scott. Commencing with his new season on PBS this fall, you'll see our own "tool man" and Senior Editor David Thiel make several guest appearances on "The American Woodshop." What's the subject? David will be bringing Scott's millions of viewers up to date on, you guessed it, the latest in woodworking tools.

If you live in the Cincinnati area where we put out the magazine you have probably attended one of our "workshops" where readers get to try out a manufacturer's latest tools. We decided that since it worked here, why not take the show on the road?

Well, we did, holding workshops in Jackson, Tenn., at the headquarters and manufacturing plant of Porter-Cable. A great group of readers showed up, as well as many members of the Memphis Woodworking Club. Porter-Cable went all out with a fantastic tour of its amazing factory. Then we had lunch featuring some mouth watering barbecue.

The next day we did it all over again at Delta Machinery's factory in Tupelo, Miss. Once again, a really friendly group of readers and a fascinating tour of Delta's manufacturing plant where the Unisaw and 14" and 20" band saws are made. Barbecue was on the menu again, and it was even better (especially the baked beans).

I really must thank those readers we met for making us feel right at home, and of course, Porter-Cable and Delta. And here's a special message to one of our guests on the Tupelo tour, Trooper Craig Bishop of the Mississippi Highway Patrol: We drove back to Cincinnati, arriving safely, *and* in record time! **PW**

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Safety Note

Safety is your responsibility.
Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand. **Safety First!**

My cherry table has me afraid of blotching

How Can I Prevent this Project from Looking Like a Mess?

I'm an avid reader of your publication and owe any finishing ability that I may have to Contributing Editor Bob Flexner's book "Understanding Wood Finishing."

I have a finishing question that I hope he can help me with. I'm about to start finishing a cherry table that I've built and intended to use WoodKote's Gel'd stain to avoid the splotchy effect.

Unfortunately, despite my best sanding and scraping efforts, the table has a number of mill marks and scratches that are evident in a raking light.

I understand that a dye stain would not highlight these defects as much as a pigment stain (such as WoodKote) would. I'm having great difficulty finding a gel stain that is also a dye stain. Could you suggest any brand names?

Phil Serruya
Thornhill, Ontario

Flexner replies: Any type of stain that you wipe or brush on and wipe off is going to highlight the flaws in your table top. The reason is that you are leaving more of the colorant in these depressions, like the scratches, no matter what type of colorant you're using.

My first suggestion would be to sand or scrape the surface until you've eliminated these flaws. Then you've solved the problem. If you leave the flaws, the only way to stain your table without accenting them is to spray on a stain and leave it; that is, spray just enough to give you the color you want and then don't wipe any off. This method will deposit an equal amount of colorant everywhere.

With practice you can even spray a fast-drying stain, like an NGR (non-grain raising) dye stain, so it flashes so quickly that it doesn't soak deep enough to bring out the natural blotching in the wood.

You could also seal the wood with a first coat of finish and then spray on a toner coat (the finish with some colorant in it). This method would be safer because you wouldn't highlight the mill marks or any potential blotching in the wood. But you also won't bring out any of the figure in the wood. The best type of colorant to use here is probably dye because pigment will muddy the wood.

If you can't spray, you could seal the wood and then apply a glaze. But the more color you add, the more you will muddy the surface because glazes are pigment.

Whatever you decide, you should practice on scrap first to be sure you can get the results you want.

— Bob Flexner, contributing editor

Making the Case for Using Native Woods, or Free Ones

I get a kick out of the woodworkers who have a mahogany or walnut appetite and a pine pocketbook. Let's get down to basics: a woodworker of any skill level would not produce a better table if he used walnut or if he used pine.

There is a solution for those with limited money. Buy native woods, which are less expensive than imported ones. There also is a large source of wood that is free. Pallets and skids are free for the asking.

continued on page 10

WE WANT TO HEAR FROM YOU

***Popular Woodworking* welcomes letters from readers with questions or comments about the magazine or woodworking in general. We try to respond to all correspondence. Published letters may be edited for length or style. All letters become the property of *Popular Woodworking*.**

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Letters

continued from page 8

These boards are four feet long and 4" to 8" wide. Most are hardwood. All you need to harvest them is a nail puller, crow bar and hammer. And with a little staining, it can look like mahogany or walnut. And the price is right.

We should all do the best we can with what we have. It will make us better craftsmen.

Alex Ribak
Shelburne, Vermont

Yet Another Tip for Preventing Rust on Your Shop Machines

I thought I'd pass along this trick for rust prevention. It's not my idea, but it works. After sanding any bare metal surface with fine sandpaper or steel wool, coat the surface with "Instant Miracle Shine" and let it dry. "Instant Miracle Shine" is a shoe shine kit I buy for $1 at one of those stores where everything is $1. The product contains lemon and mink oil.

I use a lot of pine, poplar and oak in my shop, and so far I've had no problems with finishing my wood. Best dollar I've ever spent.

Jack Burnham
Morrice, Michigan

PW Can be Hard to Find Overseas, but Worth it

Popular Woodworking is not a magazine I have read before, probably because of its scarcity at the local newsagent. In fact, I flicked through the January 2000 issue, the last copy available, which was damaged, and saw an article I liked, "Closet Overhaul." I had to hunt around for a couple days to find an intact one. I am halfway through and am impressed. After reading the "Letters" column, I am sorry I missed earlier issues.

Your Caption the Cartoon contest reminds me of a story that a friend of mine tells who is a sales manager for Record Tools. A customer returned a wooden-handled hammer as defective. The handle was sawn clean through and was returned because the customer did not see it under the board he was cutting through. The hammer was replaced because the story was the most original complaint they had ever had.

Mark D. Wood
South Africa

Projects for All Tastes and Skills Make a Balanced Magazine

I just received the August 2000 issue. The drop-lid secretary on the cover is absolutely exquisite. It was with interest that I read the article by Troy Sexton about the great deal on the "oak" he got at auction.

When I got to the fifth paragraph: "...I've been a professional cabinetmaker for a long time, ... I've got to tell you that some aspects of this project were a real challenge." I thought, "Oh great. Not even likely I'll ever get to this one." I've been doing woodworking for less than two years. (My Celtic bookshelf was pictured in your letters last September.) Because I am not quite ready to quit my day job as a chiropractor and take up cabinetmaking I was relieved to see a few projects for us aspiring woodworkers. Some of your readers may be inspired to tackle the secretary, but I'm going to tackle the folding plant stand! Thanks for the variety of projects. They are great encouragement and inspiration and sometimes, just great reading!

Dr. Cynthia Williams
Grand Terrace, California

Get the 'Wood Handbook' for Free on the Internet

I enjoyed Nick Engler's article "The Way Wood Works," (June 2000) that explains the anisotropic nature of wood. Artisans must be aware that wood is not a homogeneous material.

On the sidebar, "Gotta Have It," you mention the "Wood Handbook" from the U.S. Forest Products Laboratory. This handbook, in addition to being available from the Government Printing Office, is also available free on the web. It is available in a chapter by chapter basis, for either downloading or viewing at http://www.fpl.fs.fed.us/documnts/FPLGTR/fplgtr113/fplgtr113.htm

By downloading the free Adobe Acrobat Reader, you can view, print and search the documents very easily. **PW**

Keith Mealy
Cincinnati, Ohio

Editor's note: If you don't want to type all that in, visit www.popwood.com, click on "Searchable Links" and search for "wood handbook." You'll be there in no time.

Microadjustable Support Stand

The extra hand you need — and one more.

My grandfather used to call them "dead men" — T-shaped stands that he placed outboard of a tool or a workbench for additional support. They were the extra hands he needed to manage large workpieces — when I wasn't around, that is. After I was old enough to have my own shop, I built dead men topped with rollers to help support the work. These roller stands are very useful — indispensable, really, unless you have a permanent grandchild installed in your shop.

The trouble is, sometimes a board droops as it leaves the worktable. By the time it reaches the stand, it may have dropped below the roller. You need a grandchild to guide the workpiece onto the stand, which, of course, puts you right back to square one.

Because my own grandchildren are not all that useful yet (they still tend to drool on the tools), I decided to improve my roller stand by adding an extension table. This table fills the gap between the stand and the worktable, supporting the workpiece and guiding it onto the rollers. It's an extra hand for my extra hand, if you will. When I don't need the table, it swings down out of the way, and I can use the roller stand alone.

I made one more improvement. When using a support stand or an extension table, it's difficult to adjust it level with the power tool. So I made this stand microadjustable. A small screw jack makes it possible to dial in the position of the stand and the table in 1/64" increments. Pretty neat, huh? You can't get this option elsewhere, even on the better grade of grandkids.

Building the Support Stand

The support stand is made up of four assemblies: the base, the roller head, the extension table and the jack.

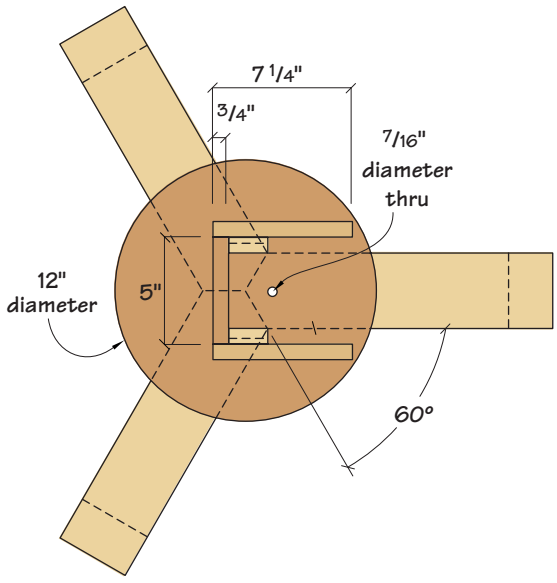
Nick Engler is the author of over 50 books on woodworking, plus countless articles and project plans. He has two granddaughters who are currently more interested in eating sawdust than helping him make it.

To adjust the extension table level with the tool, lay a straightedge across them. Loosen the locking knob and raise the roller head. It's so easy, you're guaranteed not to curse and wake Fluffy.

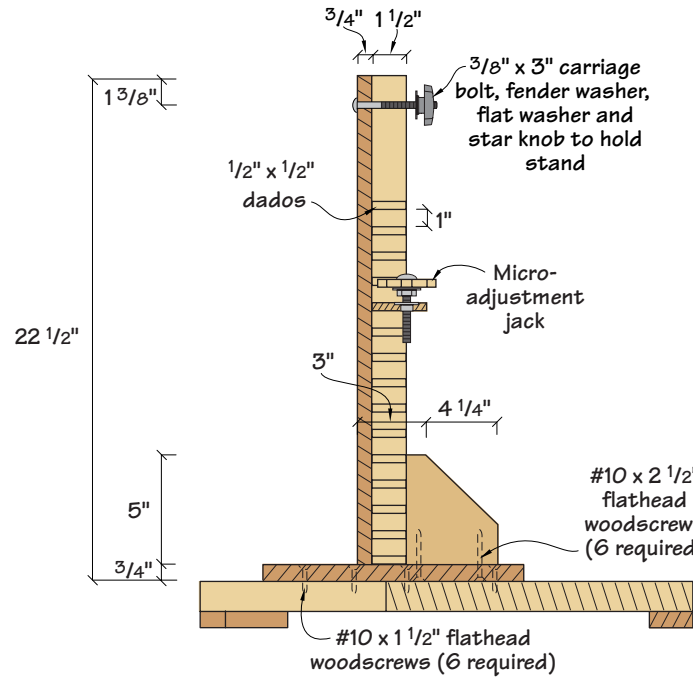
Photos by Al Parrish

Base • The base rests on three feet so it will be stable, even on an uneven floor. The feet support a U-shaped channel that holds the roller head and guides it up and down. The sides of this channel are dadoed to hold the microadjustment jack.

To make the base, double-miter the adjoining ends of the legs and attach them to the underside of a round plywood plate with screws and glue. Cut dadoes in a board



Plan



Profile

spaced every 1", then rip the board into two strips. Use these strips for the sides of the U-shaped guide. Assemble the guide and attach it to the top of the round plate.

Roller head • To help feed the work across the stand, I used 1" roller bearings (sometimes called transfer balls). I like these doodads because they will roll in any direction. You can use them to rip, crosscut or cut circles without having to worry about the roller pulling the work to one side if it isn't perfectly aligned with the direction of feed.

I arranged the rollers in two staggered rows on the top of a T-shaped mount. This arrangement packs the balls closer together and gives you more support when feeding narrow workpieces.

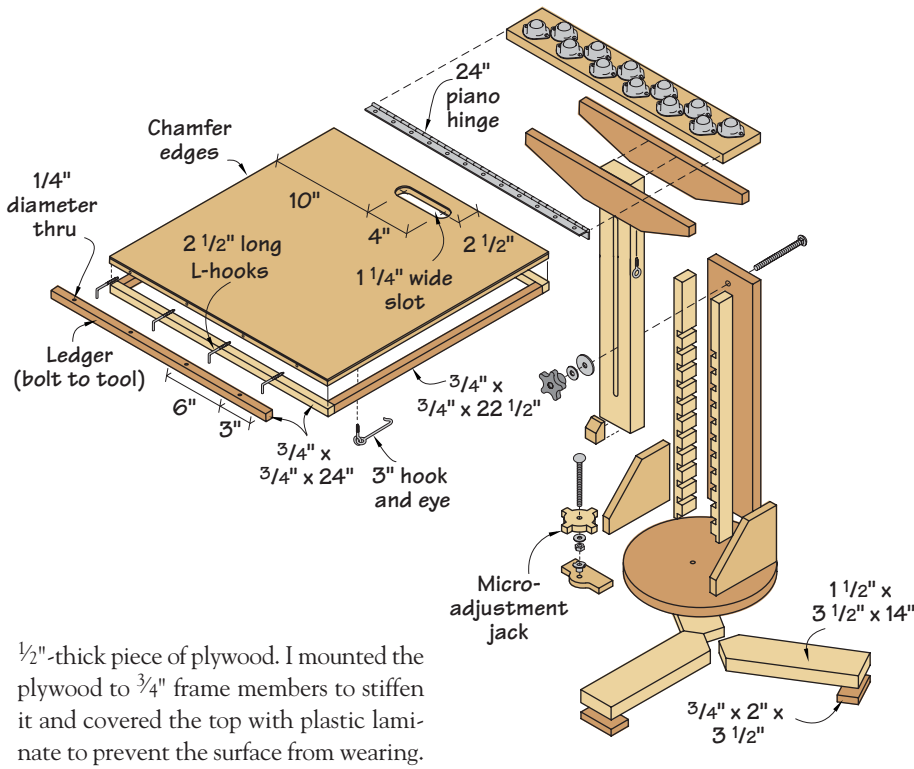
Rout a long slot down the center of the post that supports the roller head. When mounted in the base, a carriage bolt extends through the post slot and the back of the guide. A star knob and a fender washer secure the post in the guide. To adjust the height of the stand, loosen the knob.

As drawn, the support stand adjusts from 30" to 46½" high — just a little lower and a little higher than the tools in my shop. If it doesn't work for your shop, you can change the height range by varying the length of the guide, post and slot.

Extension table • The table is just a ½"-thick piece of plywood. I mounted the plywood to ¾" frame members to stiffen it and covered the top with plastic laminate to prevent the surface from wearing.

One end of the extension table is attached to the roller head with a piano hinge. Screw the hinge to the table first, then position it on the roller head. Have a grandkid hold the table out horizontal while you move the hinge until the tops of the roller bearing are 1/16" above the top of the table. Clamp the hinge to the roller head and secure it with screws.

The other end of the table hooks to a



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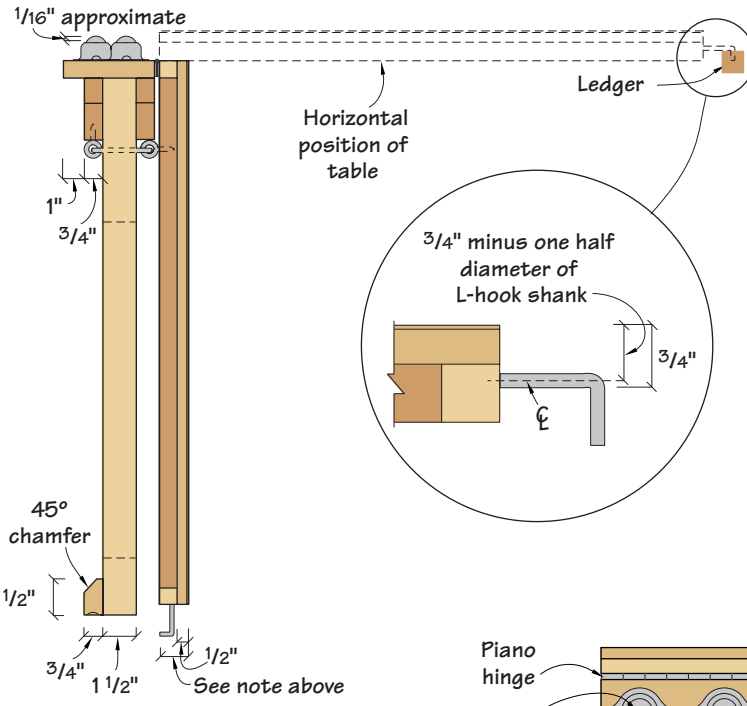
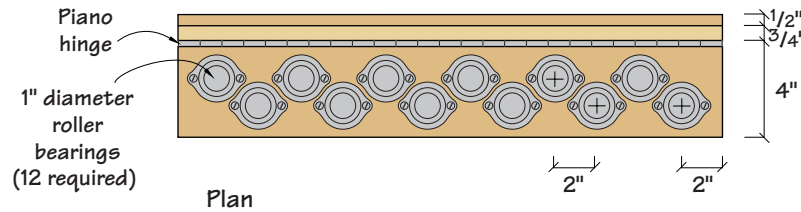


Elevation

To use the roller stand alone, simply swing the extension table down out of the way.



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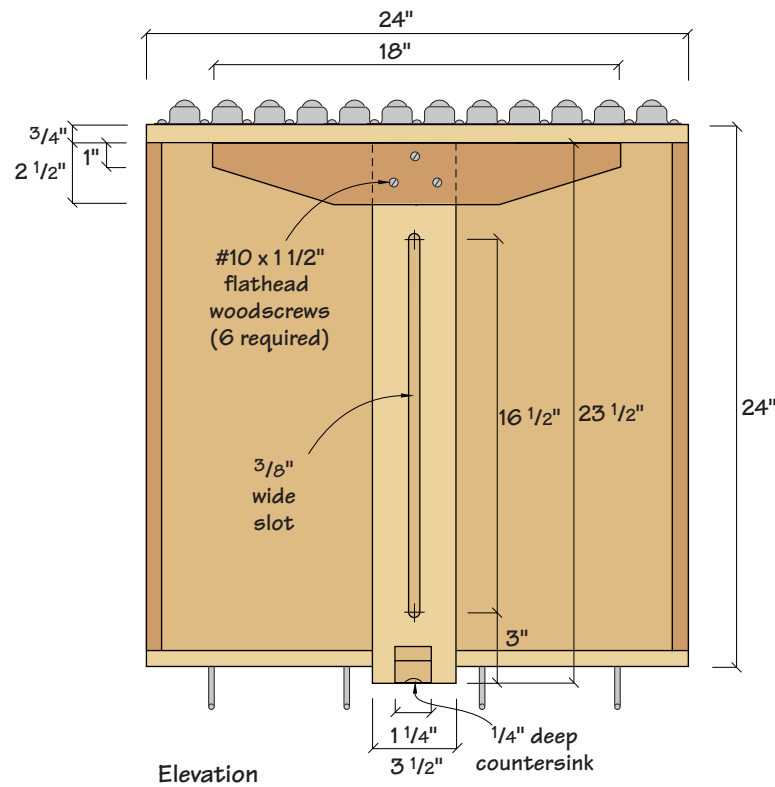


Elevation

ledger. This is a one-by with a few holes in it. Bolt the ledger to the side of the machine or bench where you want to attach the support stand. The top face of the ledger should be precisely 3/4" below the work surface. Install L-hooks in the end of the table, spaced the same as the holes in the ledger. The hooks fit in the ledger, securing the table. You can fine-tune the height of the table by bending the hooks.

I've made several ledgers and attached them to the tools where I use the support stand. I've attached two ledgers to my table saw — one for ripping and one for crosscutting. This lets me move the stand wherever it's needed.

Cut a slot in the table to serve as a handhold to carry the stand around the shop. To keep the table from flipping up when you do this, install a hook-and-eye in the underside of the roller head and the extension table.

Microadjustment jack • The jack is just a carriage bolt that turns in a T-nut. The T-nut rests in a small base that's slightly wider than the post and thinner than the dadoes in the guide. This lets you slide

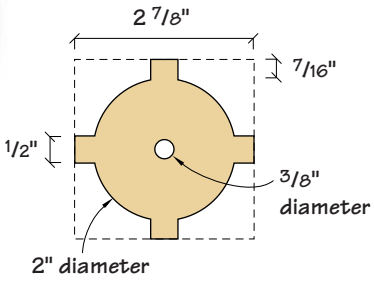
continued on page 16

continued from page 14

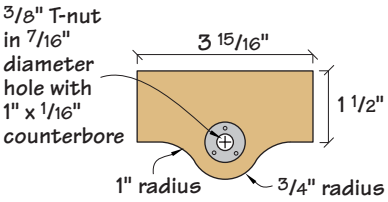
it in and out of the dadoes whenever you must readjust the height of the stand. The head of the carriage bolt is imbedded in a wooden knob with several tabs around the circumference. These tabs not only help you turn the knob, they allow you to calculate precisely how much you're raising or lowering the roller head and extension table.

The carriage bolt is 3/8" x 16 threads — which is 16 threads per inch. Turn it just one revolution and you raise or lower the stand 1/16". One-quarter turn (one tab) moves the stands 1/64".

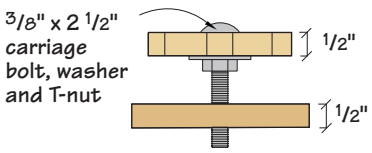
The top of the carriage bolt butts against a small wooden "finger" that is glued to face of the post, flush with the bottom. I drilled a shallow countersink in the bottom of this finger. The domed head of the carriage bolt rests in this countersink. This, in turn, keeps the bolt from wandering or wobbling as you turn the knob. **PW**



Jack Top Layout



Jack Base Layout



Jack Side View

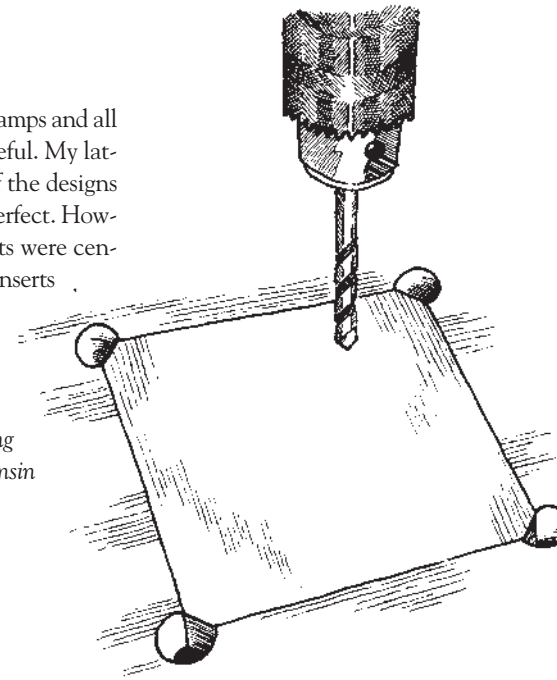
Insert the microadjustment jack into the dado slots just below the post. Let the post drop down onto the jack, then turn the knob until you can't see any daylight between the table and the straightedge.

Illustrations: John McCormick

A Trick For Your Drill Press Table

Having just started in woodworking I am busy making jigs and clamps and all the other bits and pieces I seem to need to produce anything useful. My latest project is a table for my drill press. While looking at most of the designs on the market I saw that you old-timers have got it pretty near perfect. However the thing that struck me was that all the replaceable inserts were centrally mounted, giving two or four options for changes when the inserts become inevitably used. I have offset mine to one side and made it square so that I can use the four corners on one side and then turn it over and have four on the other side. I cut the insert just bigger than the largest drill bit I have.

Mike Harding
Menomonee Falls, Wisconsin



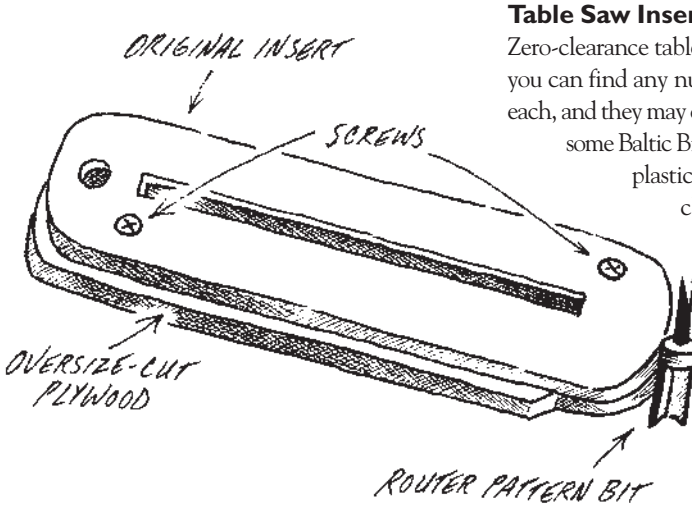


Table Saw Inserts

Zero-clearance table saw inserts are a must in our shop here at the magazine, and while you can find any number of plastic inserts for sale in the catalogs, they cost about $15 each, and they may or may not fit your saw. Our answer is a little bit of pattern routing and some Baltic Birch high-density plywood or Ultra High Molecular Weight (UHMW) plastic. Simply take the original table saw insert and drill a couple of small clearance holes through the insert. Screw the metal insert to a plywood or UHMW blank (cut it a little oversize on the band saw) and use a pattern routing bit to shape the plywood to a perfect fit. Make a few at the same time and you'll always have a zero clearance insert for different sized dadoes, bevel cuts and more. Make your own leveling screws for the new inserts by screwing ½" x #4 screws into the underside of each insert, aligned with the flanges in the table saw's top.

Popular Woodworking staff

continued on page 20

COMING IN DECEMBER
TRICKS OF THE TRADE - FROM "THE AMERICAN WOODSHOP®"

Starting in the December 2000 issue we welcome Scott Phillips, host of the popular PBS program "The American Woodshop," as a contributing editor. Scott will share his favorite tips, tricks and great woodworking ideas he has collected over the years. We still welcome readers' tips and tricks, and we'll continue to run the best tip or trick from a reader each issue. In fact, we've added Delta Woodworking Machinery as the sponsor for the Tricks of The Trade column, and we'll award a fabulous model 22-560 12½" benchtop planer to the best "trickster" each issue.

To submit your tip or trick, you can e-mail your trick and daytime phone number to us at DavidT@FWPubs.com or mail it to: Tricks of the Trade • *Popular Woodworking* • 1507 Dana Ave. • Cincinnati, OH 45207. All entries become the property of *Popular Woodworking*.

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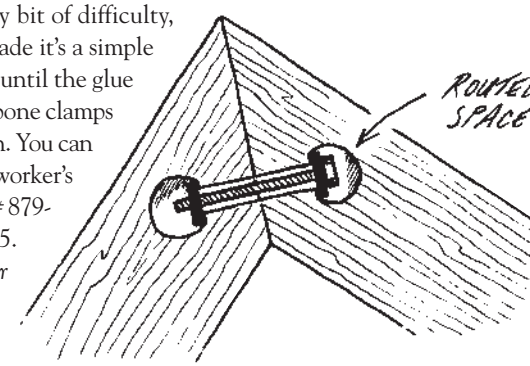
continued from page 18

'Dog-Bone' Frame Clamps

There are some amazing specialty clamps for gluing miters, and we're also amazed by some of the prices. It's no trick to spend $40 apiece for mitered corner clamps. And because most frames have four corners, you can spend $160 very easily. By stealing some much less expensive hardware from a commercial application, we've come up with a much cheaper miter clamp that works great for picture frames. Tight-joint fasteners, often called "dog bones" in the trade, are commonly used to pull tops together, but by shortening the length of the bolt and making a routered cut-out on the back of the frame corners you can make a pretty simple corner clamp for less than a buck. The routing template is the only bit of difficulty, but once that template is made it's a simple step to clamp up the corner until the glue is dry. Then release the dog bone clamps and they're ready to use again. You can order dog bones from Woodworker's Supply 800-645-9292. Item # 879-216. Ten dog bones for $7.75.

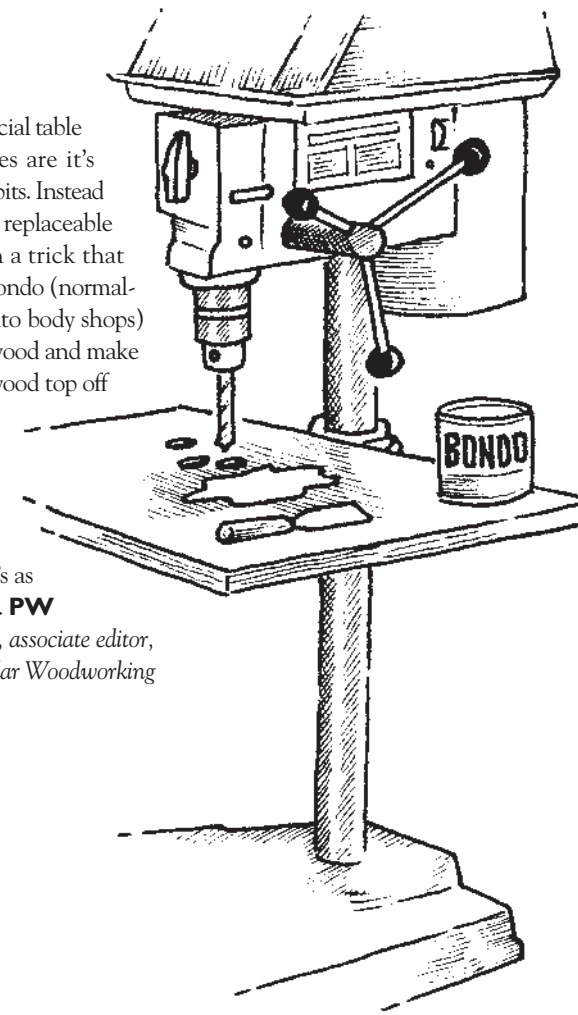
Steve Shanesy, editor and publisher, Popular Woodworking



Fix Your Drill Press Table in Minutes

If you have constructed a special table for your drill press, chances are it's pocked with holes from drill bits. Instead of constructing some sort of replaceable insert, we've come up with a trick that works just as well. A little Bondo (normally used to repair holes by auto body shops) can fill the holes in the plywood and make it good as new. Pull the plywood top off your drill press, apply some Bondo to the hole or holes in the table and let it dry. With a little sanding you're ready to go back to drilling on a surface that's as sturdy (or sturdier) as before. **PW**

Jim Stuard, associate editor, Popular Woodworking



Tinker Toys, Soccer Balls and Spaghetti

The keys to understanding finishes.

Though you may use only one or two finishes in your work, you've surely wondered about the others and how they compare. You've probably even asked yourself if you shouldn't be using one of them instead.

To help answer this question, you may have tried to classify finishes by their resins – polyurethane, alkyd, acrylic, etc., but then realized that this isn't very helpful. Take polyurethane, for example. It is used in oil-base varnishes, water-base finishes, some lacquers and some two-part finishes. If you've used any two of these finishes, you know that they are very different.

A much better way to make sense of finishes, so you can choose intelligently among them, is to combine them into three groups by the way they cure, then associate each of the groups with familiar objects – Tinker Toys, spaghetti and soccer balls. This may seem silly at first, but the objects make the groups easy to remember and the groups allow you to figure out the answers to most of your questions, even though you may never have used the finishes.

The Groups

The three groups are reactive, evaporative and coalescing.

Oil, varnish, and two-part finishes are reactive finishes because they cure by a chemical reaction that occurs in the finish when it comes in contact with oxygen (oil and varnish) or has a catalyst added (two-part finishes). Since the chemical reaction causes the molecules in the finish to join up or "crosslink," you can picture reactive finishes as Tinker Toys on a molecular scale that link up in a very large network. (See drawing #1)

Shellac, lacquer and wax cure entirely by the evaporation of their solvents (there is no chemical reaction and no linking up), so they are evaporative finishes. These finishes are made up of relatively large molecules that are long and stringy in shape, making the finishes resemble entangled, molecular spaghetti. (See drawing #2)

If you let all the water evaporate out of a pot of actual spaghetti, it hardens. If you then reintroduce water, the spaghetti first softens and becomes sticky, then the individual strands separate. The same happens to shellac with alcohol, lacquer with lacquer thinner and wax with turpentine or a petroleum distillate, only on a molecular scale.

Water-base finishes cure both by chemical reaction and liquid evaporation. Like latex paint and white and yellow glue, water-base finishes are composed of tiny droplets of finish suspended ("emulsified") in water and solvent. These droplets are very large compared to the molecules in the other finishes. Inside each droplet the finish molecules cure by chemical reaction, but the droplets themselves join only as a result of the water, and then the solvent, evaporating. (See drawing #3)

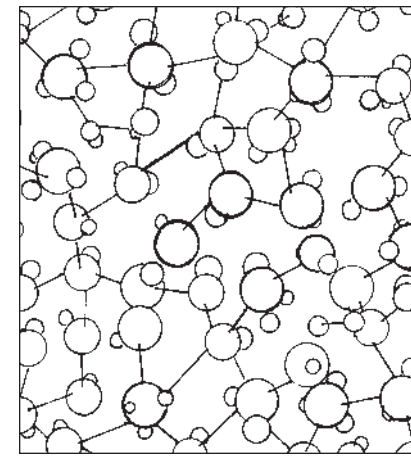
You can picture the droplets of cured finish as microscopic soccer balls. As the water evaporates, the soccer-ball-like droplets approach each other, or "coalesce," so water-base finishes are classified as coalescing finishes. The small amount of organic solvent in water base then softens the outer surface of the droplets so they stick together when they come in contact. The solvent then evaporates and a film is formed.

Putting water back onto a cured water-base finish doesn't cause any damage, but a strong organic solvent like alcohol or lacquer thinner will make the finish sticky, and dull it or dissolve it, just like the solvent does to evaporative finishes.

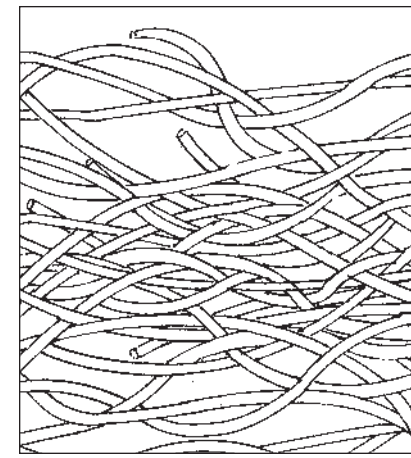
Using This Information

There are five characteristics you com-

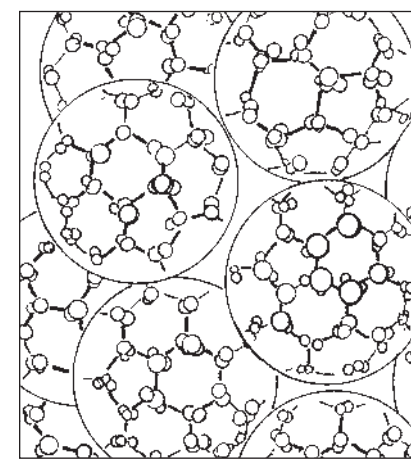
continued on page 24



1. Tinker Toys
Reactive finishes (oil, varnish and two-part finishes) cure by chemical reaction after the thinner evaporates. On a molecular scale, these finishes resemble a gigantic Tinker-Toy-like network when cured.



2. Spaghetti
Evaporative finishes (shellac, lacquer and wax) cure when the spaghetti-like molecules tangle after the solvent evaporates.



3. Soccer Balls
Coalescing finishes (water base) cure as droplets of reactive finish come together and stick to each other when the water and then the solvent in the finish evaporate. The droplets resemble microscopic soccer balls containing Tinker-Toy-like networks of reactive finish inside each.

continued from page 22

monly look for in a finish.

• Protection for the wood (resistance to water and moisture-vapor penetration);

• Durability of the finish (scratch, heat, solvent, acid and alkali resistance);

• Rubbing qualities (ease of rubbing to an even sheen);

• Reversibility (ease of repairing and stripping);

• Curing speed (ease of application without dust or sagging problems).

The Tinker-Toy-like reactive finishes – varnish and two-part finishes – are very protective and durable because the cross-linked molecules are difficult to penetrate or break apart. (Oil finishes offer very little protection or durability because they cure too soft and are left too thin on the wood.)

In contrast, the evaporative finishes – shellac and lacquer – allow some water and moisture-vapor (humidity) penetration through the gaps where the spaghetti-like molecules bend around each other. And these finishes are easier to damage with coarse objects, heat, solvents, acids and alkalis because their molecules aren't held together by the strong ties common to reactive finishes.

(Like oil, wax is considerably weaker than shellac and lacquer because it's too soft and left too thin on the wood.)

The coalescing finish – water base – is resistant to abrasive damage because almost all the surface area is cross-linked inside the soccer-ball-like droplets. But where the droplets stick together, water and moisture vapor can penetrate; and heat, solvents, acids and alkalis can cause the droplets to separate.

This is not to say that evaporative and coalescing finishes are weak finishes, only that they aren't as protective or durable as reactive finishes. If you want the best finish for a kitchen table, kitchen cabinets or office desk, it's a reactive finish (not oil). But this degree of protection and durability is seldom necessary for an entertainment center, most woodwork or a bed.

The Trade Off

No finish can provide it all, however. There

continued on page 26

Flexner on Finishing

continued from page 24

is a price to pay for protection and durability. Scratch resistance, for example, has the negative side of making a finish difficult to rub to an even sheen using abrasives. Solvent resistance means greater difficulty recoating, repairing and stripping. Heat resistance makes burn-in repairs less successful, and alkali resistance increases the difficulty of cleaning brushes and stripping.

At the sacrifice of better protection and durability, most refinishers and high-end furniture factories use lacquer instead of two-part finishes because of the reduced problems recoating and repairing, and because lacquer is easier to polish to a beautiful satin sheen.

Ease of Application

As a final lesson to be learned from the Tinker-Toy, spaghetti and soccer-ball analogy, consider that finishes are easier to apply the faster they dry and become dust and sag free. Fast-drying shellac, lacquer, catalyzed finish and, to a lesser degree, water-base finish, are less likely to run, sag or collect dust than varnish. If you are one of the many woodworkers who use regular alkyd or polyurethane varnish for your finishing projects, you need to recognize that you're using the most difficult of all finishes to make look nice.

Ease of application is the reason factories that want the ultimate in protection and durability for objects like office furniture and kitchen cabinets use catalyzed finishes instead of polyurethane, even though these finishes are still difficult to rub to an even sheen and to repair and strip. No finish has everything.

Conclusion

It's often difficult to keep all the characteristics in mind when choosing among finishes, especially if you haven't used them all yourself. You can overcome much of your lack of hands-on experience by using the mental pictures of Tinker Toys, spaghetti and soccer balls to help keep the differences straight. **PW**

Bob Flexner is a nationally known finishing expert in Norman, Oklahoma, and the author of "Understanding Wood Finishing."

THE FINISHES

Even without the three groups to simplify the finishes, there are still only seven types of finishes to choose among:

• Oil, which includes raw and boiled linseed oil, pure tung oil (not the thinned varnishes often sold as "tung oil") and blends of oil and varnish, commonly sold as "Danish oil" and "antique oil." The characteristic that unites these finishes is their inability to cure hard, which makes them functional only if you wipe off the excess after each application.

• Varnish, which includes all hard-curing finishes that thin and clean up with turpentine or a petroleum distillate like paint thinner. Common polyurethane is a varnish, as are wiping varnishes (varnish thinned with paint thinner) and gel finishes.

• Two-part finishes, which, as the name indicates, are finishes that require the combining of two parts to cure. These include pre- and post-catalyzed lacquer (pre-catalyzed has the catalyst already added), conversion varnish, polyester, two-part polyurethane (both solvent-base and water-base) and epoxy.

• Shellac, the only finish that thins and cleans up with alcohol.

• Nitrocellulose and CAB-acrylic (water-white) lacquers, which always thin and clean up with lacquer thinner and can be easily dissolved with lacquer thinner even after they're fully cured.

• Wax, which includes liquid, paste and solid, and always dissolves and thins with turpentine or a petroleum distillate. As with oil, you buff off all the excess to make the soft-curing wax functional.

• Water-base finishes, which include all finishes that thin and clean up with water except those that would be classified as "two-part" finishes.

In practice, you rarely have to choose among all seven types. You usually choose among four.

To begin with, you can eliminate wax from the seven (except for decorative objects like turnings and carvings) because of its very weak protective and durability qualities. Wax is more often used as a polish on top of another finish to add shine and scratch resistance.

Of the remaining six types, you're usually limited to oil, varnish, shellac and water base if you aren't using a spray gun, because the other finishes dry too fast to apply with a cloth or brush.

If you are using a spray gun, you normally choose between two-part finishes, shellac, lacquer and water base because you can achieve all the looks and durabilities you want much faster with these finishes.

Delta Offers 18" Drum Sander

Performance: ●●●●○
Value: ●●●○○

Delta: 800-438-2486, or
www.deltawoodworking.com

Commercial shops have long used drum sanders to flatten and sand wide panels, but until recently prices and size (closely related) have kept this useful machine out of home shops. With the advent of the open-end sander by Performax a few years ago, prices have started to approach a level that makes them more accessible to the home woodworker.

Delta's new model 31-250, priced at $800, competes with the Performax 16-32 Plus and Ryobi's WDS1600 but offers 2" (or 4" in two passes) greater sanding capacity, and a motor rated for an extra ½ hp.

The sanding drum is powerd by a 1½ hp, 12.8 amp induction motor and allows the sander to sand at 2,210 or 3,300 surface feet per minute depending on belt adjustment and application. The feed belt is run by a .45 amp direct-drive D.C. motor that is infinitely adjustable to allow feed belt speeds from 1 to 12 feet per minute. The 18" x 20" cast iron table has an open-end design to allow a 36" board to be sanded in two passes by turning the board around.

One of the biggest concerns with open-end drum sanders is that the sanding head can flex, allowing the thickness of the board (across the width of the drum) to change. On the Delta, the table moves to adjust the height, while the sanding head remains fixed. During our testing, we were satisfied that there was no significant flex in the head. In addition, we found that adjusting the table parallel to the sanding drum was fairly simple using an Allen wrench and crescent wrench. There was adjustment required out of the box, but we recommend checking such settings on these machines in any case. Instructions were provided to accurately guide the operator through the set-up process. Another adjustment that's tricky on some drum sanders is the tracking (left-to-right) of the feed belt. The Delta is simple to adjust (again with an Allen wrench) and the adjustment is conveniently located at the infeed side of the machine.

The 1½ hp motor performed well and had plenty of power. The infeed pressure roller seems stiff at first because it doesn't grab the board like a planer does. But this stiffness provides the needed pressure to give you nearly snipe-free performance.

An awkward process with many drum sanders is changing the sandpaper strip. Changing the paper on the Delta proved no more awkward than on other models. The paper release and tensioning mechanism is very similar to that on other drum sanders, and held the paper firmly in place.

Overall, this machine would be a good addition to most home shops considering the move to wide-belt sanding. The 31-250 performs its task well, is easy to operate and adjust and provides more sanding capacity for the same price as similar models.

For more information, circle #160 on the Resource Directory Coupon.

How We Rate Tools

At *Popular Woodworking* we test new tools and products with an honest, real-world workout — just like you do when a tool arrives in your shop. We check to see how easy they are to assemble, how clear and complete the manuals are, and then we set them up for use and check the machines' tolerances against its competitors. Finally we put the tools to use in our shop building projects that appear in the magazine. Each issue the magazine's editorial staff shares our results and experiences, rating each product or tool for performance and value.

In rating tools we use a one-to-five scale, with "five" indicating that we consider this tool to be the leader in its category. You won't see many "one" or "two" ratings for performance because we don't feel the need to publicize an inferior tool. For value, "five" means the tool is a great deal for the money, while "one" means we consider it pricey. However, a low "value" rating may be for a one-of-a-kind or a really great tool that may be worth the high price.

There's no such thing as the best tool for every woodworker. Each person's needs are slightly different and may require different features and price ranges. If our tool reviews don't answer all your questions, contact me at 513-531-2690, ext. 255, or by e-mail at DavidT@FWPubs.com. If we haven't reviewed the tool you're considering, there's a good chance I've used the tool, but simply haven't had a chance to write a review. Give me a call and see if I can help. You can also check out our past published tool reviews at our website: www.popwood.com. And if that's not enough tool info for you, sign up through our website to receive our free e-mail newsletter every other week where we tell you where to get the best price on tools and provide up-to-the-minute information on the newest tools.

—David Thiel, senior editor

Makita's Newest (and Best) Routers

Performance: ●●●●●
Value: ●●●●○

Makita, 800-4MAKITA
or www.makitatools.com

With the introduction of four new routers, Makita has refreshed its router line with some of the best fixed-base routers we've reviewed. Makita has paid a lot of attention to user comfort, while still increasing power and performance with these new 11 amp, 2¼ hp routers, making them a joy to use.

Offered as two single-speed routers (RD1100 D-handle and RF1100 fixed handle) and two variable-speed models (RD1101 D-handle and RF1101 fixed handle), they operate at 24,000 rpm or between 8,000 and 24,000 rpm in the variable-speed models. Incorporating soft-start technology for smooth transition to speed and providing very low vibration, these models also use electronic speed control to continuously adapt the amperage draw to maintain peak torque under load. Despite all this power, these tools operated around 81dB, which is quiet for a router. As with all routers, though, you need ear protection.

The height adjustment mechanism is almost effortless to use and foolproof. To release the base you flip a pressure buckle, then you spin the motor housing to adjust the height. In our opinion, the height adjustment mechanism is the easiest to operate on the market today, though the Bosch 1617/1618 models offer more precise depth adjustment. Another feature on the Makita's base adjustment is designed for router table use. When mounted upsidedown in a router table, the motor will rotate out of the base, but then it drops into a detent rather than falling free, avoiding damage due to drops.

Other nice features include a premium 8-foot rubber cord, external brushes for ease of maintenance and a flat, unobstructed top surface to ease adjustment on a workbench. Prices for the various models are expected to range between $200 and $240. All models offer interchangeable ¼" and ½" collets and weigh under 8 pounds.

While we don't usually prefer routers over 1½ hp for free-hand use due to size, these routers offer great power in a manageable size and weight for that use, with the D-handled model being a particularly well-balanced favorite. We would have preferred a shaft-lock so bits could be changed with only one wrench, but considering what these routers have to offer, we won't be picky. Continued use will prove the ultimate dependability of these routers, but from what we've seen after two months of heavy use and Makita's reputation for motors and mechanics these routers should become strong favorites on many shopping lists.

For more information, circle #161 on the Resource Directory Coupon.

Tool Scoop

DeWalt Cuts the Cord On Its Biscuit Joiner

New from DeWalt, the DW931K and DW932K cordless biscuit joiners are simply cool tools. Take DeWalt's existing DW682K plate jointer, cut the cord off, and you've pretty much got the fence assembly of the cordless models. Add a 14.4- or 18-volt battery and you're ready to run. The 14.4 is around $240 and the 18v $260, while the corded model is $150, so you'll have to determine whether the cordless benefit is worth an extra $100. Maybe not, but if you're working a jobsite, or just hate the cords (like me) then it's worth considering—especially if you've already invested in a DeWalt cordless system. We'll have a full review of the 18 volt model in December's issue.

Bench Dog Multi-Use Featherboards

We were happy to recommend the Bench Dog router tables to our readers in a previous issue, and still consider them an excellent choice, so we're happy to mention that Bench Dog has added some accessories to its router-table line to make them even more convenient and safe. The Feather-Loc™ four-in-one featherboard accessory functions as a featherboard, fence stop, table stop and a starting pin (fulcrum). Sold in pairs for $29.95, Feather-Locs fit into any ¼" hex bolt T-tracks, or are available with a slot adapter. The accessories can be used on Bench Dog's table or fence extrusions, offering improved safety and easier control of work pieces.

Feather-Locs can be purchased through mail-order or from on-line retailers. For a list of locations call Bench Dog at 800-786-8902, or check out their website at www.benchdog.com.

Grizzly's G1023S — A Cabinet Saw At Contractor Saw Prices

When we saw the ad in Grizzly's newest catalog for the G1023S cabinet saw with a Biesemeyer-type fence for $775, we knew we had to test it.

Featuring a 3 hp (18 amp), 220v totally enclosed, fan cooled motor, two solid cast iron wings, a magnetic switch and the new Shop Fox Classic fence, this saw is an amazing bargain. Assembly was simple, and the fit and finish of the machine are quite good. In fact, the G1023S was ready to run with less fuss than we've ever had with a Grizzly machine. The only significant adjustment we had to make was to set the blade parallel to the miter slots. The motor provides plenty of power, and the table flatness is well within acceptable parameters. Even the miter gauge is a little better than expected, with an adjustable-fit T-bar to reduce play.

The switch is drilled to mount on the left side of the table, which impedes easy access to the beveling handle, but if it bothers you enough, it's simple to relocate. The saw is set up for dust collection, but the motor cover to make it work efficiently is an extra $30. The saw comes with a standard and a dado blade insert, though we highly recommend a zero clearance insert.

The Shop Fox Classic fence (which is a copy of the Biesemeyer T-style fence) needed a little tweaking (one of the phenolic faces needed to be run over the jointer to reduce the height), but proved accurate and easily adjustable. Sold as an accessory as well, we were pleased to note that the fence is packaged with a tap and die for easier installation on other saws.

Performance: ●●●●○
Value: ●●●●●

Grizzly Industrial: 800-523-4777, or www.grizzly.com

Out the door for $840 (including shipping), or $870 with the motor cover, this is an exceptional deal. We're told that in the near future a 110v, 2hp model (G1023S-110) will be available for those without 220 power. If you were planning on getting a contractor saw because you couldn't afford a cabinet saw, think again. The G1023S is the serious home-shop answer, and a sound value for many small professional shops.

For more information, circle #162 on the Resource Directory Coupon.

POPULAR WOODWORKING
OCTOBER 2000

Freud SD208 Dado Stack

Some days it feels like I'm addicted to my dado stack. I use it to cut almost all my tenons, rabbets, grooves, lap and bridle joints and (of course) dadoes. So when I went to replace my 15-year-old high-speed steel set — which tended to gnaw the wood instead of cutting it — I was looking for the perfect combination of price and performance. Lucky thing I found it on my first try with the Freud SD208 carbide dado stack.

For about $85, the SD208 comes with two 12-tooth 8"-diameter outside blades, four 1/8" two-tooth chippers, one 1/16" two-tooth chipper and a set of metal shims. This setup allows you to cut dadoes between 1/4" and 13/16" wide, which is more than adequate for any home shop.

More expensive dado sets have more teeth on the chipper blades for a cleaner cut (and to make balancing easier) and come with a nifty case and a 3/32" chipper. This undersized chipper lets you quickly set up your stack to cut dadoes for plywood, which can be notoriously undersized. And while these additional features are nice, the more expensive dado sets also cost twice as much as the SD208.

According to Freud, an Italian toolmaker, the carbide in the SD208 is the same grade (H01S) that the company uses in its more expensive sets. The teeth incorporate Freud's nice anti-kickback design and are set at a 15-degree hook angle, which is the same as Freud's Safety Dado (the SD308). This angle helps make the cut more aggressive, which makes it ideal for small or underpowered saws. The company's top-of-the-line dado sets use a negative five-degree hook angle, which actually reduces the aggressiveness of the cut for use in big cabinet saws.

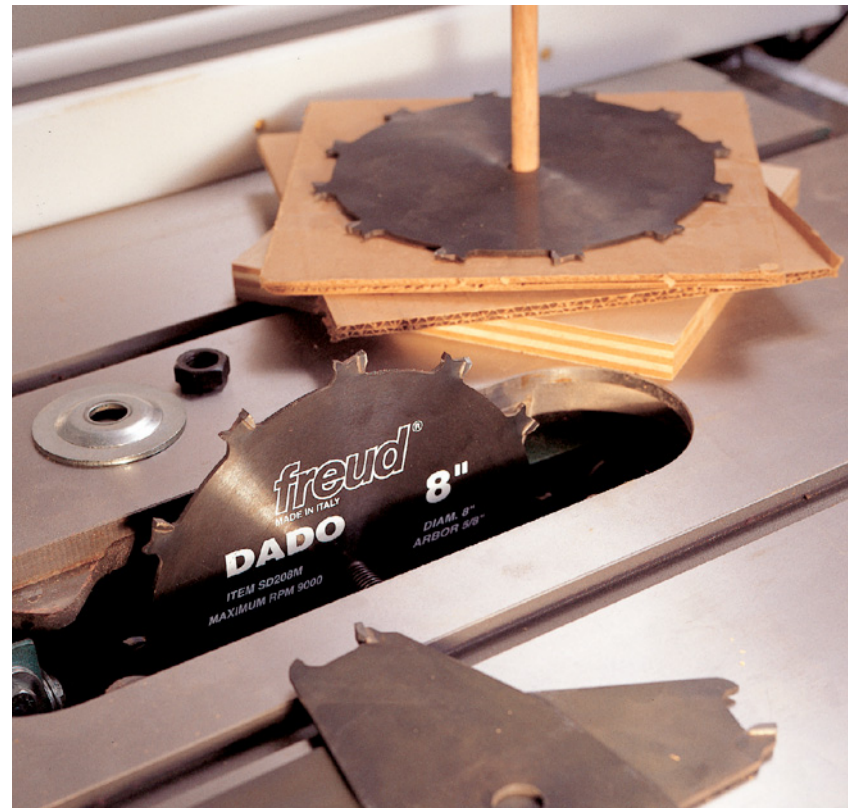


Photo by Al Parrish

So how does the SD208 perform? In solid wood, the SD208 cuts nearly as well as the more expensive sets. In plywood, you'll see a little more tearout on the underside of your cut than you would with a premium set.

To minimize tearout, take some of the money you saved and buy (or make) a couple of inexpensive zero-clearance inserts for your table saw. This will reduce — but not completely eliminate — the tearout on plywood.

Since you saved money by not buying a case with the set, the other thing to do is to make yourself something that will store the dado stack without damaging the carbide. The plastic blister-pack the SD208 comes in simply cannot be used for this purpose. I made a holder for my stack that consists of a piece of 8" x 8" scrap with a 5/8" dowel in the center. Then I put pieces of cardboard between each blade to protect the carbide.

After more than a year of routine use, the teeth have kept a good edge and the quality of the cut has remained as high as when I took the blades out of the wrapper. For the serious home woodworker, there is not a reason in the world to spend a penny more than the cost of the SD208. **PW**

—Christopher Schwarz

RESULTS

FREUD SD208 DADO STACK

NICE FEATURES

- **Clean cut in solid woods**
- **Decent cut in plywood**
- **Great quality for price**

RECOMMENDED MODIFICATIONS

- **Buy a zero-clearance insert**
- **Make a case to protect the carbide blades**

Freud 800-472-7307. The SD208 is available through Tool Crib of the North, 800-635-5140, for $84.99.

ABOUT OUR ENDURANCE TESTS

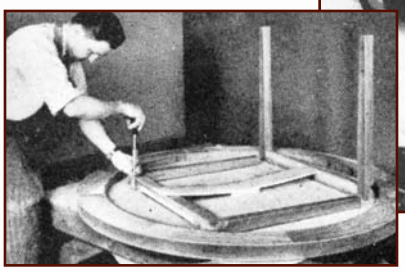
When a new tool hits the market we do our best to tell you what the benefits and pitfalls are with that tool. While this is good information, we know that the question you really want answered is, "How long will the tool last?" That's what this column is for. We regularly pick a tool we've used in our shop for at least a year that has stood up to our regular use. We make sure the tools we've tested here are virtually unchanged from the versions in the store today. So when you see a tool written up in here, it has passed the *Popular Woodworking* Endurance Test.

—David Thiel, senior editor

The Deltagram

A nostalgic look back at plans published by Delta Machinery before and during World War II.

From Volume 15, Issue No. 3, 1945

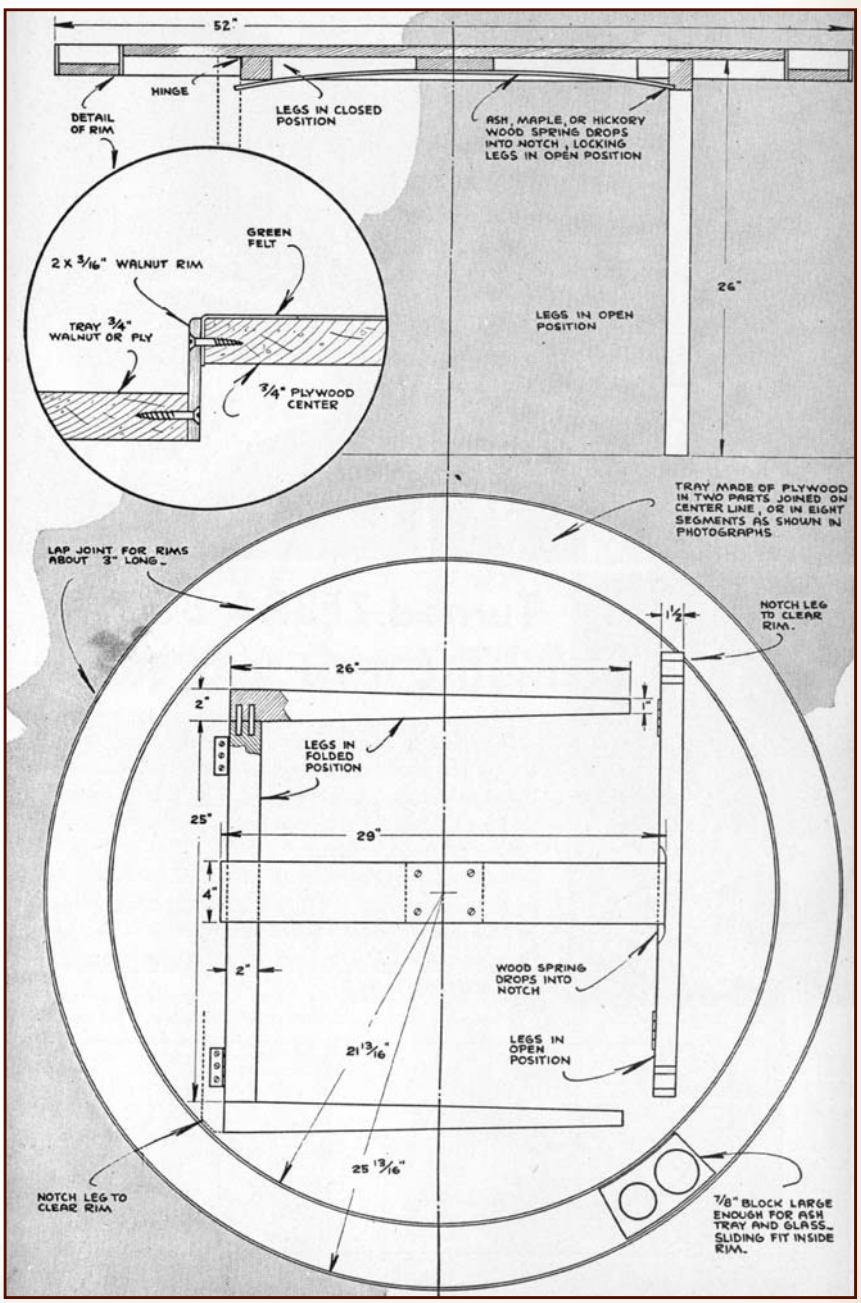


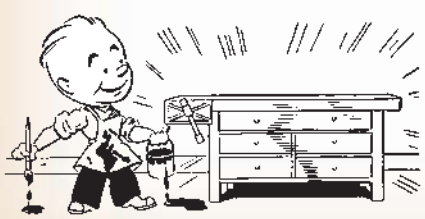
Circular Poker Table

Here's a popular type poker table with a novel arrangement for dividing the tray for a varying number of players.

The center part of the table is 3/4" plywood and the tray ring may be made either from eight splined hardwood segments or two plywood halves joined together on the center line. The tray ring is made up first, and the 2" x 3/16" walnut rim is then fastened to the inside of this ring. The outside walnut rim is then fastened to the outside of the tray. The center part of the table is then covered with green felt and inserted into the middle of the tray so that the top surface is flush with the upper edge of the rim. The completed tray is then fastened to this center part with screws only, so that the felt may be changed. The legs are then made and assembled in two units which are hinged to the underside of the table. A wood spring of hard wood such as ash, maple or birch holds the legs in either the folded or open position.

Eight blocks are now cut from 3/4" walnut to fit the inside of the tray. These blocks should have a sliding fit and should be long enough to hold a small ash tray and a glass. These blocks will then slide anywhere you wish inside the rim to divide the playing surface into any number of spaces up to eight. **PW**





The host of PBS' the Woodwright's Shop builds a foot-powered lathe and jigsaw.

By using recycled lumber he helps the environment, adds some 'new' equipment to his shop and impresses his daughter.

a lathe from a Loft

It all began when I went to pick up my daughter Rachell at the end of her freshman year at college. We had just finished loading her belongings when I spotted a pile of pine 4 x 4s and such in a nearby dumpster.

"What's all that wood?" I asked her.

"They're-old-lofts-from-people's-dorm-rooms,-Dad,-they're-trash-now-in-the-dumpster-please-let's-go!" she said, sinking a little in her seat. Her friends and classmates were all around, and I suddenly realized that this was a perfect opportunity to demonstrate my concern for the environment. Wouldn't she be proud!

"Let's go take a look. They even have a bunch of carriage bolts with them! I could make a treadle lathe from all this!"

"It's-trash-in-a-dumpster,-Dad,-let's-go-now. Please!" she said, pulling a sweatshirt over her face and sinking even lower. I guess the sun was bothering her.

"Come on! Let's show everyone how we don't let wood go to waste!" I said as I climbed up into the dumpster and began pulling old pizza boxes off the timbers. What a treasure! And best of all,

by Roy Underhill

Roy Underhill is the host of the television series, "The Woodwright's Shop," now celebrating his twentieth year of subversive woodworking on public TV. He is the author of five books on traditional woodworking, and for ten years he was master housewright at Colonial Williamsburg. He travels extensively, teaching and studying the technology of the pre-industrial era.

Photo by Al Parrish

Schedule of Materials • Foot Powered Lathe

No.	Ltr.	Item	Dimensions T W L	Material
2	A	Legs	3½" x 3½" x 30½"*	Pine
1	B	Foot	1½" x 3½" x 29½"	Pine
2	C	Feet	3½" x 3½" x 29½"	Pine
2	D	Stretchers	1½" x 3½" x 40"	Pine
2	E	Lathe bed rails	1½" x 3½" x 40"	Pine
2	F	Braces	1½" x 3½" x 34⅛"*	Pine
1	G	Headstock rear	1½" x 3½" x 36"*	Pine
1	H	Headstock front	1½" x 3½" x 11½"	Pine
1	I	Headstock pulley	2⅜" dia. x 3"	Pine
1	J	Tailstock	3½" x 3½" x 12"	Pine
1	K	Tailstock wedge	⅞" x 1⅛" x 6"	Pine
1	L	Tool rest	¾" x 3⅜" x 6"	Pine
1	M	Tool rest base	¾" x 4" x 8"	Pine
1	N	Guide block	2½" x 2½" x 3¼"	Pine
1	O	Locking panel	¾" x 2½" x 5½"	Pine
6	P	Flywheel	¾" x 7½" x 22½"	Pine
3	Q	Flywheel	1½" x 7½" x 22½"	Pine
1	R	Tie rod	¾" x 1½" x 13"	Pine
1	S	Treadle	¾" x 3½" x 29"	Pine
1	T	Connecting spacer	¾" x 1½" x 1½"	Pine

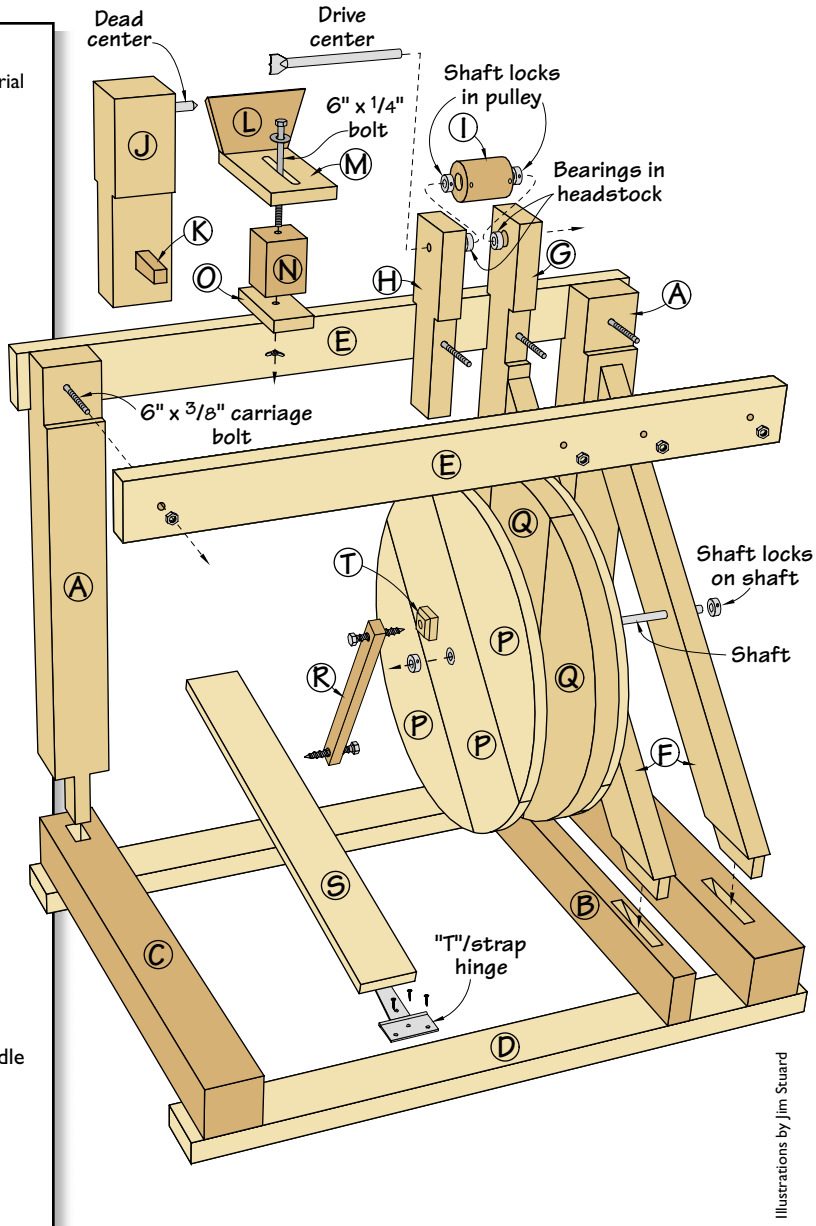
*Length includes tenons.

Jigsaw

1	U	Table	¾" x 9" x 23"	Pine
1	V	Front brace	1½" x 2" x 11½"	Pine
1	W	Back brace	1½" x 2¼" x 18"	Pine
1	X	Bottom rail	1½" x 3" x 22"	Pine
2	Y	Arms	½" x 2" x 22"	Oak
1	Z	Armature link	¾" x 1¼" x 4¼"	Pine
1	AA	Index block	¾" x 2½" x 2½"	Pine
1	BB	Locking panel	¾" x 2½" x 5½"	Pine

Hardware
Lathe
- 4- ½" stop collars
- 4- ½" thrust bearings
- 1- ½" fender washer
- 1- ½" x 36" steel rod (axle, drive & dead center, crank)
- 6- #12 x 4" wood screws for attaching stretchers to feet
- 4- 6" x ⅜" carriage bolts, nuts and washers
- 2- 3" x ⅜" carriage bolts connect tie rod, wheel and treadle
- 1- 3" "T" hinge for treadle

Jigsaw
- 2- 3½" x ¾" eye dia. x ⅜16" thread, eye bolts
- 1- ⅜16" thread x 2⅛" turnbuckle
- 2- ½" bronze sleeve bearing (sawn into two ½" lengths)
- 2- 1½" lengths of ½" shaft
- 2- Coping saw ends
- 1- 6" x ¼" bolt, wing nut and washers for mounting saw.
- 1- 3½" mending plate
- 1 ½" thrust bearing



Illustrations by Jim Stuard

The frame is the easiest part of the machine. Essentially the frame is three L-shaped frames, two 2x4 base plates and two 2x4 braces. The two outside frames are made from two 4x4 posts, and one 2x4 with tenons at both ends. The top of the upright 4x4 is rabbeted on both sides to form an open bridle joint with the top braces. The flywheel frame is made of 2x4s.

when I had finished loading the timbers, I looked at Rachell and saw that her pride in her old man had moved her to tears! Sometimes even I do things right.

The Frame and the Flywheel

The salvaged timber was perfect for my new treadle lathe design. This new lathe would be much simpler than my old one, using an "inboard" flywheel with the connecting rod attached to its face, rather than to a crankshaft that was difficult to make and hard to repair. It would also have a jigsaw attachment and, most important, would be a woodworking tool that kids could make for themselves.

As I was to be the primary kid using this lathe, it had to come apart and pack up small enough for easy travel. The frame of my lathe is only 40" long for two reasons. First, these lengths are easier to pack when traveling, second, the scavenged 2 x 4s were 80" long. You can certainly make it as tall and as long as you want, the only essential is a clear path for the drive belt between the flywheel and the driven pulley. I also used mortise-and-tenon joints to connect the three L-shaped frames and their braces so I could quickly knock them apart. They could just as easily be con-

I trimmed the center of the flywheel sandwich to a close octagon, then attached one side and continued to shape the two pieces. I then attached the other side and worked the whole flywheel to its ultimate round shape.

Being a firm believer in handy scraps, I was able to use two fall-off piece to help me square up the shaft to the wheel, then mark the bearing location on the wheel.

nected with screws or bolts and attached permanently.

In the past, I have made lathe flywheels like wagon wheels, with hubs, spokes, fellows and such. Although they look nice, they work no better than this sandwiched disc made from 1 x 8 and 2 x 8 pine. Since a finished "eight-inch" board is 7½" wide, three of them laid side by side will give you a 22½"-wide total. Because this is as wide as you can get, that gives you the diameter of the wheel, and the lengths you'll need for the nine boards of the sandwich.

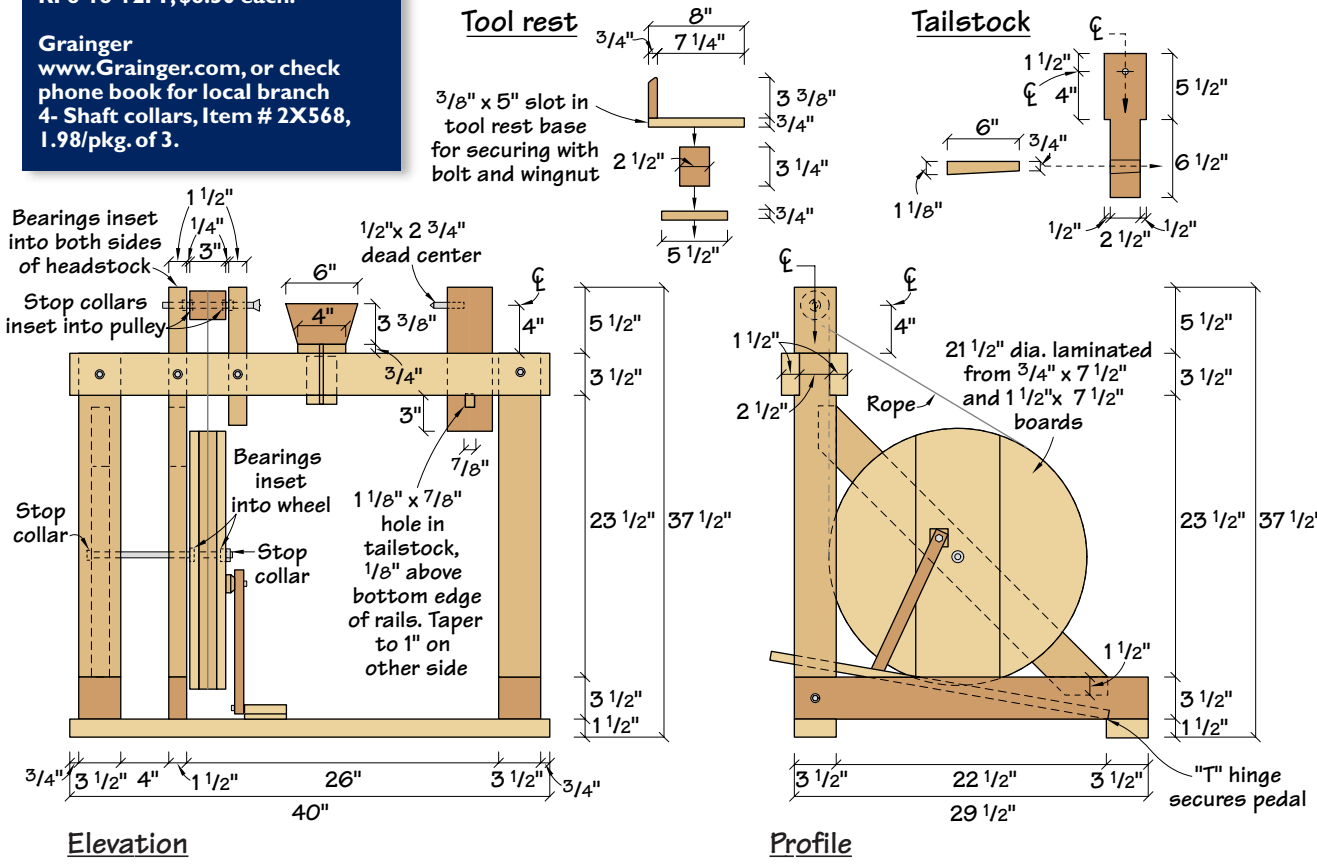
The flywheel has to be heavy so it will store energy, and balanced so it won't shake the lathe about as it spins. A 3"-thick solid disc of even the lightest pine will be heavy enough, so put your energy into getting the wheel balanced. If you have any boards that are heavier than the others, try to distribute them in the sandwich to create an even balance around the center. Pay attention at this point and you won't have to attach any weights later on.

Start with the three 2 x 8s that will be the filling of your board sandwich, sawing them to length and then assembling them side by side into a 22½" square. Find the center of the square by connecting opposite corners with intersecting diagonal lines and then draw the largest circle you can fit in the square using trammel points or a stick with holes in it. I used a

SUPPLIES

Bearing Distributors Inc.
513-761-0866
5 • Heim sealed bearings, item # RF8-18-12PP, $8.50 each.

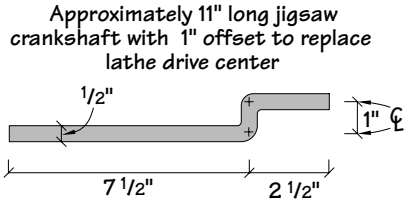
Grainger
www.Grainger.com, or check phone book for local branch
4- Shaft collars, Item # 2X568, 1.98/pkg. of 3.



Carving the groove in the flywheel for the rope takes a little time, but the changes in end-grain direction makes carving easier than turning.

The connecting rod is attached to the treadle by a lag bolt screwed into the treadle side.The opposite end of the connecting rod rides on a 3/8" lag bolt screwed through a small block (to allow clearance over the stop collar) into the flywheel.

Jigsaw Crankshaft



thin-bladed turning saw to cut the circle, but you can also make a series of close cuts with a regular panel saw and then chisel and shave down to the line.

Because each of the three layers in the flywheel will be offset 60 degrees from the others, the grain on the edge of the assembled wheel is going to be headed every which way and complicate smoothing with proper edge tools. Therefore, I urge you to bring the middle layer of the sandwich true to a circle before attaching an outer layer with slathers of glue and finishing nails. You can then bring the outer layers true to the inner circle with a minimum of cursing.

Mounting and Truing

Having taken care to make a balanced wheel, you need now to hang it true on the axle. Find the center of the disc by repeatedly swinging arcs from the outside edge with the trammel or other stick you used to draw the original diameter. The center of these arcs is the center of your wheel. I used two cheap thrust ball bearings in the wheel, aligned as follows:

- Set an expansive bit so that it will bore a snug hole for the bearing you intend to use, testing it on a scrap piece to be sure. Bore into the center mark just deep enough to inset the bearing.
- Now get a 9/16" auger and bore the rest of the way through the wheel. (As always, it's a lot easier to bore the larger diameter hole first and then center the smaller hole within it than it is to reverse the process.)

The object now is to inset the second bearing on the opposite face so that the wheel will not wobble on the shaft. Easy:

- Insert the first bearing in its socket and slide a length of the 1/2" shafting through it.
- Lay the wheel with this first bearing-side down. Slip the second bearing over the shaft so it slides down onto the upper face.
- Because the 9/16" hole extending through the wheel is larger than the shaft, you have enough play to push the shaft into a precisely square relationship with the face of the wheel. Check all around the axle shaft with several squares at once, and when you have it just right, carefully trace around the second bearing.
- Remove the bearing and the shaft and carve out the socket for the bearing with gouges and chisels. Even if you find you are a little out of square, you can correct the matter with shims and screws around the sides of the bearing.

With the wheel now running on its shaft, you can further balance and true it by holding the shaft in a vise and spinning the wheel. It doesn't need to spin like the wheel on a racing bike, just so it doesn't wobble and shake more than you do. I used the two teeth of a mortising gauge to lay out the 3/8" groove for the drive cord that goes all the way around the wheel. In theory, you could turn this groove into the periphery of the wheel as it spins, but considering the grain changes, you're better off carving.

The final finagling with the wheel involves mounting it squarely on the back braces of the lathe. Again, the fastest way to get it square is to bore the first hole through the innermost brace, set the long shaft into this hole, mount the wheel and then push and pull the shaft until the wheel is hanging with equal clearance all around. When the shaft is in the right position,

The two ends of the rope belt are butt-spliced by sewing back and forth between the two pieces. It only takes a minute or two with an upholstery needle. With time and use the rope will stretch and you'll need to cut and re-splice the rope.

smack the end with a hammer to leave a mark on the inside face of the second, outer brace to show where you need to bore the second hole. Finally, put a big fender washer between the wheel and the frame and stop collars on the ends of the shaft.

Of course the wheel doesn't do much without the treadle and connecting rod. The treadle simply attaches to the frame with a T-hinge at the back, and the connecting rod rides on a lag bolt set into its side, with the opposite end attached to the flywheel. Adjusting the attachment points of the tie rod to the flywheel and the treadle will partially determine the "mechanical advantage" (how high you have to lift your foot) of the lathe. A 6" motion at the end of the treadle seems about right for most work.

Headstock and Drive Center

The headstock consists of two extensions of the frame holding bearings. These bearings can be bronze or ball, but at least the left one must be a thrust bearing, meaning it is designed to take pressure along the length of the shaft as well as easing the shaft's rotation. You follow pretty much the same procedure used to align the bearings in the flywheel to make sure the bearings in the headstock are properly lined up.

Unlike the flywheel, the driven pulley needs to attach firmly to its shaft, as well as being readily removable. The stop collars inset into both ends of the pulley meet both of these needs; their greater diameter makes a firm connection to the wood of the pulley, and their set screws (reached through holes drilled through the pulley) allow you to remove and change the shaft as needed.

The wooden part of the driven pulley begins as a 3" section of pine 4 x 4. Find the center of one end and bore a precise inset for a stop collar into the end grain. Now set a 9/16" auger in the center of this hole and bore through to the other end, stopping just as the end of the lead screw peeks out. Using this point to center the auger, bore the inset for the second stop collar into the far end.

The pulley is still just a square block at this point — not much good. Put the stop collars in place and mount the block between the headstock bearings. Hold a pencil in place on the end grain to draw a 2¾"-diameter circle on each end. You can then remove the block and chisel down to these lines — assured that you have roughed in a pulley precisely concentric to the shaft. (It's kind of like shooting arrows at the side of the barn and then painting the targets around them — perfect every time.)

The roughed-in pulley is about to become your first turning job. Of course this means you need a belt to connect the flywheel to the pulley, and short of a proper bit of round leather belting (such as used on old sewing machines) you can get by with ¼" cotton cord, joined with a square knot for the time being. Simply wrap the rope around, pull it semi-snug and tie it off. Start treading and the roughed in pulley will spin so that you can turn it down to the finished size, using your regular turning gouges and an improvised tool rest. Once you get a smooth place turned, stop and move the rope into that spot, retying the knot tighter if necessary. Finally, turn a groove in the middle of the pulley for the belt to ride in. As with any lathe, the smaller the diameter of the driven pulley, the higher the speed and the lower the torque. You can, of course, just treadle faster or slower, and you can easily turn at over 1,000 rpm.

One peculiarity of this design is the crossed drive cord which creates the additional peculiarity of the flywheel going in the opposite direction as the driven pulley. The point of this crossing is to increase the contact surface between the belt and the small pulley. Without the crossed belt,

To sharpen the dead center for the tail stock, I slipped the bar into the drive pulley and tightened it down with the stop collars. Then it was a simple matter of turning the lathe and using a file to form the point. Note the crossed drive cord on the pulley which increases the contact on the pulley, keeping it from slipping during use.

The drive center is shown here being formed, with the jigsaw crankshaft lying next to it. After rough shaping, the center is filed and ultimately takes on its spade-bit shape. The center is then mounted in the drive pulley by tightening the stop collars.

or the addition of an idler pulley, the driven pulley would be constantly slipping. You can further reduce slipping by making the rope sticky with just about anything containing sugar. I use maple syrup with great success.

When the pulley is turned as smooth as you need, finish it by first drilling the holes through its sides to give access to the set screws in the stop collars. After the holes are done and tested, run some glue around the seats for the stop collars and, with the shaft in place, set the stop collars back in for the final time. You can continue with the knot in the rope to let it stretch and until you get an idea of how much tension it needs. Eventually, though, you'll want to butt-splice the rope.

Tailstock and Dead Center

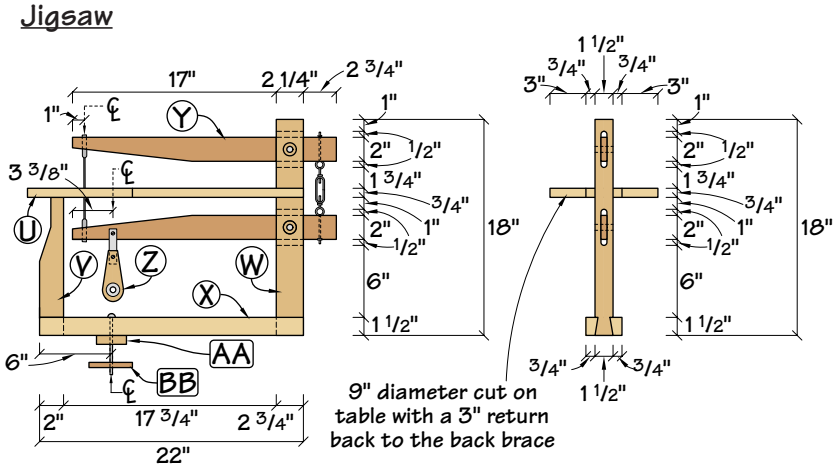
Now for the second piece of turning — the dead center for the tail stock. The dead center is just a short length of the ½" shafting with the business end sharpened to a precise conical point. The angle of the cone is not critical, but its concentricity is. If the point is the least bit lopsided or rough, it will quickly enlarge its contact point with the wood being turned and will be a constant source of trouble. So, although you can quickly rough in the point by freehand filing, the final shaping needs to come from mounting it in the driven pulley, (before you cut it into the 3" length that you need), tightening the stop collars and bringing the end true with your file held against the spinning point. After this, you'll be able to tell folks how your treadle lathe works for turning metal as well.

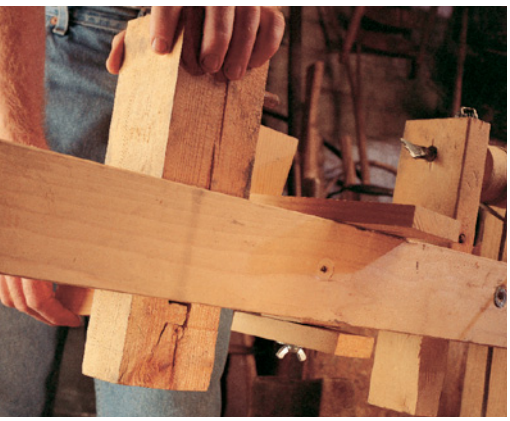
Would that the drive center was as easy. The drive center needs to grip the end of the wood being turned, and has somewhat the shape of a spade bit. Having anvils and forge about, it was quickest for me to simply heat, hammer and file the end of the shaft into shape. This may be the most awkward part of the lathe for you (kid or not) to make. Although you can cold hammer the drive center into shape, you will need a good red heat to make the sharply bent crankshaft for the jigsaw attachment. Minimally, you can do the job yourself with a torch, a hammer, a vise and something to use for an anvil. The path of wisdom, however, may be to support your local blacksmith.

With the drive center in place, all that remains is the tool rest, which can be a full length bar resting on outriggers attached to the head and tail stocks, or a smaller L-shaped construction attached by bolt and wing nut, or both. The tailstock is attached with a wedge.

Turning

Using the lathe is just the same as with any other alcohol-powered equipment. Rough in the stock to an octagon before mounting it between the centers, being sure to rub some beeswax in the hole for the dead





The bent crankshaft is attached to the jigsaw through a hanging armature link. The mount is attached to the jigsaw with a piece of steel strapping screwed into a saw kerf in the mount, and attached loosely to the lower jigsaw arm.

An L-shaped tool rest is shown here attached by bolt and wing nut to the lathe frame. The tailstock is best attached with a wedge. This is the fastest and the firmest way to move and mount the tailstock. The wedge gives just the right "pinch" to the wood being turned if you slightly cock the bottom of the tailstock towards the center before tapping the wedge home.

center. If your bearings are too cheap and have so much play in them that the work chatters when you're turning, you can compensate a bit by adjusting your cutting style to put more of a "push" from rubbing the bevel. Bronze bearings may have less play than cheap ball bearings. You can even turn the bearings slightly out of square with the shaft to tighten them up.

Still, machines tend to give you problems at places where motion changes direction, like when car engines "throw a rod," the conversion of the reciprocal motion of your foot on the treadle into the rotary motion of the flywheel is a potential trouble spot. Just as a car needs accurate timing, so too does the foot operating the lathe need timing, as a sudden stop in the foot will meet with considerable resistance from the flywheel, snapping the connection at the end of the tie rod. You will develop considerable expertise with this lathe, but it is so inviting for others to try that you will have a lot of inexperienced feet on it, they will snap the bolt, and excuse themselves by making a comment about "walking and chewing gum at the same time," so keep a few spare bolts on hand.

Jigsaw

As if this treadle lathe were not cool enough, now you can make the jigsaw attachment that sits atop it. Curiously, the jigsaw is basically a way to convert the rotary motion of the flywheel and pulley back into reciprocating motion of the blade. This conversion requires that you loosen the set screws in the stop collars of the driven pulley, remove the drive center and replace it with a crankshaft. Unless you are Superman, you cannot bend these sharp angles in cold ½" steel shafting — you'll have to heat it with a torch and bend it in a vise.

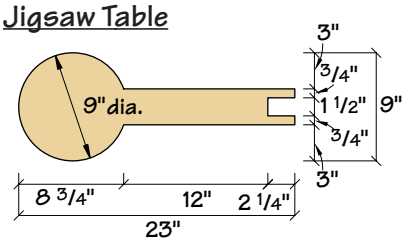
The frame of the jigsaw is quite straightforward. I used big dovetails for the front and back posts as the best combination of strength and quick disassembly. The arms of the jigsaw are the only pieces that aren't scrap pine; they are scrap oak for strength. They have to be strong because the turnbuckle at the rear must tension the coping saw blade at the front.

I have seen many homemade jigsaws from the past century, and every one used the blade holders from an old coping saw. Often the maker would just hacksaw off the arms of the coping saw and bolt them onto the ends of the jigsaw arms. This has the advantage of allowing you to turn the blade at right angles to the arms when necessary for clearance.

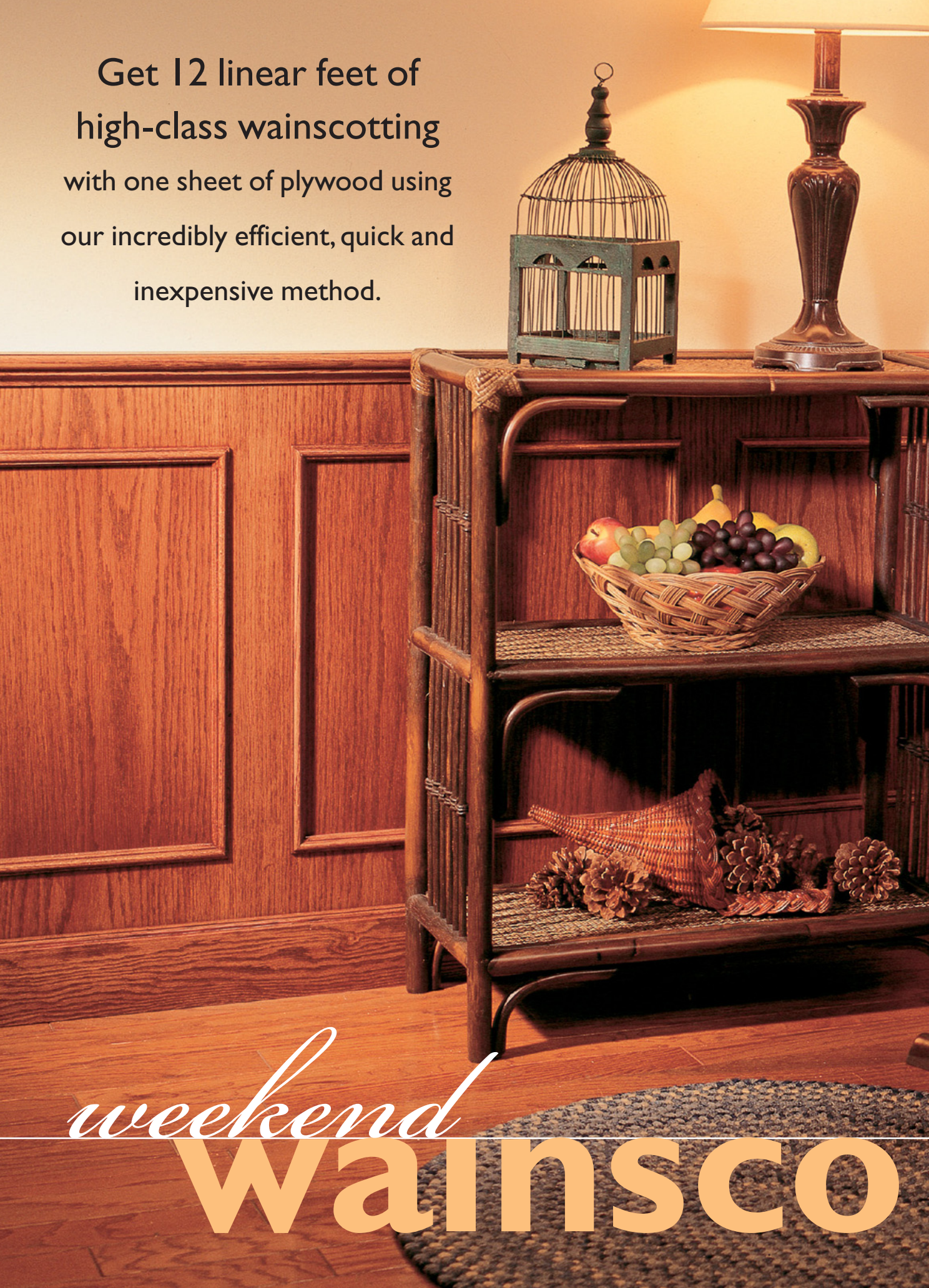
It's quite a spectacle when this whole thing is going. The flywheel looks like something off of Fred Flintstone's car, the bearings are rattling, the drive rope twanging, and the jigsaw jumping as your knee goes up and down.

But there at the business end, the saw cuts along beautifully, the lathe turns like a top. Won't the kids be proud! **PW**

Jigsaw Table



The turnbuckle is right off the shelf, with the addition of a lock nut to one of its eyebolts (obviously not the one with the left hand threads). Without the lock nut, the turnbuckle will work loose in seconds. I also inset a bronze bearing (sawn into a ½" length) into each of the arms at their pivot points. This is not so much to reduce friction in operation as it is to keep the wood from wearing and again loosening the tension on the blade.


Get 12 linear feet of
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with one sheet of plywood using
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weekend
wainsco

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by David Thiel
Photo by Al Parrish

If you ask a woodworker to picture a room they'd like to spend time in (besides the shop) they frequently form a picture in their minds of a room with lots of wood in it. Perhaps ceiling beams, a wood floor and wainscotting. If you have an older house, you might be lucky enough to have such a room. But if you have a newer home, more likely than not your rooms are painted drywall. You could pay a contractor to install a lot wainscotting, but because you already have woodworking tools, why not do it yourself? Here's a quick, easy and amazingly cost-effective way to turn a "so-so" room into a "something else" room.

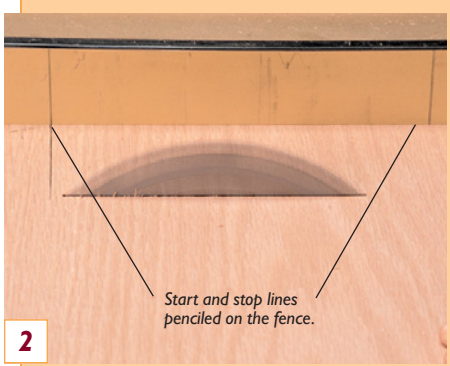
Don't Waste Plywood

The basic ingredient to making this project affordable is carefully cut ½" plywood. By making the wainscotting a respectable 32" high, a sheet of plywood will give you 12 lineal feet of paneling. Start by determining the lineal footage of the area you want to cover. Sketch out the wall sections on a piece of paper, including doorways. Using a two-panel, 46" wide section may not always work best for your room needs, and you'll have to decide if changing the panel size will give a better overall look. Regardless, the techniques used in the article will work on any size panel. Remember, if you run into a corner, allow an extra ¾" in length on one panel so it can tuck behind the opposite panel, without changing the panel spacing.

To provide a less "flat" appearance to the wainscotting, you cut inset panels from the main panel, sort of like removing the doughnut holes from doughnuts. Then you trim the hole with moulding that has a rabbet cut on the back. After that, you fasten the inset panel back into the surrounding face panel. Because of the way the moulding is made, the panel will be recessed. Finally you shim the backside of your wainscotting and attach it to your wall with 2" finishing nails.

The other tricky element to this project is joining adjacent panels of wainscotting in a way so there is a minimal amount of seam visible. Here's how I tack-


1



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Holes on a Table Saw

How to make square holes on a table saw is a great thing to know, and a very important part of this wainscotting project. Each panel needs two 19¼" x 19¼" sections cut out in precisely the same location, and with a clean enough cut to allow the waste pieces to be reattached with only a little slop. First mark all the cutout locations on the panels, carrying the line to the edge of the panel. In fact, you don't really need the cutout itself, just the location lines at the edge of the panel. With the saw off, run your table saw blade to an appropriate cutting height (and count the number of times you turned the wheel to get there). With the fence just touching the blade, make a mark on the fence where the blade starts and stops (photo 1).

Next, set the fence for 4¼" and prepare to cut all the bottom and top edges of the panels. With the saw turned off and the blade lowered below the table level, position the panel with the first location line against the mark on the fence. Start the saw, and slowly bring the blade up through the piece to the cutting height you set earlier (photo 2). Make sure the panel is held firmly in position, but not with your hand over the blade.

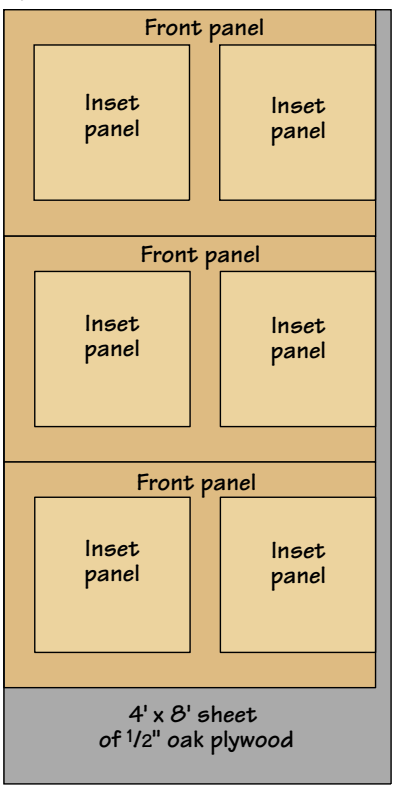
Push the panel through the cut until the second indexing line reaches the "start" line on the fence (photo 3). Stop the cut, lower the blade and turn off the saw (or move to the next cut). Repeat this process for all the bottom and top edge cuts.

The "vertical" cuts take a little more time to set up, but they are basically the same (photo 4). Start with the cut near the edge of the panel. Set your fence at 3½" and make the cut. Then reset the fence to 22⅞" and make the next cut in the middle of the panel. At the end of this cut your inset panel will still not be completely free from the main panel because of the curve of the saw blade.

Your last cut is with the fence set at 26⅝", and it will almost cut the second inset panel free. Finish cutting the corners of the inset panels with a handsaw.

And there you have it: holes cut on the table saw.

Optimization Diagram



SCHEDULE OF MATERIALS: WAINSCOTTING

Parts needed for each 4' section:

No.	Item	Dimensions T W L	Material
1	Front panel	1/2" x 46" x 28" *	OP
2	Inset panels	1/2" x 19 1/4" x 19 1/4"	OP
8	Moulding strips	3/4" x 9/16" x 20"	SO
2	Hanging strips	1/4" x 2" x 46"	Ply
1	Base support	3/4" x 2 1/2" x 46"	P
1	Base moulding	3/4" x 4" x 46"	SO
1	Top cap	3/4" x 2" x 46"	SO
1	Cap cove	3/4" x 3/4" x 46"	SO

*If building a corner, one panel needs to be 46 3/4" wide, and a 3" wide filler needs to be added to the mating panel.

OP=Oak ply • SO=Solid oak • Ply= Plywood • P=Poplar

led that: Each face panel has two inset panels in it that you remove from the surrounding panel by plunge-cutting on your table saw (which is covered in the story at left). One of the inset panels is surrounded on all four sides by the surrounding panel. The other inset panel is surrounded on only three sides by the surrounding panel. After you remove the inset panel, the end of the surrounding panel looks like a large "C." When you attach two adjacent panels, you'll have only two small 3"-long seams.

Start Cutting

The first step is to cut the plywood sheets to size, and then remove the inset panels. To be able to reuse the inset panels, you'll need to use a table saw for this. The accompanying story at left explains how to cut out the inset panels. Remember to mark the panels if you wish to maintain a grain and color match on each section.

The rest of the machine work is milling. The moulding used to trim out the inset panels is an oak 3/4" x 9/16" stock shelf edge moulding. Cut a 1/4" x 1/4" rabbet on one edge to allow the moulding to drop into the recess and flush against the inset panel. Then cut this moulding into 20" lengths, with 45-degree miters on both ends.

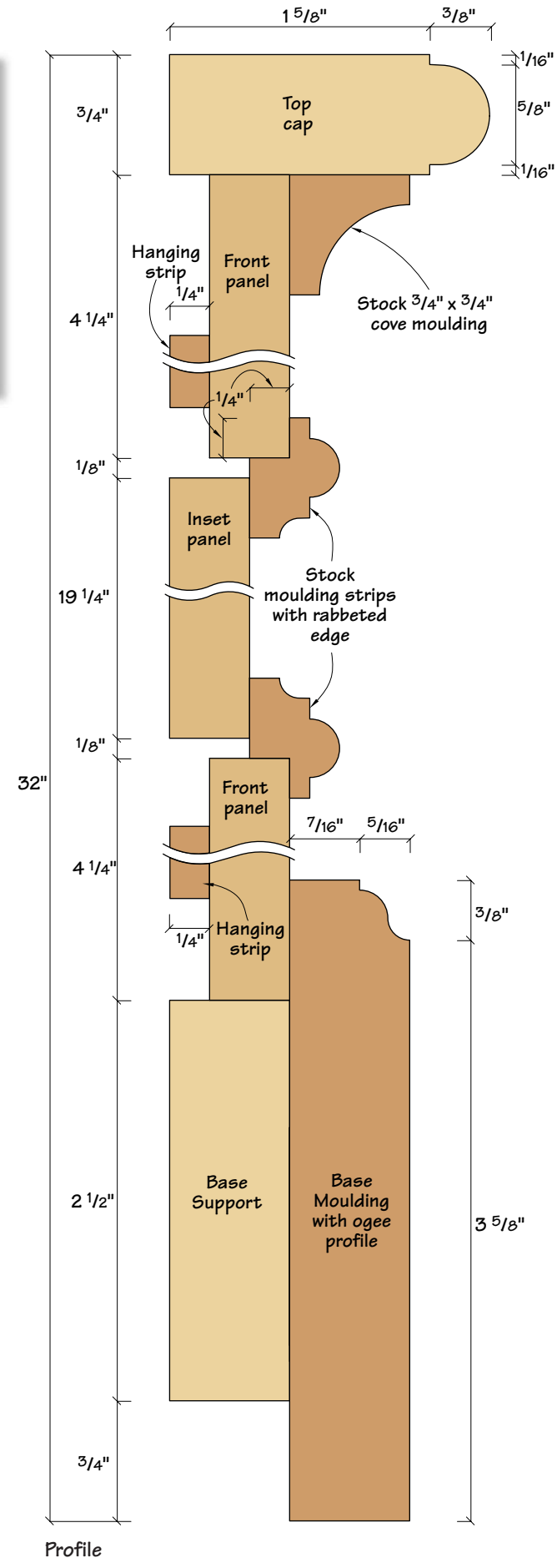
The base moulding is simply a long 3/4" x 4" board. Cut a fillet ogee profile on the top edge using a router mounted in a router table. The top cap moulding is a 3/4" x 2" board with a bullnose detail routed on the front edge. Add a stock 3/4" x 3/4" cove moulding to the underside of the cap and voíla (see the diagrams for full-size cross sections of these mouldings).

With the mouldings run, mill out some 1/4" x 2" plywood hanging strips and the 3/4" x 2 1/2" plywood base support strips.

With all the pieces ready to go, start sanding. When you have all the pieces looking pretty, you have a decision to make. You can finish the panels now in your shop or finish them after they're installed. If you'll be painting the wall afterward and you don't have carpeting or a wood floor down, finishing in place is a nice option. Otherwise I'd suggest finishing beforehand and avoid the mess.

Rag on an "English oak" gel stain to all the exposed surfaces. Then put a top finish of clear lacquer over all the surfaces to protect and gloss-up the panels. Both of these steps are easier when the panels can be laid flat to avoid runs. This is why I finished the panels before installing them.

A word of caution on finishing in place with finishes that combine stain and polyurethane. While this might seem the perfect project for that product, I don't recommend it. My experience has



*With the stud locations marked **(top left)**, nail the base support and hanging strips in place. Next, attach the assembled panels to the hanging strips with the panels resting on the base support strip **(bottom left).** Next, miter the baseboard and cap mouldings in the corner and nail them to the panels **(top).** Note the 3" filler strip necessary to complete the corner.*

been that the finish (like many other top coats) can sag on vertical surfaces. The pigment also sags, causing the color to "pool" on the lower edge of the panel.

Take it to the Wall

The next step is to get out the chop saw and head to your work site. If you've got an air-powered brad nailer, this is the chance to find out what a useful tool it is. If you don't have one, this is a great chance to talk yourself into one.

Installation is fairly simple. Start by determining if the floor is level. If you have major lumps and won't be putting a floor or carpeting against the base, you might need to scribe the bottom of the base moulding to fit the floor (or nail a strip of base shoe moulding to cover the gaps). But first, mark a level line 3¼" up from the floor (preferably off the highest point in the floor). Locate the studs and mark their locations on the walls. Attach the base support board with the top edge flush to your 3¼" line. Next, attach the ¼" hanging strips above and below the inset panels.

For the next step, take a few minutes to assemble the panel sections while everything is flat. Start by attaching most of the inset moulding strips to the front panel with a 23-gauge pinner. The moulding strip that covers the panel seam is the only one that can't be attached prior to installation. Now fit the inset panels in place behind the moulding and nail through the moulding at an angle to attach the inset panels to the assembly. You're now ready to attach the panels to the wall. With the panels in place, attach the missing fourth inset moulding to the mated panels.

The last steps are attaching the base moulding, cap and cove moulding to the panels, and your wainscotting is installed. One trick of finish carpenters is worth passing on here. It's the scarf joint. More likely than not you will need to use more than one length of either base or cap moulding on a particular wall. Rather than cutting a 90-degree butt joint at the juncture, cut a 45-degree angle on each end of the pieces. This way, shrinkage or movement will show a much less visible gap. **PW**

The last step is fitting and tacking the cove moulding strips in place. Note on the leading edge of the moulding.The 45-degree cut is half of a scarf joint.

Quick Cove Moulding

You don't need a shaper to make good-looking cove moulding, just a table saw and a scrap of plywood.

I use cove moulding on just about every case piece I build. And because I usually work with curly maple (and because I don't want to go broke) I make my own using my table saw and a length of any wood that has a straight edge.

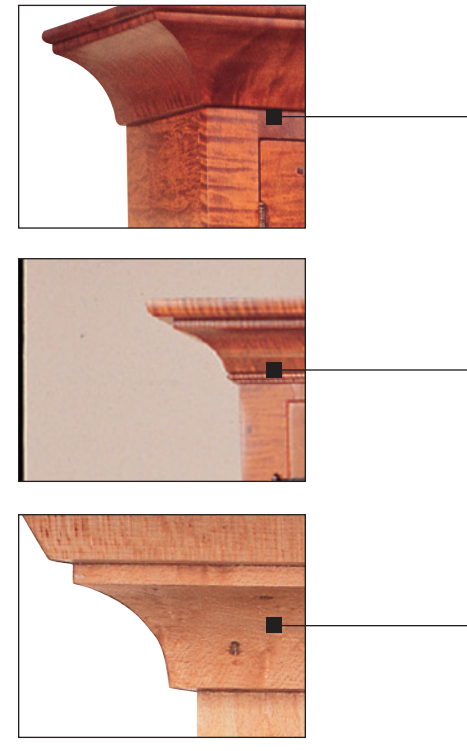
The basic concept is simple. You pass your work over the blade at an angle, using that long straight length of wood as a fence, and nibble away at the wood until you get a nice, concave profile. Then you cut a couple bevels on the edges and sand for a good long while. Let me be the first one to tell you that this procedure is not a science. The setup is a bit tricky, though after a few attempts you can make a piece of cove moulding without a whole lot of trouble. Also, always make a little extra cove moulding for a project in case you botch a miter.

The cove moulding I made for this article uses 1" stock that is $4\frac{1}{4}$" wide. Begin by putting a rip blade in your table saw and cutting a long piece of scrap to use as an auxiliary fence. Why a rip blade? The top of the teeth are flat and will give you a smoother cut. Make a photocopy of the drawing on the following page and glue that to the end of a piece of your stock. Now it's time to set your auxiliary fence in place.

Where to Put Your Fence

Most books that discuss this procedure advise you to clamp your fence in front of the blade at an angle. This causes the blade to push your work tight against your fence as you push it through, giving you more control. However, I put my fence behind the blade as you can see in the photos. If you're making cove moulding for the first time, I recommend you put the fence in front of the blade for the first few times. Then, after you have some experience, try it my way, which feels more comfortable to me. Rest assured that either way will work fine.

Place your fence across your saw's table and raise the blade to the height of the finished cut, which is a bit shy of $\frac{5}{8}$" in this case. Note how many times you turned the wheel of your saw to get there. The trick here is to adjust the fence until the blade lines up with the arc on the



by Glen Huey

Glen Huey builds custom furniture in his shop in Middletown, Ohio, for Malcolm L. Huey & Sons and is a contributing editor to Popular Woodworking. *See his work at www.hueyfurniture.com*

First set your blade to the finished height of the cove cut using the drawing on the end of a piece of stock.

Place the auxiliary fence on the top of the saw's table and line up the teeth with the arc drawn on the end of your stock.

pattern you affixed to the wood both on the infeed and outfeed sides. Keep adjusting your fence until everything lines up. Then clamp your fence down to your saw. My saw's tableboard is made of plywood, so I merely screw my fence down to my saw. Now put a little wax on your saw's table to make feeding the stock easier.

Cutting the Cove and Bevels

Lower your blade all the way down and then raise it up about 1/16" for your first pass. Run your stock against the fence and raise the blade another 1/16" for the next pass. Keep doing this until you get to your finished height. On the last pass or two, move the stock more slowly (but steadily) over the blade. Also, be sure to keep firm downward pressure on the stock near — but not over — the blade. A slow speed and firm pressure will produce a smoother cut (read: less sanding). Remove the auxiliary fence from your saw and get ready to rip the bevels on the edges.

The bevel on the front of the moulding creates a shadow line between the cove and the case. The angle of your saw blade doesn't have to be exact, but I like to use a 45-degree angle because that's what I cut on the back side. Use the drawing on the end of your stock to set your table saw's fence. Then rip the two bevels as shown in the photo.

The bevels on the back of the moulding are important because they allow the moulding to fit snugly between the case and a top cap. They need to be at exactly 45-degrees, so cut a test piece or two before cutting the real thing. Again, use the drawing to set your fence and rip the bevels off both edges.

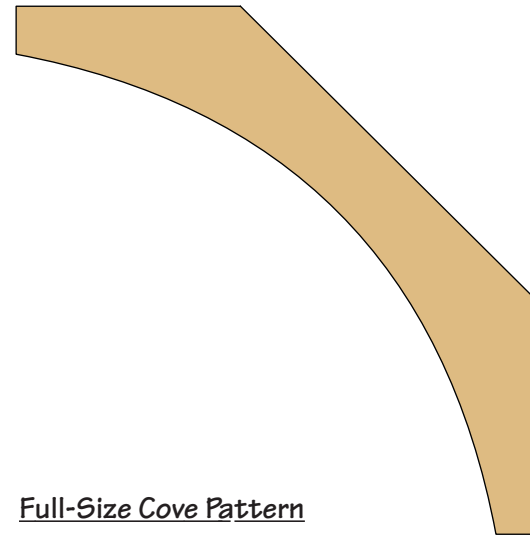
Now take a look at your piece of cove moulding. Do

I screw my fence in place. If you don't want to poke holes in your tableboard, C-clamps will do just as well.

After years of doing this, I've found that a little furniture wax makes this cut a lot easier.

After the cove cut is made, cut the bevels on the front face of the moulding. Set your saw blade to cut a 45-degree bevel and rip the edges.

Then switch the stock to the infeed side and adjust the angle of the fence to line it up with your arc. Go back to the outfeed side and check it again. When both line up, you're ready to clamp the fence down in position.



Full-Size Cove Pattern

you like the profile? Is it one you think you'll use again? If it is, then cut off a 12"-long chunk of it and put it aside. You'll find it's easier to duplicate a piece of cove moulding if you can use the actual piece of moulding as a template.

Sanding

Cove moulding needs a lot of sanding. In fact, this is the most time-consuming part. One way to speed things up is to replace the standard pad on your random-orbit sander with a very soft one. Most manufacturers make pads with a variety of densities, the only problem is finding the catalog or store that stocks them.

A soft pad follows the curve of the cove mould better and allows you to remove the saw marks quickly, without flattening the cove.

Before I bought a soft pad for my sander, I sanded cove moulding using a short section of broom handle. Wrap the broom handle with a sanding sponge and then wrap your sandpaper around that.

I wouldn't do all this work if I didn't think the cove moulding made much of a difference, but it does. Cove moulding dresses up a case piece dramatically. In many cases it makes the difference between something plain and something plainly beautiful. **PW**

Reset your fence and cut the 45-degree bevels on the back side of the cove moulding.

If you have to sand your moulding by hand, use a large diameter dowel or broomstick. Wrap it in a sanding sponge and sandpaper. Then go to work.

The better way to sand cove moulding is to get a softer pad for your random orbit sander that will follow the curve of the cove.

greek key desk

Two simple tricks make cutting and gluing this desk a real snap.

This is an original design by Armand Sussman, an amateur furniture maker living in Pennsylvania. The design creates an illusion of wood twisting and turning. By using contrasting woods, an endless stripe is created, adding movement to this piece. The glass top serves as a work surface, but it doesn't obscure the base. The numerous lap joints (called "step-miters" by Mr. Sussman) have been worked into a novel Greek key design on the ends of the desk, which is built using cherry and walnut.

The desk is constructed by laminating strips of wood together. By making some of the layers shorter than others, you make the joints for attaching that lamination to another. As a result, all of the materials for this project must be machined precisely. Any variances will show up as gaps in the joints after final assembly.

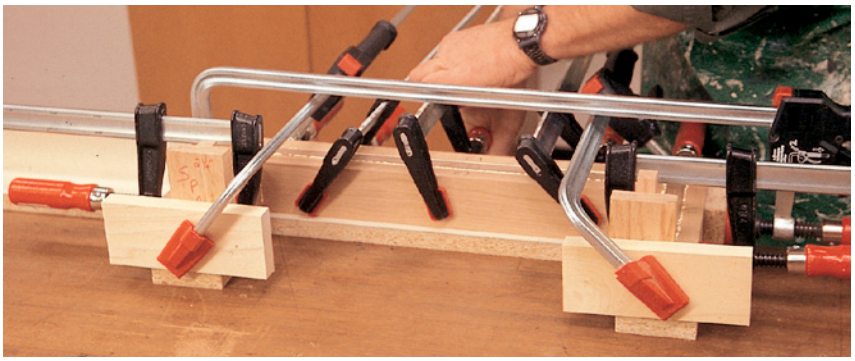
Tricks to Dead-on Components

There are two tricks to make sure your pieces are all the right size and won't slide around when you glue them up. First, when cutting out the pieces for this desk, I found it easier to cut them grouped by letters, such as A1, A2, A3. A1 is the longest piece, A2 is 1½" shorter, and A3 is 3" shorter than A1. Because all of the desk's components are stepped like this, I came up with a quick way to make these

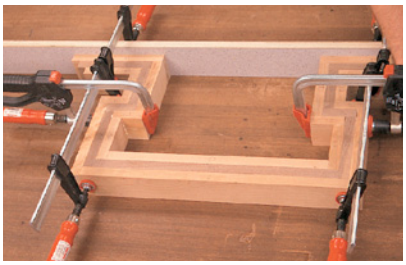
by Jim Stack

Jim Stack is acquisitions editor for Popular Woodworking *Books. This desk is one of 15 designs that will appear in the forthcoming book "Fast Furniture"* (Popular Woodworking *Books) which will be available in January 2001.*

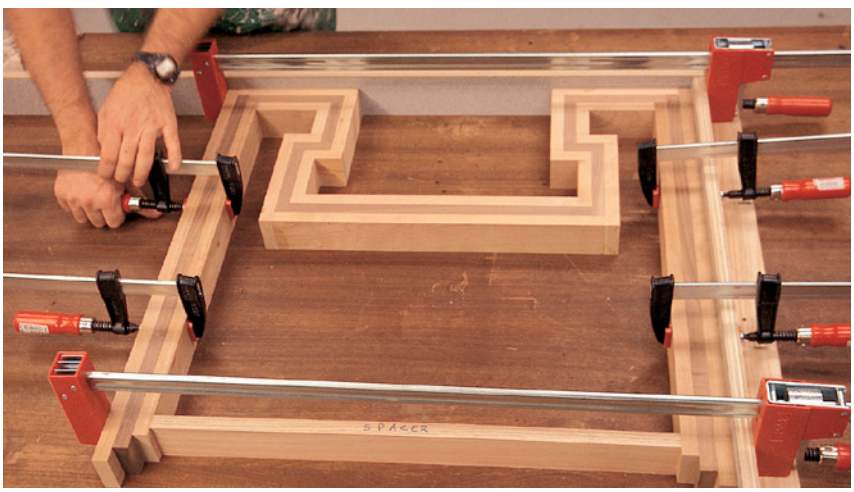
Here I'm cutting the A2 piece with one of the spacers in place. To cut the A3 piece, use two of the spacer blocks.



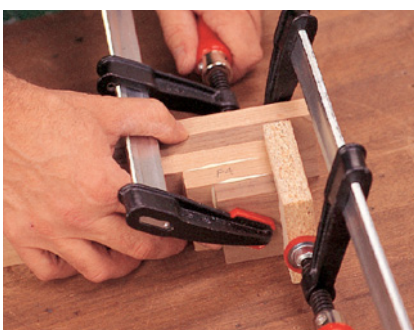
Here I'm clamping the E and D pieces together. Use spacers on the ends of the D parts to hold them in place against your gluing jig.



This is where your parts start to look like something. Joining the three assemblies creates the Greek key at the bottom of the base.



When assembling the legs to the Greek key, I used a spacer (seen at the bottom of the photo above) to keep the legs spaced properly while gluing-up.



The stop block clamped at the end of the glue-up jig keeps the F4 and F5 pieces level with the top of the G3 piece.

Start by gluing G1 in place, then work your way up. As you can see in the photo, I clamped the entire leg to my assembly bench to make things easier.

cuts. Cut the longest piece first using a stopblock on the fence of your table saw's sled or miter gauge. Then take two scrap pieces of ¾"-thick wood from the project and glue them together to form a 1½"-thick spacer. Hold this piece against the stop block to cut the second piece. Then make a second spacer using two more scraps and use both spacers to cut the third piece. This method makes the desk components perfectly sized. Cut out all your pieces, then get ready to glue them up.

To keep your pieces from sliding around during gluing, make a jig from two pieces of melamine-faced particleboard put together lengthwise at a right angle to create a straight fence. Then put a small piece of wood on the end of the jig to act as a stop. This gives you a square corner to work out of.

On to Assembly

Start by gluing the E pieces and two sets of the D pieces together to form a shallow "U." (When gluing these step-mitered joints, I found it best to use polyurethane glue. It provides a strong bond for this type of joint.) I dry-fit all the parts to be sure I would be able to get all the pieces to come together tightly. After applying the glue, clamp the length of the E pieces first. By using ¾" spacers at the ends of the D parts, applying even clamping pressure is easy on the lengths of the D parts. Make two of these assemblies.

The next assembly consists of the C, B and A parts. The glue-up of this assembly is done the same way as the E and D assembly. Make four of these assemblies.

Next glue one of the E and D assemblies and two of the ABC assemblies to-

gether to form the Greek key part of the end assembly. I had to clean the glue squeeze-out at the joints and pare the wood down in a couple places with a chisel to get a tight fit. If your pieces don't come together tightly, your joints will not be strong.

For the next assembly, put two glue-up jigs at a right angle. This makes the glue-up of the two legs (F) to the Greek key assembly easy to keep square.

Glue the F4 and F5 pieces to the tops of each leg. Use a stop block to keep the pieces even with the end of the F3 piece of each leg.

The G pieces attach the two end assemblies together. It is easier to control gluing and alignment of the G1 pieces if they are glued into place one at a time, starting at the bottom and working up.

Sanding and Finishing

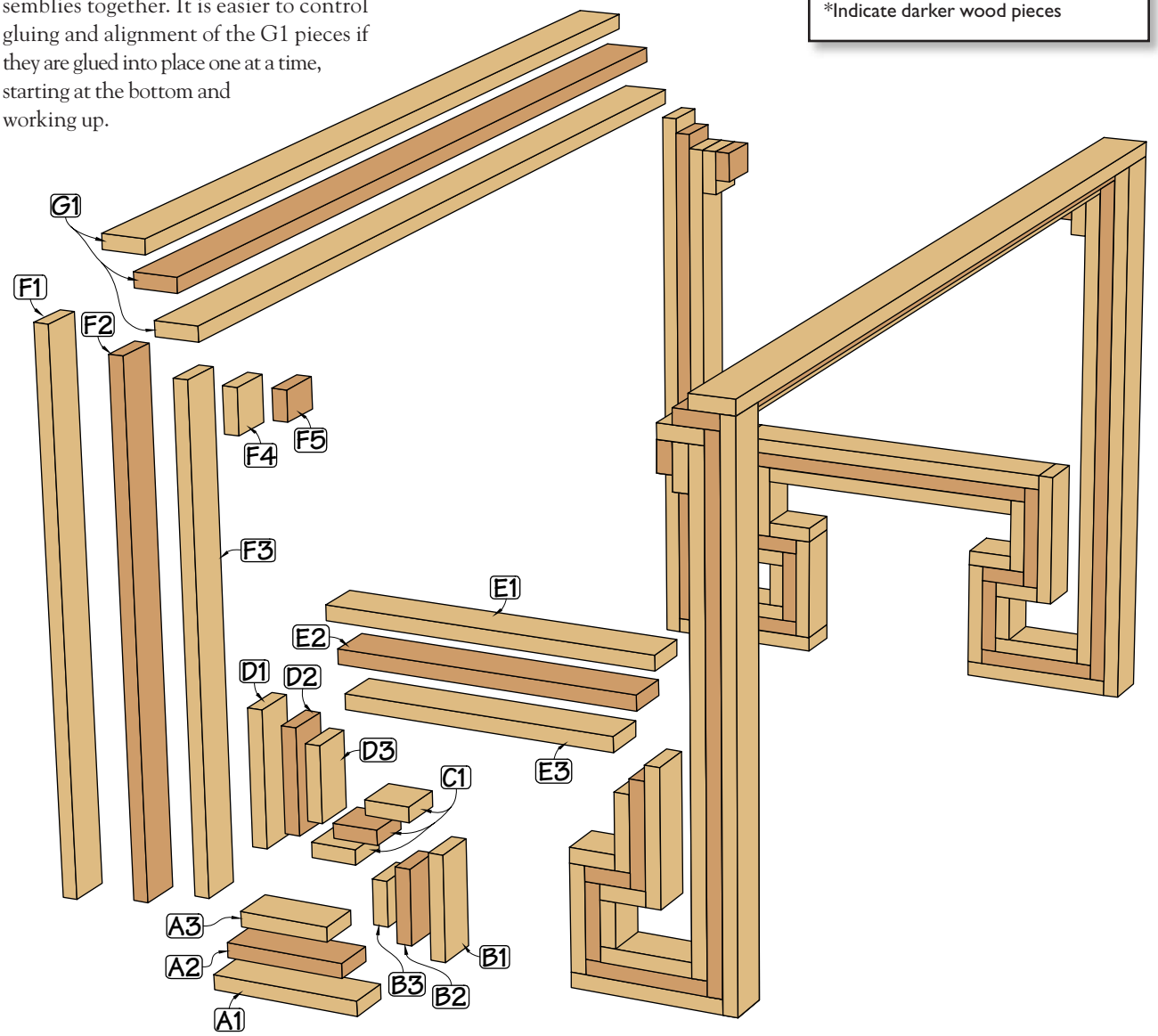
I used a random orbital sander, going up to 150 grit sandpaper. Break all the sharp edges with a sanding block using 150 grit sandpaper. For a top coat, I applied three coats of a clear finish.

For the top I used a ½"-thick piece of 30" x 50" tempered glass polished on all edges. (To keep the glass in place, use six clear door bumpers applied to the top stretchers.) It wasn't until I completed this desk and had the glass top in place that I appreciated how striking it looked. **PW**

Schedule of Materials: Greek Key Desk

No.	Item	Dimensions T W L
4	A1	¾" x 2¼" x 7½"
4	A2 (*all)	¾" x 2¼" x 6"
4	A3	¾" x 2¼" x 4½"
4	B1	¾" x 2¼" x 5¼"
4	B2 (*all)	¾" x 2¼" x 3¾"
4	B3	¾" x 2¼" x 2¼'
12	C1 (*4)	¾" x 2¼" x 2¼"
4	D1	¾" x 2¼" x 6¾"
4	D2 (*all)	¾" x 2¼" x 5¼"
4	D3	¾" x 2¼" x 3¾"
2	E1	¾" x 2¼" x 16½"
2	E2 (*all)	¾" x 2¼" x 15"
2	E3	¾" x 2¼" x 13½"
4	F1	¾" x 2¼" x 27¾"
4	F2 (*all)	¾" x 2¼" x 26¼"
4	F3	¾" x 2¼" x 24¾"
4	F4	¾" x 2¼" x 2¼"
4	F5 (*all)	¾" x 2¼" x 1½"
6	G1 (*2)	¾" x 2¼" x 48"

*Indicate darker wood pieces



YOUR FIRST Cabin

I've built hundreds of single-door cabinets like this one. Some people use them as spice cabinets. Others use them in the bathroom as a medicine cabinet.

As I was building this particular cabinet, it occurred to me that it would be an excellent project for beginners. It has all the traditional components of larger-scale cabinetry, yet it doesn't need a lot of material or tooling. Once you've built this cabinet, you can build something bigger using the same principles. Intermediate woodworkers might also pick up a trick or two because I build my cabinets just a bit differently.

Photo by Al Parrish

Choose Your Wood

I used tiger maple for this project, but if this is your first cabinet, you might want to use poplar and then paint the finished item. Poplar is easy to work with and less expensive than maple, especially if the maple has some figure.

As in larger cabinets, most of the major components are made from ¾"-thick stock: the case sides, top, bottom, plus the rails and stiles for the door and the face frame. This cabinet has a solid wood shiplapped back that's made from ½"-thick pieces; the door panel is ⅝" thick.

Face Frame: the Place to Start

It seems logical to begin by constructing the case. Don't. The size of your case and door are all determined by your face frame. Build it first and then you'll use your face frame to lay out your case and door. All face frames are made up of rails and stiles, much like a door. The stiles are the vertical pieces. The rails are the horizontal pieces that go between the stiles.

When you rip your stiles to width on your table saw, make the rip 1/16" wider than stated on the Schedule of Materials. You need this extra to overhang the sides of your case so you can trim it flush with a flush-cutting bit in a router. Once your pieces are cut to size, join the rails and stiles using mortise-and-tenon joints.

Begin by cutting the tenons on the rail ends. I know the books say to cut the mortise first, but I've found it's easier to lay out your mortises after your tenons are cut. Try it, and I think you'll agree.

by Troy Sexton

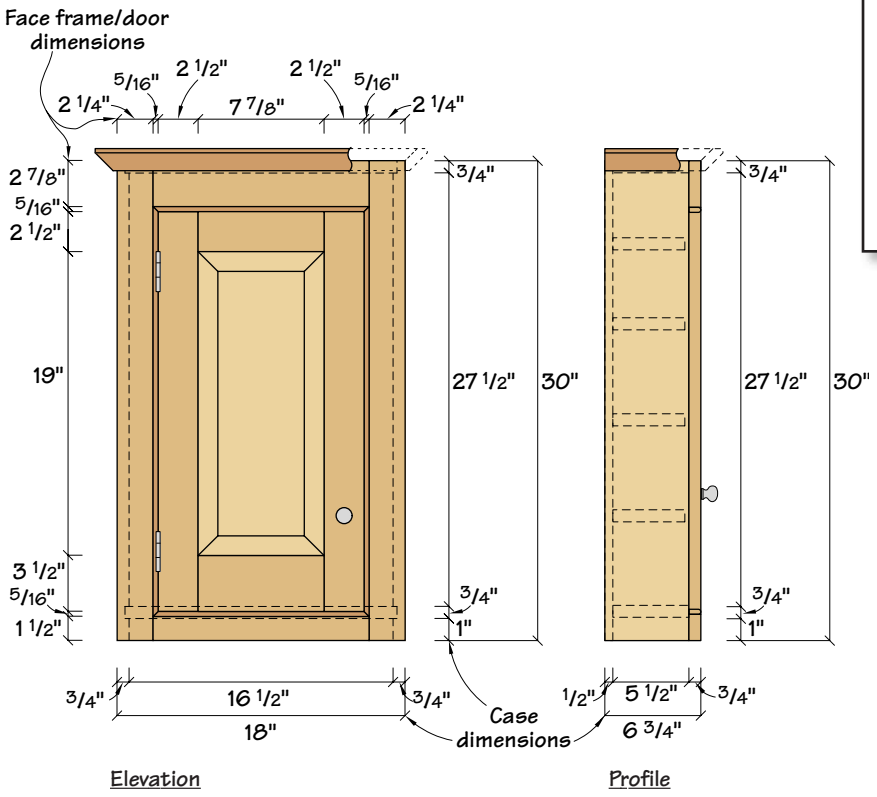
Troy Sexton designs and builds custom furniture and is a private woodworking instructor in Sunbury, Ohio, for his company, Sexton Classic American Furniture. Troy is a contributing editor for Popular Woodworking.

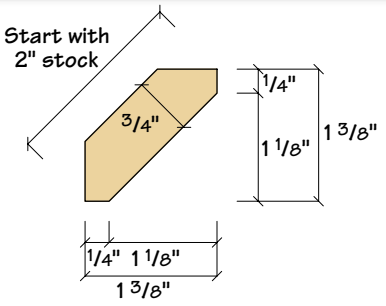
et

If you've never built a face frame cabinet, learn the tricks that ensure a square-looking case, tight joints and doors that work as you build this small spice cabinet.

Schedule of Materials: Spice Cabinet

No.	Item	Dimensions T W L
2	Face frame stiles	¾" x 2¼" x 30"
1	Top face frame rail	¾" x 2⅞" x 15½"
1	Bot face frame rail	¾" x 1½" x 15½"
2	Door stiles	¾" x 2½" x 25"
1	Top door rail	¾" x 2½" x 9⅞"
1	Bot door rail	¾" x 3½" x 9⅞"
1	Door panel	⅝" x 8⅜" x 19½"
2	Case sides	¾" x 6" x 30"
2	Top & Bot	¾" x 5½" x 17"
4	Shelves	¾" x 5 7/16" x 16 7/16"
	Back boards	½" x 17" x 30"
	Top moulding	¾" x 2" x 36"





The tenons should be ⅜" thick (one-half as thick as your stock), centered on the rail and 1" long. I cut ½" shoulders on the tenons. If they're any smaller, the mortise might blow out. Now use your tenons to lay out your mortises on the stiles. Hold the tenon flat against the edge where the mortise will go and use the tenon like a ruler to mark your mortise.

Now cut your mortises. Make them all 1 1/16" deep, which will prevent your 1"-long tenons from bottoming out. You don't want your tenons to wobble in your mortises, yet you don't want to have to beat the tenon in place.

Dry-fit your face frame, then put glue on the mortise walls and clamp it up. While you're waiting for it to dry, turn your attention to the bead moulding that goes on the inside edge of the face frames.

Years ago, I used to cut the beading into the rails and stiles. Then I would have to miter the bead and cut away the beading where the rails and stiles were joined. It sounds like a pain, and it was. Now I simply make my bead moulding separate from my face frame and miter, nail and glue it in place. It looks just as good.

To make the bead moulding, put a ¼" beading bit in your router and mount it in a router table. Then take a ¾"-thick board that's about 4" wide and cut the bead on one edge. Take that board to your table saw, set your rip fence to make a ⅜"-wide cut and rip the bead from the wide board. Repeat this process three more times.

Adding this beaded moulding to the inside of the face frame creates a nice shadow line around the door. Miter, glue and nail it in place. Don't forget to putty your nail holes.

Fit your door in the face frame before you attach the face frame to the case. Everything lays flat on your bench as you work. You'll find this procedure is a faster and easier way to get perfect results.

Here you can see how the bottom of the case acts as a door stop. This is one of the reasons I build my face frames first: I can make sure my bottom will be in perfect position.

Now take your strips and run them through your planer to reduce them in thickness to 5/16". Miter the corners; then glue and nail them in place. Sand both sides of your face frame with 100 grit sandpaper and move on to building the door.

The Door

Why make the door next? Well, for one thing, it is easier to hang your door in your face frame before you nail the face frame to your case.

I build my doors so they are the same size as my opening, then I shave off a little so there's a 1/16" gap all around. This way if the door or face frame is out of square, I can taper the door edges to fit, hiding my error.

The door is built much like the face frame, using the same size mortises and tenons. The biggest difference is that you will need to cut a groove in your rails and stiles for the door panel, so your tenons must be haunched. A "haunch" is a little extra width in the tenon's shoulder that fills in the groove on the end of the stile.

Begin by cutting a 3/8"-deep x 3/8"-wide groove down the center of one long edge of your rails and stiles. Cut your tenons on your rails. Then cut your mortises on your stiles. Dry fit the pieces together and measure how big the center panel should be.

You want the panel to float to allow seasonal expansion and contraction, so cut the panel to allow 1/8" expansion on either side. Now raise the door panel using your table saw or a cutter in your router table. Practice on scrap pieces of 5/8" stock so you achieve the right lip, angle and fit.

When the panel is complete, sand the raised section, then glue up the door. Be careful not to get any glue in the groove that holds the panel. When the glue is dry, hang the door in your face frame.

Finally, the Case

The case is simple. The top and bottom pieces fit into 1/4"-deep dadoes and rabbets on the sides. The back rests in a rabbet on the sides and is nailed to the back edge of the top and bottom pieces.

You'll use your face frame to lay out your joints on the sides. You want the bottom piece to end up 3/16" higher than the top edge of the bottom rail on your face frame. This allows your bottom to act as a stop for the door. Mark the location of that 1/4"-deep dado and cut. The top piece rests in a 1/4"-deep x 3/4"-wide rabbet on the sides. Cut that using your table saw. Then cut the 1/2"-deep x 1/4"-wide rabbet on the back edge of the sides.

Fit the face frame on the case. The stiles should hang 1/16" over the edge of the case so you can rout (or plane) them flush later.

Drill holes for shelf pins and space them 1" apart on the sides. Sand the inside of the case. You'll notice that the top and bottom are 1/2" narrower than the sides. This is to give you a good place to nail the back pieces to the case. Assemble the case using glue and nails, making sure the top, bottom and sides are all flush at the front.

Attach the face frame to the case using glue and nails. Trim the face frame flush to the case using a bearing-guided flush-cutting bit in your router. Finish sand the cabinet to 180 grit.

Take your scrap pieces and use them to make a shiplapped back. Cut a 1/4" x 1/2" rabbet on the edges and then cut a bead on one edge using a 1/4" beading bit in your router table. You want to give the back pieces room to expand and contract, about 1/8" between each board should be fine.

Cut the moulding for the top so it resembles the drawing detail at left. Finish sand everything, then nail the moulding to the top.

I like to peg the tenons in my doors to add a little strength. Drill a 1/4" diameter hole most of the way through the stile and tenon. Then whittle a square piece of stock so it's round on one end, put glue in the hole and pound it in place. Cut the peg nearly flush. You want it to be a little proud of the stile — it's a traditional touch.

Break all the edges of the case with 120-grit sandpaper, and putty all your nail holes. Paint, dye or stain the all the components (I used a water-based aniline dye). Then add two coats of clear finish and nail the back pieces in place. Hang the cabinet by screwing through the back boards into a stud in your wall. **PW**

SUPPLIES

Rockler 800-279-4441
#31495 hinges for door, $5.79/pair

Horton Brasses Inc. 800-754-9127
#K-12 w/MSF (machine screw fitting), call for pricing

SCRAPWOOD

fishing lures

You'll be amazed at how much the fish love to chase the scraps from your shop floor. All it takes is a little wire, plastic and a couple hours. And that's no fish story.

When I was a little boy I didn't have a lot of money, so I made my own fishing lures from scraps around my dad's shop. Now I'm a cabinetmaker and build mostly reproductions with my dad in an old converted barn. However, recently I started making my own lures again, still using shop scraps, and I was amazed at how well these crankbait lures work.

All you need are some short pieces of ¾" wood, some flexible wire, 1/16"-thick clear Plexiglas and some hooks. I like to use curly maple because it's amazingly buoyant. Different species of wood will give you different results so feel free to experiment with what you have on hand. I like to make a handful of lures all at once so I start out with a piece of stock that's ¾" x 1⅛" x 20", which makes six lures.

The first step is to cut a kerf in this board that will hold the wire harness (which is shown in photo 10). Install a thin-kerf blade in your table saw, set it to make an 11/16"-deep cut and make the cut down the center of your board. Crosscut your stock into 3¼" lengths. Now follow the steps in the photos to complete your lure.

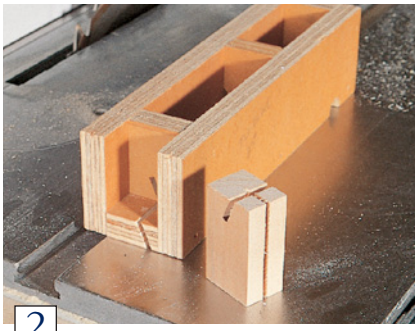
When I finish a lure on my lunch break I always insist on testing it in the pond next to our barn. It's a rough life, I know. **PW**

by Lawrence Todd Hough

Lawrence Todd Hough builds Queen Anne and Shaker furniture with his dad in their shop in Lebanon, Ohio. Luckily for him, both his children love to fish and help him make lures on the weekends.

1

Cut the slot in the lure for the Plexiglass bill. I built a simple plywood jig to make this an easy and safe operation. This jig can cut several lures at one time. Set your saw to cut a 23-degree bevel approximately 7/16" into the blank. Put the blanks in your jig and run it against the rip fence.



2

When the blank is removed from the jig, this is what it looks like. Notice how the kerf for the wire harness and the kerf for the bill intersect at the front.

3

Photocopy the pattern of the lure's body (at far right) and affix it to your blank with rubber cement or a spray adhesive. Cut out the rough shape of the lure on your band saw.

6

Now it's time to shape the wire harness. I take one length of wire and bend it so it creates holes to attach the lure to my fishing line above the bill, and eyeholes to attach hooks to. I bought special roundnose pliers at Sears for this operations, which helps a good deal. Begin working on the wire harness by bending one end into a small loop and fitting that loop in the kerf. This loop is where you'll attach your fishing line.

7

Now make a right angle bend in the wire as shown in the photo because the next loop will hold the first set of hooks at the front of the lure.

9

Bend the wire at the back end of the lure to make another loop for hooks. Note how I wedged a scrap piece of Plexiglas into the bill. This helps hold the wire harness in place while I make this final bend.

10

When you're done bending the wire harness, this is what it will look like.

11

For the bill I use 1/16" Plexiglas. Put masking tape on both sides of the piece, which will allow you to draw your shape out. It also keeps the plastic from chipping when you cut it out. The size of the bill and the angle it goes into the mouth determines how deep the lure will run when you use it. The larger the lip, the deeper it will run. You will have to experiment to find out what you like. It takes a lot of trial and error. Trace out the shape of the bill and cut it on a scroll saw.

4

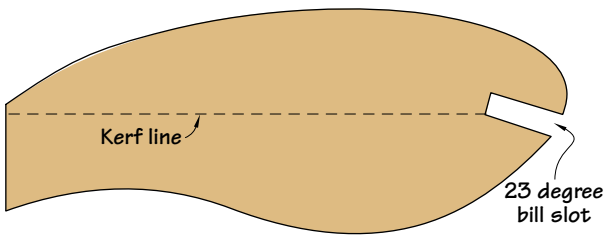
Now it's time to sand the rough shape. First draw a reference mark down the middle of the back from nose to tail. This will help you keep track of your progress as you sand. I do the initial shaping on a disk sander. Watch your fingers!

5

When the initial sanding is complete, your lure will look something like this. I use an inflatable drum sander to further smooth out the lure followed by a good deal of hand sanding while sitting in front of the TV.

8

Make a loop at the bottom of the lure and bend the wire so it comes out the back of the lure.



Lure Body

Glue the harness and bill in place with a common, all-purpose glue, such as Duco cement. When that's dry, fill the saw kerf with Durham's Rock Hard water putty and allow that to dry. Sand the excess off and spray your lure with a clear sealer. Put hooks on the bait. Test it in the water to make sure it "runs" straight. Adjustments are a lot easier to make now. Take the hooks off and spray the lure with a coat of flat white paint. Next, add your primary color, such as chartreuse. Let it dry. Now add your accent colors, such as blue on the back and red on the throat. Finally, add a clear coat of polyurethane varnish. I put four coats on each lure, and I apply the varnish by dipping the lure into it.

Put the hooks back on the bait. Test it again. If it does not run "true" use a pair of pliers to bend the eye above the bill to one side or the other, until you get it to run straight.

Now go catch a lot of fish.

'Galoot' Sa

From ripsaw to crosscut, keep all your hand saws within easy reach. You'll also protect their cutting edges.

by Samuel Peterson

Samuel Peterson lives in Columbia, Missouri. He enjoys traditional woodworking and collecting old tools.

Photo by Al Parrish

wtill

Join the Unplugged

To see an archive of the last few weeks worth of messages from the Old Tools e-mail service, go to: http://mailmunch.law.cornell.edu/mhonarc/OLDTOOLS/

To subscribe to the e-mail service (it's free), send an e-mail message with the text "subscribe OLDTOOLS "your full name" to listserv@listserv.law.cornell.edu (the above mentioned text has to be in the body of the message, without quotes. Replace "your full name" with your name.) After reading a few days worth of e-mails, your first e-mail to the group should be a short biography of yourself.

What's a "Galoot?" In woodworking, some people use this word to describe any person who enjoys working wood using the old ways. Imagine seeing almost transparent shavings spew out of handplanes, using scrapers instead of sandpaper and being able to enjoy the old-time sounds of the shop. Galoots tend to gather in an obscure corner of the internet known as "the porch." The OLDTOOLS e-mail group (also called a "listserv") was created about 1995 by a handful of people interested in marking gauges, and it has become a haven for discussing old tools.

One of the old standbys in a galoot's shop is the hand saw, and a sawtill is a great way to organize your collection. This one displays up to 10 full-size handsaws and four tenon saws safely and securely. A large shelf below provides room to store saw sets, saw vises and other related items. Hang this on your wall, and everything is right there for quick retrieval.

Construction Details

The first step is to cut out the two side pieces from red oak. One board produces both side pieces, so correct layout is important. Select a ¾" x 11¼" x 52" board and place a mark at 10½" and another at 41¼" on opposite long edges, measuring from the end. Bring the marks in 3". Connect the two final points of the marks with a diagonal line. Now you should be able to see how both sides come from one board. Use the lid from an aerosol can to mark the radius on the corners. Cut the sides from your board (we galoots prefer a bowsaw). Clamp (or cramp for our English cousins) them together and remove any differences in the two. A handplane, spokeshave and 4-in-1 rasp will take care of this quickly. This is a good time to cut the panel grooves, dadoes and mortises, before the dovetailing is done.

Cut both the top back and bottom back boards to length, and cut a panel groove into one edge of each board. The bottom back board will need a ¼" tenon on each end and on the bottom edge.

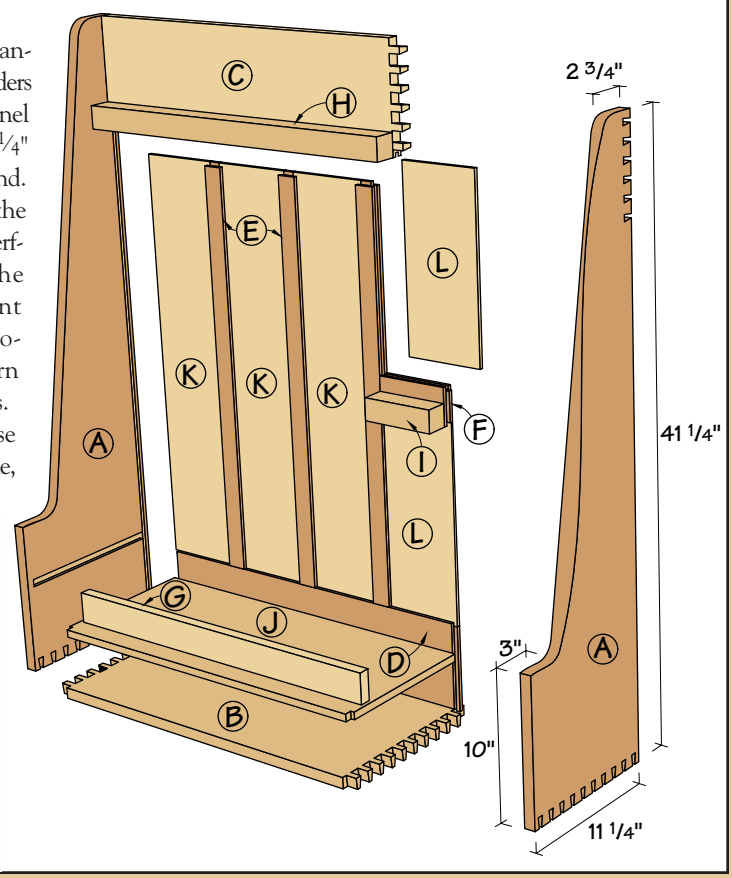
After cutting the bottom board to length, begin the dovetailing! Cut the tails and pins on the sides, top back and bottom boards. Be sure to space the pins on the top back so the groove on the bottom is hidden.

Prepare the panels and panel dividers as shown. The panel dividers have a ¼" tenon on each end. Now customize the large and small kerf-boards to get the spacing you want and to accommodate your western or Japanese saws.

Fit the carcase pieces without glue, and fine tune things. I finish my panels before the glue-up to make sure the panels never show an unfinished area. I find that the glue-up process works best by gluing one side, letting that dry and then gluing the panel dividers and eventually gluing the remaining side.

For the finish, I like to rub in a coat of boiled linseed oil and let it dry. This is followed with a coat of BriWax that is buffed up for a nice satin finish.

Working with hand tools can have many benefits for the unhurried woodworker. Just one is that you can teach young children the same techniques that you use, and they can work safely in the shop with you. Try it, and I think that you will like it. Just be careful though, because once you get started, it's a slippery slope. **PW**



Schedule of Materials: Galoot Sawtill

No.	Ltr.	Item	Dimensions T W L
2	A	Sides	¾" x 11¼" x 41¼"
1	B	Bottom	¾" x 11¼" x 24½"
1	C	Top back	¾" x 7" x 24½"
1	D	Bottom back	¾" x 7" x 23½"
3	E	Vert panel div	¾" x 1¼" x 27½"
1	F	Horiz panel div	¾" x 2½" x 5 5/16"
1	G	Saw handle rest	¾" x 2½" x 23"
1	H	Large kerf board	1½" x 1½" x 23"
1	I	Small kerf board	1½" x 1½" x 4 13/16"
1	J	Shelf	½" x 10½" x 23½"
3	K	Back panels	¼" x 5¼" x 27½"
2	L	Back panels	¼" x 5¼" x 12¾"


RIDGID

Downdraft Sanding Table

This project can turn a dust-filled shop into a pleasant work area, and the cardboard ducting is a snap to build.

by Jim Stuard

If you've ever sanded without dust collection in an enclosed space, you've probably seen the "cloud" that forms in your shop as you work. And if your shop is in a basement, you've probably heard from the person who does the dusting that the central air system has evenly distributed your sawdust throughout the entire house. Take heart, you can nix these two problems with one project.

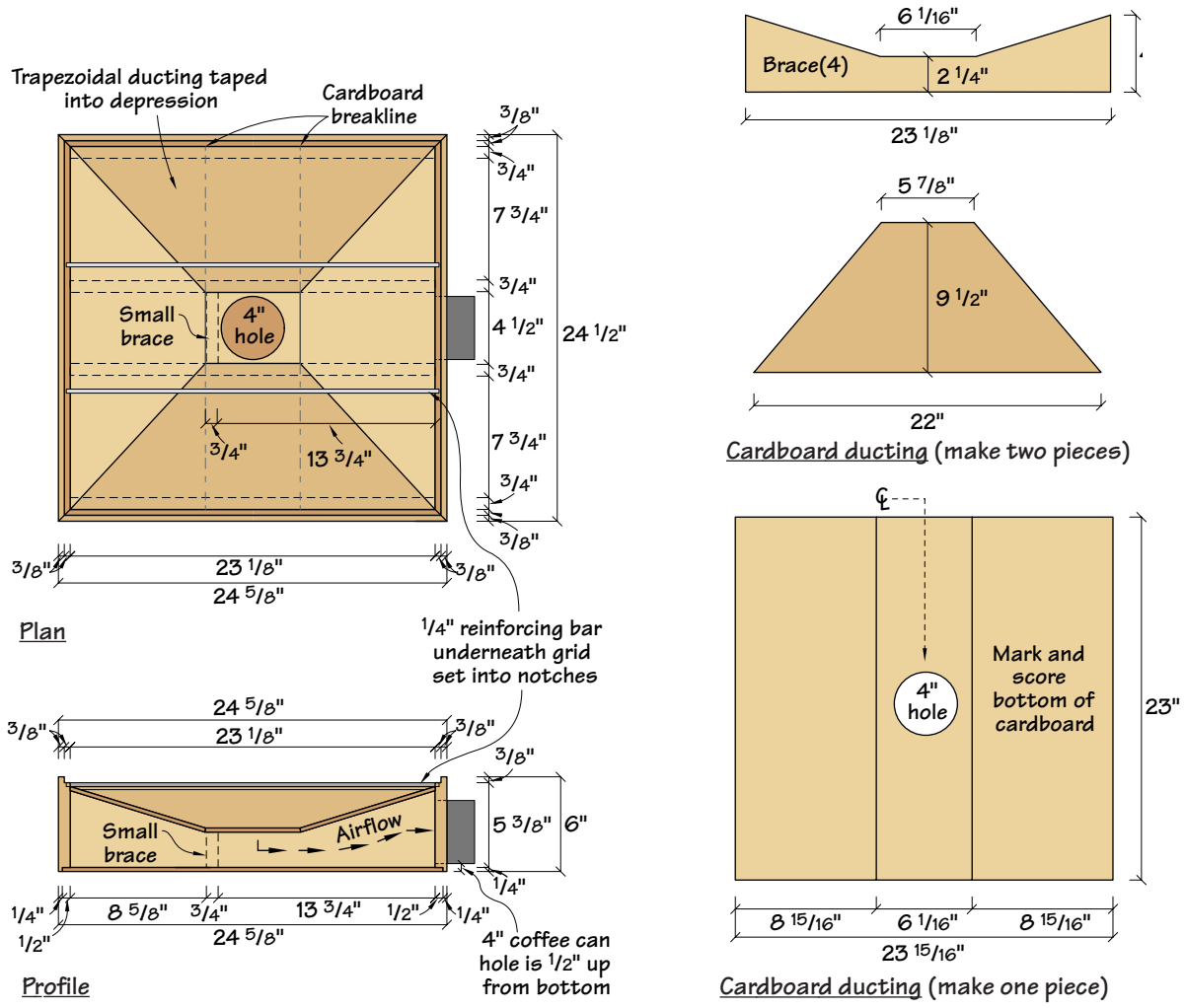
A downdraft sanding table connected to a small dust collector will give you a place to sand small- to medium-sized parts and will eliminate virtually all your sanding dust.

The table is essentially a two-foot square box with a bottom and some ribs. On top of that is a sheet of strategically cut and folded cardboard with sloping sides that directs dust to a hole in the center and in turn out a coffee can port to your collector. The work surface is made from a lighting grid (called diffuser) for a florescent ceiling fixture (cost: about $2) that is covered by an open-mesh carpet pad. The grid is reinforced by two steel bars underneath.

These grids are tougher than they look. As long as you don't abuse them all day, they can take a pounding. However, because of the way they are made, you can't cut them into a perfect square. To remedy this, I simply cut the box sides to suit the odd size. That's why the box is a little longer one way than the other.

Begin construction by ripping out the 6"-wide side material. Cut the sides to length with miters on the ends. Use a biscuit joiner to cut one slot in the center of each miter. Cut a 3/8" x 3/8" rabbet in the top edge of the sides. Cut a 1/4" x 1/2" rabbet in the bottom edge of the sides for the box bottom. Glue the box together

Photo by Al Parrish



with a band clamp. Set the bottom in place to square up the box while the glue dries. Cut the wooden bracing to size and then to shape as shown in the diagram. Then attach the bracing and bottom with screws. Cut the hole for the dust collection hose now. As an aside, my dust collector has 4" diameter hose. I also recently discovered that baby formula cans and most 14 and 16 ounce coffee cans are just under 4" in diameter. This makes perfect connections for a 4" dust collector hose. With a 4" hole cut in the side according to the diagram, it's a simple matter of cutting up a can with tin snips to leave tabs that can be screwed to the inside of the box. Leave at least 2" of can protruding from the box to attach the dust collection hose.

With the box assembled, you can see that the rabbet in the top edge of the sides leaves about ⅛" all the way around when the plastic grid is inserted. This accommodates the carpet pad that's later glued to the grid. Now cut notches for the steel bars that will reinforce your lighting grid. Mark out ¼" x ¼" x ¼" notches in the sides according to the diagram, just below the rabbet in the top edge.

Build the ducting from cardboard because it's lightweight, easy to shape and strong enough for this application. Cut the three pieces of ducting according to the diagram. Mark and cut the bends in the large piece and cut a 4" hole in the center. Place it in the box and check the fit against the bracing. Now place the trapezoidal ducting in place and check the fit. If all works well, tape the small pieces in place. This effectively holds the ducting assembly together and provides great airflow. Hook up the dust collection and check to see that the ducting is seating down on the bracing properly. If you want, caulk the joint around the opening in the cardboard.

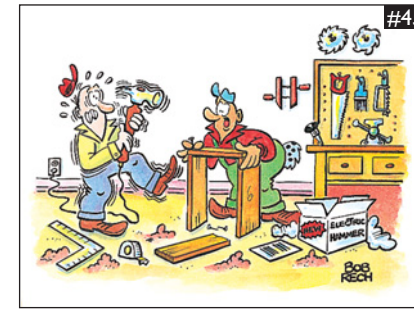
Finish the project by cutting out a sheet of open-mesh carpet padding a couple inches bigger than the plastic grid. Apply contact cement to the pad and the grid. Carefully apply the pad to the grid and fold the overhang over the edge of the grid, for a snug fit into the rabbet. A snug fit dampens vibration from the sander and keeps small parts from moving around while being sanded. **PW**

DOWNDRAFT SANDING TABLE

No.	Item	Dimensions T W L	Material
2	Long sides	¾" x 6" x 24½"	Plywood
2	Short sides	¾" x 6" x 24⅝"	Plywood
1	Bottom	¼" x 24" x 24⅛"	Plywood
4	Braces	¾" x 4 13/16" x 23⅛"	Plywood
1	Small bracing	¾" x 2¼" x 4½"	Plywood

Cartoon

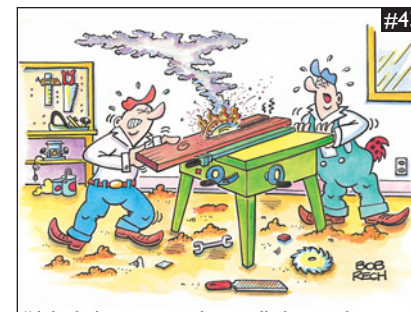
Illustrated by Bob Rech
www.bobrech.com



Submit your caption(s) for this issue's cartoon on a postcard to *Popular Woodworking*, Cartoon Caption #45, 1507 Dana Ave., Cincinnati, OH 45207 by September 22. Winners will be chosen by the editorial staff.

The winner will receive a selection of Quick Grip clamps from American Tool Co. Inc. Newly redesigned, these one-handed clamps are a must-have tool. Winners will receive five 12" clamps and five 24" clamps. A $170 value!

The runners-up each win a one-year subscription to *Popular Woodworking*.



"A little bit more and we will change this piece of oak into a piece of ash."

Richard Anthony, from Boise, Idaho, is the winner of our Cartoon Contest from the June issue and recipient of the fine set of Quick Grip clamps. The following runners-up each receive a one-year subscription to *Popular Woodworking*:

"I think my poor old grandmother has a better set of teeth than your old saw, Bob."
Keith Dickes, Toledo, Ohio

"Just think... In the old days they did this the *hard way*!"
Ron Brooks, Norman, Oklahoma

"This really solves the dust control problem!"
Ned Earl, Chester, California

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Introduction to Missile-Making

When Sam and I started woodworking, we hoped our skills would take off like a rocket. It wasn't our skills that took off...

I grew up around woodworking tools, but my interest in the subject dwindled to non-existence when I hit my middle teenage years. My brother, however, continued the hobby in his home shop throughout his adult life. When he and his family moved to a smaller house, he needed a place to store his tools. Because my wife and I live in a house with an unfinished basement I told him that we'd be glad to store them.

After this "acquisition" of tools, my wife urged me to make some household items. So I decided to brush up on my limited woodworking skills. During the same time a friend of mine, Sam, had his interest in woodworking sparked by a mutual friend of ours. The spark was quickly fanned into a flame when he saw the tools resting in my basement.

Together, we became avid "tool collectors." He was building his workshop from scratch while I was trying to fill in the gaps in my brother's tool collection. Sam purchased a table saw, a lathe and a router — which spurred me into a purchasing frenzy. First came a 14" band saw and a 6" jointer — next was a router and a sander, quickly followed by a biscuit jointer and a compound miter saw. We were rapidly reaching a high point in "tool collecting." Unfortunately, our wives grew tired of the shopping spree and wanted to see some results from all our buying efforts.

Finally the day arrived for us to begin mastering our tools. We made the crucial decision to build our first project in his shop and to start with something simple: a footstool. The router, mounted under his new router table, was to be our first exciting conquest.

It wasn't really the tool we needed to use, but for us, it held the most intrigue. With a roundover bit properly installed in the router, we chose a scrap piece of pine to practice on. The fence was set at what we determined to be the proper distance from the router bit.

Tension filled the air. All that shopping, all that time spent setting up our individual shops was culminating in this one moment of exhilaration. Sam placed the board on the work surface and squared its edge to the fence, then flipped the switch to start the router. The hum of the motor... the whir of the bit... the smell of a new piece of equipment running for the first time... we were about to become "woodworkers."

Slowly he pushed the board toward the rotating router bit when "BOOM" ... a thunderous noise shattered the steady hum of the motor. Sam's hand remained steadfast atop the now empty face of the router table. Across the room and lying undisturbed on the floor was our first 12" x 3" router-launched "missile." Two feet above it was the dented surface of a wall cabinet.

Being the "expert" of the duo, I quickly surmised that Sam had obviously not applied enough pressure when holding the board and encouraged him to try again. Carefully, and with more tension applied, he took the practice board and repeated the steps. Our second attempt resulted in a louder crash, a deeper dent in the cabinet and two novices buckled over at the waistline, laughing like a couple of kids after successfully pulling off a prank against a forlorn school teacher.

We finally decided that reading the directions might possibly shed some light on what could be causing the problem. It was after reading just a short while that we found out feeding the board between the bit and the fence was a no-no!

Fortunately no one was hurt — except for our pride and that cabinet — and we learned a valuable lesson about understanding how to properly operate tools before attempting to use them. **PW**

John R. Bryant works wood in Midway, Kentucky.