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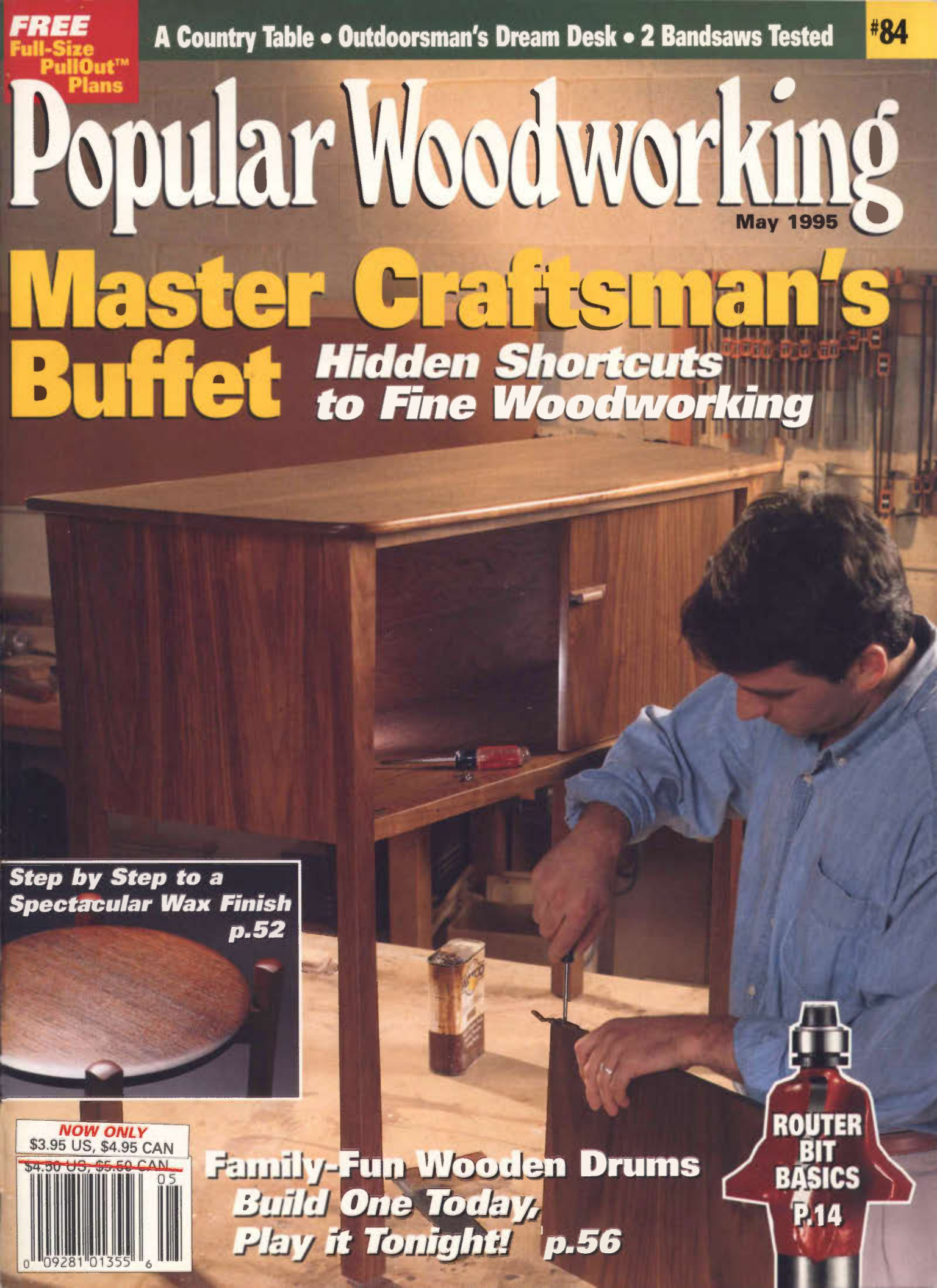

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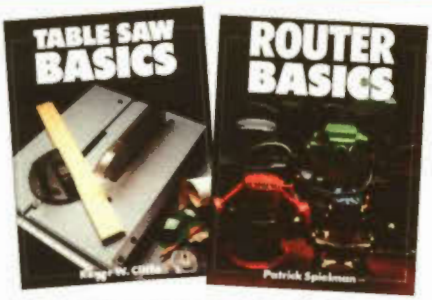

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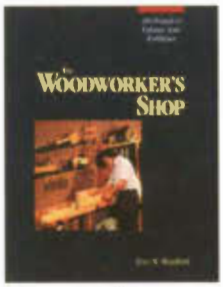

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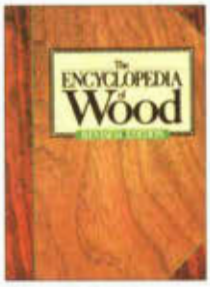

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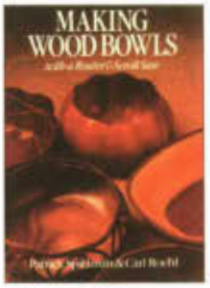

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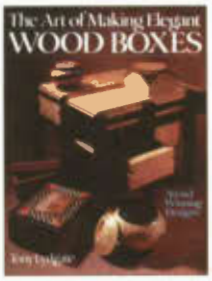

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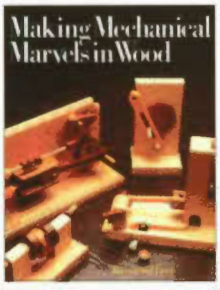

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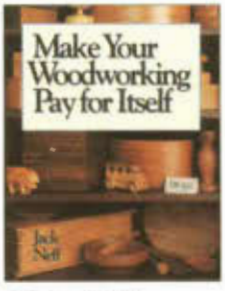

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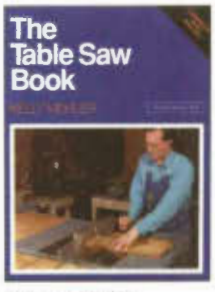

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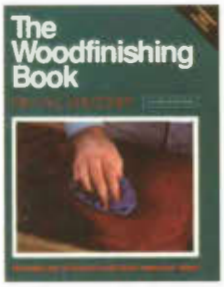

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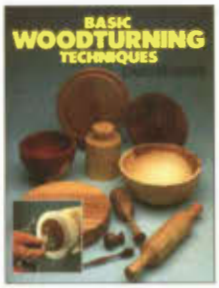

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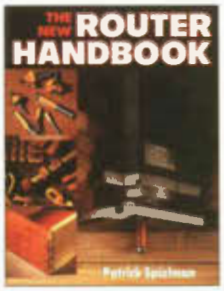

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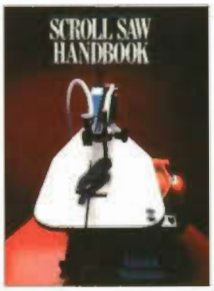

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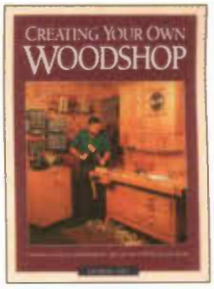

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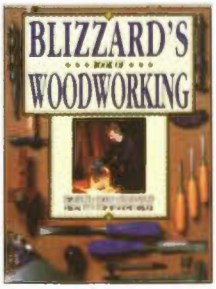

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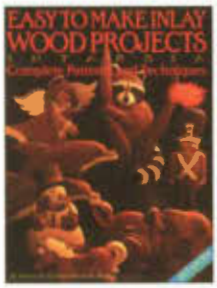

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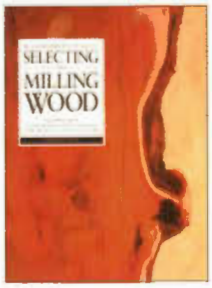

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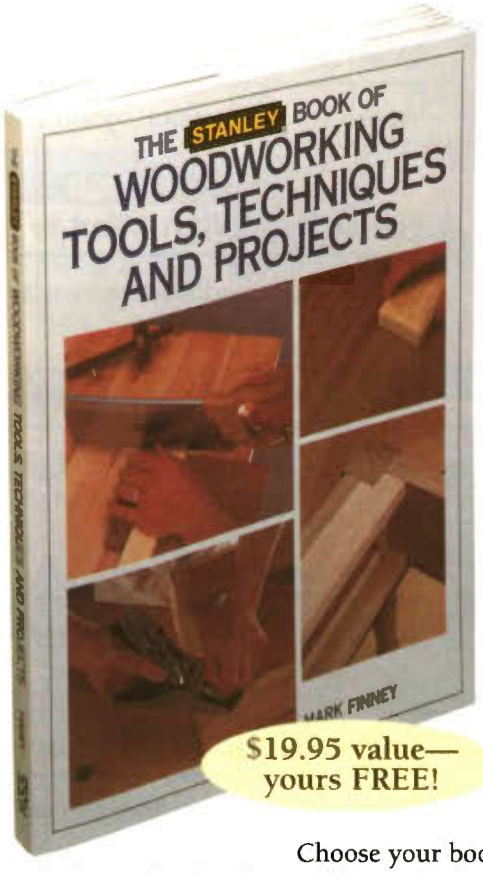

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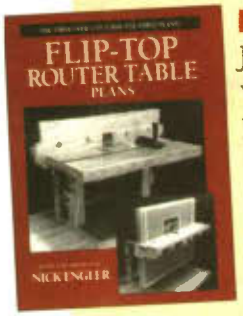

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Contents

Columns & Departments

On the Cover

Our cover story features another installment in the Master Craftsman series. Ken Sadler's small buffet works well in any "space challenged" dining room, or will do multi-purpose duty in any less than spacious area of your home. We're presenting two versions of the project, Ken's original project and an optional approach by *Popular Woodworking's* editors. You get Ken's complete text and drawings and the editors' alternative including their thinking behind the changes. Pictured on the cover is the editors' version of the project using walnut with a Tung oil finish. Cover photo by Dick Binstadt.

Safety Note
Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In most 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. Think ahead. Safety First!

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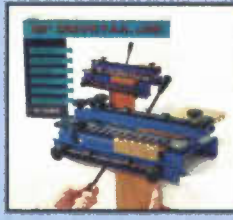

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El Grande

"I'll make you a chisel," said Antonio "Tony" Gomez, a senior cabinetmaker at the shop where I had worked for a couple years. Most all the 25 employees at the custom furniture shop knew Tony, Sr. "made" many chisels, an undertaking few were willing to attempt.

From below Tony, Sr.'s bench, the gentlemanly native of old Mexico rummaged for and then found a box half filled with sawdust. Sifting through it, he unearthed a well past their prime collection of wood files. Tony, Sr. selected one of the larger files, "a mill-bastard, this will make El Grande," he said.

He turned on his heel and headed for the small metal-working area of the shop. We stopped at the vertical belt sander.

Tony, Sr. spent the next 10 minutes grinding the edges of the file straight, then moved on to the flat faces removing the course "teeth." Every minute or so, he plunged the piece into the water bucket to cool the hot metal. The casual nonchalance with which Tony worked only served to underscore my wonderment at the transformation taking place.

Eyeing the nearly smooth surfaces, Tony instructed," you have to keep the thickness even and the edges parallel." Satisfied with his progress, he ground off the last remaining traces of abrasive teeth, shut down the sander and moved to a nearby bench grinder. "Here we'll bevel the edges and set the proper blade angle," he said as the grinder kicked on with a whir. Another 10 minutes later he dunked the blade one last time, inspected it, then handed it to me. "Looks great, Tony," I said.

"Tonight I'll turn a handle and fit it with a steel collar." Tony said. Thanking him for both the lesson and the chisel, I commented I had no idea you could make such a nice chisel from what was previously a crude tool. "The steel is good," he said, "you can make it very sharp. Maybe it's not as good as a fancy one you buy, but what did it cost to make?" he asked.

"When I was a boy in Guadalajara, I worked in a furniture shop. It was during the war. That made tool steel impossible to get. One day, the shop owner sent me to the junk yard for a car bumper. I did not know why. Imagine my surprise when we made jointer and planer knives from it," Tony said. "They weren't great, but they worked. The shop couldn't close because we didn't have knives. The workers had families to support," he concluded.

The next morning, Tony had the chisel completed. He'd even lacquered the handle. Removing it from his well-worn tool box, he said, "I'll sharpen it for you."

As he had done a thousand times before, Tony reached for his sharpening stone, a sorry looking block that was dished out from years of use and broken in two pieces as well. Squirting honing oil on the stone, Tony began to work. He'd pause occasionally to inspect the edge. Finally, he flipped the blade to remove the burr from the back edge. After a moment he stopped, raised his arm to his lips and licked a spot about six inches above his wrist. With chisel in hand, he swiped at the moistened spot on his opposite arm, cleanly shaving a few dark hairs from his olive colored skin.

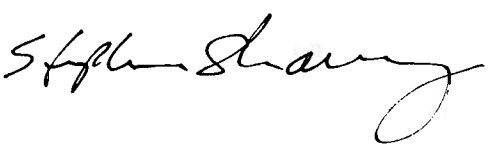
"It's sharp," he said, handing me El Grande. I thanked him profusely for my new chisel. In my heart I thanked him for a lesson from the life of an old cabinetmaker.

Like Tony, I have found it essential to be adaptive in woodworking. Circumstances often dictate how a project will be constructed, available tools have a big influence. Even the type of finish influences construction decisions. To be adaptive, inventive, creative and productive are just some of the lessons Tony and other accomplished cabinet makers have taught me. For these lessons, I am forever grateful!

* * * * * *

Hugh Foster's article on chisels and gouges prompted me to recall the above story, especially Hugh's comment that he found an inexpensive set of Stanley chisels not only worked well, but "had some adventures other (chisels) wouldn't dream about...What's the problem if we occasionally do some rough work...a thought that really haunts the rest of this article" which concerns more expensive tools. While we all love fine tools, we should also remember that better tools don't necessarily make us better woodworkers.

While I don't recommend you make planer knives from your car's bumper, the concept of being inventive is an important one. Contributor Bryan Mills addresses this subject in our "Out Of The Woodwork" column. Bryan takes umbrage with woodworking magazines' "cookie cutter" approach to projects which assume there's only one way to do something. Certainly, I agree. If fact, we're demonstrating this by presenting two approaches to the construction of Ken Sadler's Master Craftsman buffet project in this issue.. There's so many other things worthy of your attention in this magazine, I'll just finish here and let you get on with your reading.



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Letters

We welcome your comments, pro or con, about articles we publish. We also want to see color pictures of what you're building. Send your letters and photos to: Letters, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. Letters may be edited for publication.

A problem compounded

I recently made the toddler's chair in your March 1993 issue. However, I had difficulty with the compound angles required for the feet and the dadoes required for the steps and seat. Through trial and error I was able to complete the assembly of the chair, but I have been asked to make six more of these chairs for my other grandchildren.

The article didn't indicate what angle settings should be used for the table saw and miter gauge. The photo on page 63 indicates a jig was made to cut these angles.

The article also doesn't mention if the pieces have to be flipped, or if the jig is moved to the other side of the blade. Since I'll be making six more of these chairs, I would appreciate any help you could give me.

Robert Gordon, Sr.
Bowie, Maryland

ED. You are correct that the article itself doesn't give the saw settings for the compound angles, however, the diagram on page 62, indicates an 87° angle from front-to-back and side-to-side.

I'm not too sure they actually made a special jig for the project. A 3° shim used with a cross-cut sled should provide the necessary angles. You should be able to complete the compound dadoes by using the shim and angling your dado stack in the saw. You'll probably need to make a new saw insert, but you'll use it again.

If the cross-cut sled is the jig you indicated, go ahead and make one. It's simply a factory miter gauge taken to the next level. You'll use it over and over for all your projects.

January cover "magical"

Your magazine is the greatest! I have been under your influence since 1988 and am paid up till March of 1997.

I usually let others do the writing, but I just had to say that I know why Dean Gutzwiller is smiling on the cover of the January 1995 issue. It's because he got the leaf, on the table he is leaning on, to stay up without moving the leg over to support it!

That's a pretty good trick! Keep up the good work.

Richard Laws
Pinckney, Michigan

ED. Congratulations, you caught us! Actually the gate leg was swung out just enough to support the leaf. It's nice to know we have readers who pay such close attention. Thanks Richard, and keep a close eye on us in the future.

E-mail address

To get a hold of us through E-mail, all you need to know is Popular Woodworking's screen name and address: Bruce Woods, 75463,3377. Or you can leave messages in the Woodworking Section of the Crafts Forum. We will be looking forward to all questions, queries for articles or just general conversation.

We've also signed on to America Online. Our screen name is Wudworker. To drop us a line without using the mail system, look for The Exchange's Woodworking Center.

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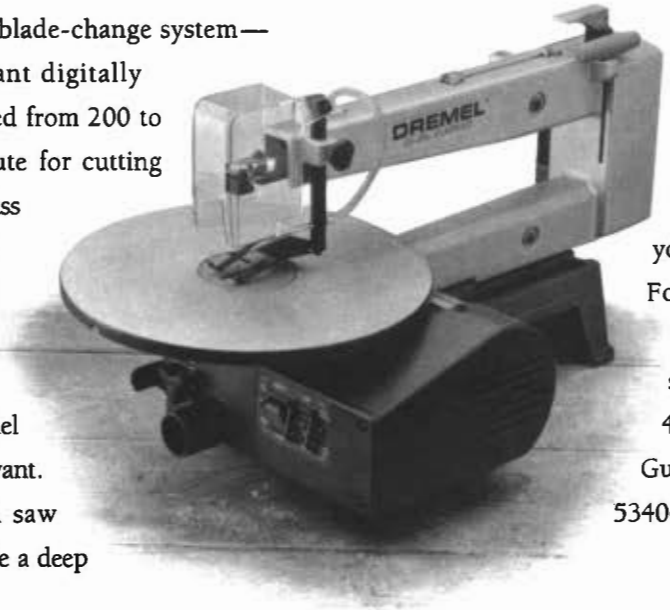

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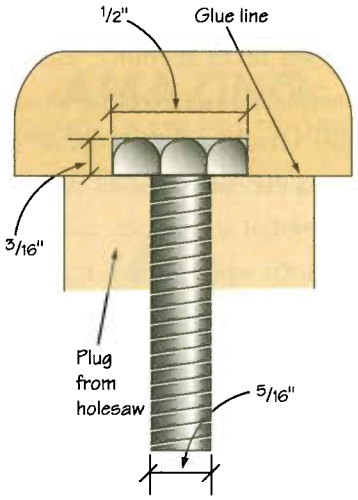
Tricks of the Trade



Get A Handle on Your Projects

Over the years, I've made numerous jigs and rather than purchase the knobs for them, I've made them. The material I use is ¾" hardwood, usually maple, cherry or birch. I use a 2" and a 1⅜" circle. These can be cut out using a bandsaw for the 2" circle (to avoid the center hole), and a holesaw for the 1⅜".

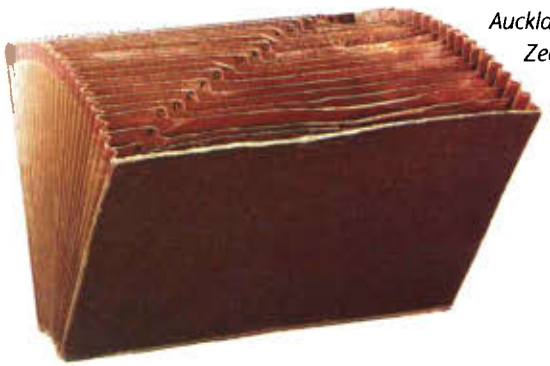
After drilling the necessary holes in the pieces ***(see drawing)***, I assemble the components, using glue and a C clamp to hold the entire assembly together. To finish the knobs I mount a 1½" drum sander in my drill press and sand six finger-recesses in the upper handle. I finish by rounding over the edges with a sanding block and applying several coats of black epoxy spray enamel.

Maurice J. Landry
Bakersfield, California

Keeping Your Grits In Order and Handy

Throw out all those valuable family documents and put that expanding file to much better use organizing your sandpaper. By keeping the similar grits together, you can be sure of finding paper of the proper grit for your sanding needs. A staple gun fastens the file to the wall and you can use a bit of sticky velcro or an old buckle and some webbing to keep it shut.

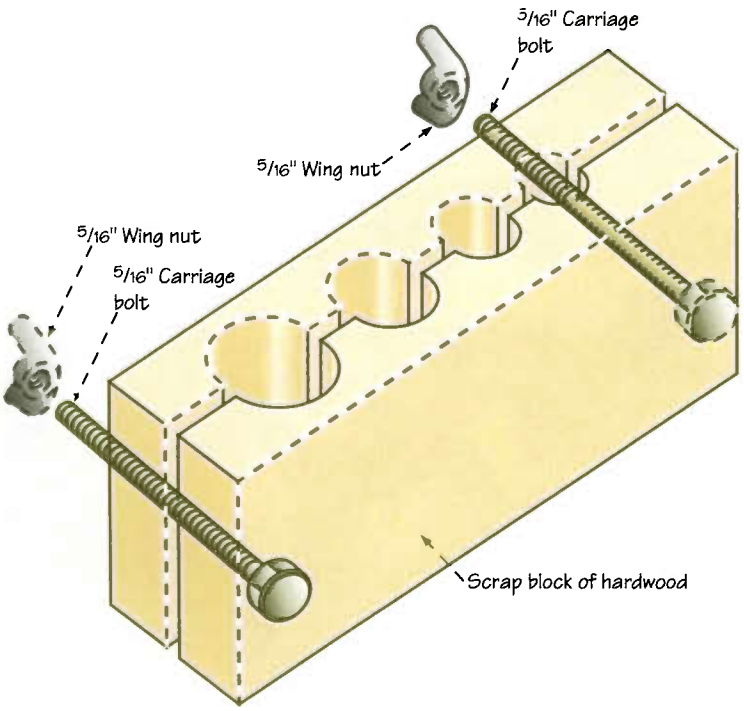
Keith Christensen
Auckland, New Zealand



Improve Your Paint Remover

Using sawdust with paint remover is often more effective than merely applying the remover and scraping the work. First the remover is brushed on and the work surface is scrubbed until it no longer feels tacky. Then more remover is added, sawdust is spread over it and scrubbed with a block until the work is dry, after which the paint can be easily scraped off.

Thomas LaMance
Prewitt, New Mexico



End Drilling Dowels

I recently needed to drill the ends of several different size dowels. To do this I made a jig using a scrap of maple 3" x 2" x 12", but your needs may dictate a different size.

Drill holes through the block in the sizes of the dowels which will be drilled. Then drill a 5/16" hole at each corner of the faces of the block.

After drilling all these holes, I ripped the jig the length of the block right through the middle of the dowel holes. Next, simply use 5/16" carriage bolts and fender washers to draw the two halves tight against your dowels. You now have a sturdy base to work with.

Thomas L. Johnson
Rancho Cucamonga, California

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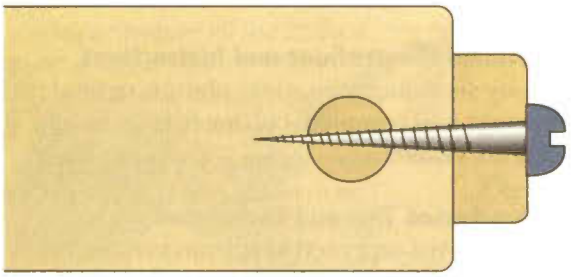
Replacement Rung Snaps Into Place

To replace a broken chair rung without disassembling the chair, make the rung as you would normally with a turned-down dowel on one end. On the other end, drill a hole the size of the dowel to a depth of about 1¼". Insert a small compression spring into the hole. Compress the spring by inserting the dowel, then mark the dowel at the point where it is even with the rung. Remove the dowel and cut off at your mark.

Put glue on both ends of the spring-loaded dowel, and on the fixed dowel and insert into the chair. If the size of the original dowel is large enough to weaken the rung if drilled out, plug the hole in the chair and use a smaller sized dowel.

H.J. Andreson
Lincoln, Kansas



Screwing Into End Grain

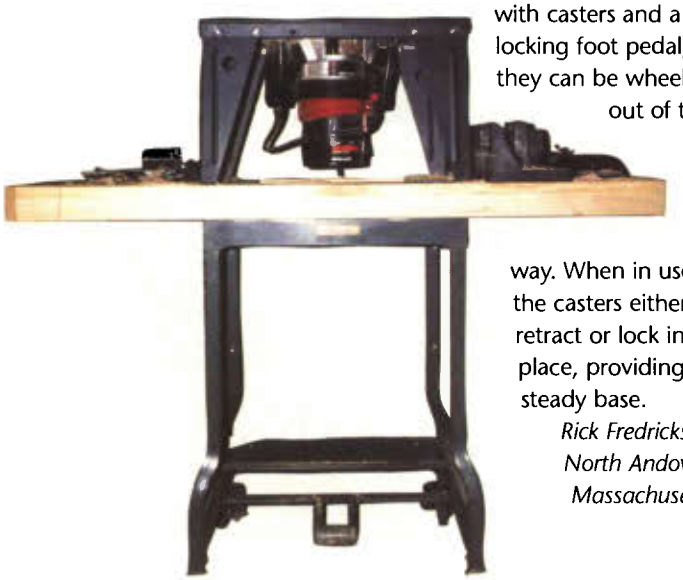
When it becomes necessary to screw into end grain, I've found a method that works quite well. Install a dowel through the material to accept each screw. This is good when glue may not be used because the attached piece must be removed later.

Arthur Chapman
Newburyport, Massachusetts

My Kingdom for a Portable Bench

As is the case with many woodworkers, my shop is in an already crowded basement. There isn't enough floor space to permanently set up full sized tools, so I buy bench top tools. However, there also is not enough room on my bench, so for many years I have been using office typewriter tables as stands for my power tools.

Used tables cost about $15 and since they are equipped with casters and a locking foot pedal, they can be wheeled out of the way. When in use, the casters either retract or lock in place, providing a steady base.



Rick Fredrickson
North Andover, Massachusetts

Keep Frequently Used Items Hanging Around

I use plastic clothes pins in my shop to hold plans, small parts for projects, copies of orders and the list of things my wife wants me to do around the house and yard. The pins have holes that fit over ⅛" peg board hooks, or can be used on 4-6 penny finishing nails. They're easier to move than tacks and can be arranged by priority. They also don't make holes in plans or photos.

Stephen Wolenec
Mazomanie, Wisconsin

Handy Drill Storage

I don't know about other woodworkers, but I really appreciate having my drills, both corded and cordless, near at hand and ready to use. I solved this by mounting a ready-made scabbard on the wall right over my bench where most of the use takes place ***(See photo page 76).***

Albert Beale
Littleriver, California

Tricks of the Trade shares readers' tips for making woodworking tasks easier and safer. Send your original, unpublished ideas to Tricks of the Trade, *Popular Woodworking*, 1507 Dana Ave. Cincinnati, Ohio. We pay $35 for each TOT we publish.

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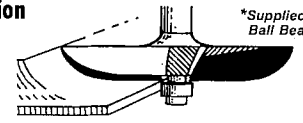

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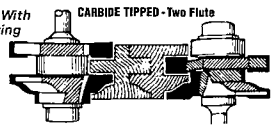

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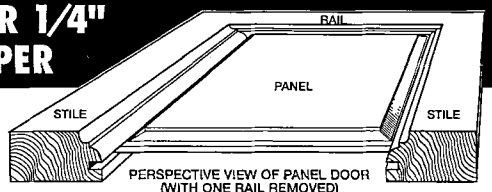

PERSPECTIVE VIEW OF PANEL DOOR (WITH ONE RAIL REMOVED)

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#1315	ROUND OVER - 3/16" Radius	1/4"	$11.00
#1368	ROUND OVER - 1/4" Radius	1/4"	$12.00
#1316	ROUND OVER - 5/16" Radius	1/4"	$14.00
#1369	ROUND OVER - 3/8" Radius	1/4"	$15.00
#1370	ROUND OVER - 1/2" Radius	1/4"	$17.00
#1317	ROUND OVER - 1/4" Radius	1/2"	$12.00
#1318	ROUND OVER - 3/8" Radius	1/2"	$15.50
#1319	ROUND OVER - 1/2" Radius	1/2"	$17.00
#1320	ROUND OVER - 3/4" Radius	1/2"	$21.00
#1333	TONGUE & GROOVE - Straight	1/4"	$29.00
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#1335	TONGUE & GROOVE - Wedge	1/4"	$29.00
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#1337	FLUSH TRIM -3/8" Diameter -1" Cutting Length	1/4"	$ 7.50
#1338	FLUSH TRIM -1/2" Diameter -1" Cutting Length	1/4"	$ 8.00
#1339	FLUSH TRIM -1/2" Diameter -1-3/16" Cutting Length	1/2"	$ 8.00
#1340	PATTERN / FLUSH TRIM -1/2" Diameter	1/4"	$15.00
#1341	PATTERN / FLUSH TRIM -3/4" Diameter	1/4"	$17.00
#1342	PATTERN / FLUSH TRIM -3/4" Diameter	1/2"	$19.00
#1351	LOCKMITRE -7/8" Cutting Length	1/4"	$32.00
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#1389	SPIRAL UPCUT - 1/8" Diameter (solid carbide)	1/4"*	$ 9.95
#1390	SPIRAL UPCUT - 1/4" Diameter (solid carbide)	1/4"	$13.25
#1391	SPIRAL UPCUT - 1/4" Diameter (solid carbide)	1/2"*	$15.45
#1392	SPIRAL UPCUT - 3/8" Diameter (solid carbide)	1/2"*	$26.45
#1393	SPIRAL UPCUT - 1/2" Diameter (solid carbide)	1/2"	$33.00

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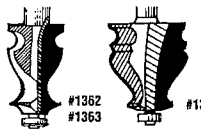
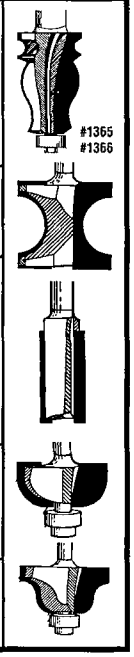
#1363	1-5/8" C.L.	1/2"	$29.95
#1364	1-5/8" C.L.	1/2"	$31.95
#1365	1" C.L.	1/4"	$31.95
#1366	1-11/16" C.L.	1/2"	$31.95
#1330	BULL NOSE - 1/2" Diameter of Circle	1/4"	$16.00
#1331	BULL NOSE - 3/4" Diameter of Circle	1/4"	$21.00
#1332	BULL NOSE - 3/4" Diameter of Circle	1/2"	$21.00
#1371	STRAIGHT - 1/4" Diameter	1/4"	$ 6.50
#1372	STRAIGHT - 3/8" Diameter	1/4"	$ 6.50
#1373	STRAIGHT - 1/2" Diameter	1/4"	$ 7.00
#1374	STRAIGHT - 3/4" Diameter	1/4"	$ 9.50
#1375	STRAIGHT - 3/8" Diameter	1/2"	$ 7.50
#1376	STRAIGHT - 1/2" Diameter	1/2"	$ 8.00
#1377	STRAIGHT - 3/4" Diameter	1/2"	$10.00
#1378	COVE - 1/4" Radius	1/4"	$12.00
#1379	COVE - 3/8" Radius	1/4"	$13.00
#1380	COVE - 1/2" Radius	1/4"	$14.00
#1381	COVE - 1/2" Radius	1/2"	$15.00
#1382	ROMAN OGEE - 5/32" Radius	1/4"	$16.00
#1383	ROMAN OGEE - 1/4" Radius	1/4"	$17.00
#1384	ROMAN OGEE - 1/4" Radius	1/2"	$18.00





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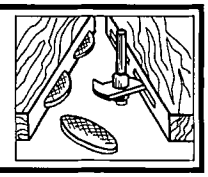

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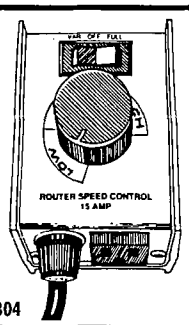

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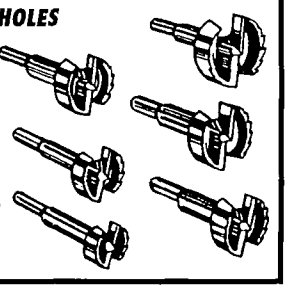

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Finishing Forum

The Finishing Forum is an ongoing discussion about the art of wood finishing. If you have a question or a problem, we'd like to help. If you have a tip or secret to share, or you recently tried a new product, write: The Finishing Forum, c/o *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. Letters may be edited for clarity.

STICKY PROBLEM

I've found a good source for some extremely rare and horrendously expensive hardwoods, such as pink ivory. It comes completely coated with wax to retard drying, which is a good thing, but removing the wax seems next to impossible.

A household book gives this halfway helpful idea for wax finishes: Melt the wax off with a hair dryer and wash with vinegar and water.

I'm not about to wet down a megabuck wood. Also, I'm not confident that sanding will do a good job of removing the wax. Needless to say, sanding isn't a solution on burls, where you want the natural burled edge but want to finish with something other than wax.

What can I do to give me a clean starting point, without sacrificing precious wood or dragging wax through the wood with a tool?

Chuck Kubin
Cheyenne, Wyo.

Chuck:

It's very hard to give you advice on removing the wax from your exotic wood because I don't know how large the pieces are, or what their configuration is. Therefore I'll tell you what I've done in similar situations and hope it helps.

For smaller pieces of wood I've used a paint stripping gun that operates on hot air. I attach a tiny screw eye to the wood and hang it from a ceiling joist with wire. Using the stripping gun, melt the wax by applying just enough heat to get it flowing. There's little danger of harming the wood if you're careful. With this technique, you'll be able to clean 90% of the wax from the wood. The remainder will easily mill off.

For large slabs or burls of exotic wood, try leaning them upright against a firm surface. Start at the top with your heat gun and work down, removing as much wax as you can. If you're trying to remove wax from the natural, waned edge of a plank, just heat the edges, since trying to scrape or abrade the wax could damage the edge. Try removing the remaining traces from waned edges with naptha, a fast-evaporating solvent that is slightly more aggressive than mineral spirits or paint thinner. Last, use a cabinet scraper to clean the wax from the flat surfaces.

Incidentally, you needn't be concerned about traces of wax that won't come off with the heat gun or scraper. I keep a block of parrafin on my workbench at all times to "sweeten" the cut of my hand plane or saw on difficult woods, which is precisely what hardwood dealers use to slow the rate of vapor leaving the wood. You won't harm your tools by letting them come into contact with parrafin wax, providing you've removed the majority of it from the wood's surface.

Tom Wisshack *is a contributing editor for* Popular Woodworking *who makes and restores fine furniture in Galesburg, Ill.*

By Tom Wisshack

SPLOTCHY MAPLE

How can I stain hard maple without the splotching I seem to encounter each time? My most recent project was three end tables. Everything progressed according to plan until I tried to apply a stain/sealer to surfaces that had been final sanded using 400 grit wet/dry sandpaper. The stain splotched so badly I resanded, removing all the stain and stopped sanding at 220 grit. My reasoning was the 400 grit polished the surface thereby preventing the stain from penetrating. The result of the second staining over the 220 grit was similarly unsatisfactory, with continued splotching, uneven stain absorption and blackening of portions of the surface grain that I could not anticipate or predict looking at the bare wood prior to staining.

I enjoy working with hard maple, but I'm doing something radically wrong in my preparation for staining. Can you provide a few hints on how to obtain a more satisfactory finish on this beautiful species?

Dennis Lenz
Lakewood, Colo.

Dennis:

I'd be delighted to help with your splotchy maple, considering I just completed a curly maple side table and am thrilled with the results.

First off, write Woodworkers Supply of New Mexico, 5604 Alameda Place, NE, Albuquerque, NM 87113, or call (800) 645-9292. Ask about their aniline dyes and give them a rough idea of the color you're trying to achieve. They can make some suggestions to get you started.

The dyes come with complete instructions, but I'll add a few things that may not be apparent at first:

1. Start with a diluted solution and slowly advance to the tone you want by adding dye in small increments. Multiple coats of the dye won't cloud your wood because the dye is completely transparent.

2. Practice on scrap wood identical to what your using, and sand it to the same degree.

3. Aniline dyes have a sparkling clarity and will enhance the figuring of your maple like no other conventional stain. You'll be hooked once you try them, and it's almost impossible to ruin a piece of wood with them unless you add way too much powder to the water. The reason you achieve superb results is because the dyes dissolve in water, unlike oil stains, which consist of pigment particles suspended in a clear vehicle (turpentine and linseed, or other oil). No matter how much you dilute an oil stain, it's never going to enhance the figuring in a wood like maple to the degree that aniline dye does.

The last part of my answer is a lot like the good news/bad news joke: Aniline dyes, as spectacular as they are for coloring and enhancing wood, will fade over time. (Ironically, the pigments in oil stains, probably outlast anilines). Here's what I did to overcome the problem. I wiped on several coats of waterbase polyurethane varnish with UV Blocker and rubbed it to perfection when dry, finishing up with a coat of paste wax. By the time the dye fades on my little curly maple table, it will have acquired a nice patina of its own. PW

R.J. DeCristoforo

Making Sense of Router Bits

With so many options available, some help in deciding what's needed in your shop.

Few tools in recent years have made as strong an impact on woodworking as the electric router. This is especially true in the home shop where the tool can function like a mill shop. Moldings, raised panel doors, decorative edges, a variety of joints and more are now practical applications without needing a complement of stationary equipment.

This has led to a comucopia of router tooling that can be bewildering, even intimidating, especially to the novice. Buying haphazardly is a bad approach, and suggesting that one needs all types is equally ill advised. You don't have to buy too many quality bits before you exceed the price of the router itself. An informed background of router bit basics and the innovations available today can be helpful.

Anatomy of a Router Bit

Router bits share common parts and traits ***(diagram 1)***. All bits have a shank, or shaft, most commonly found in ¼" and ½" diameters. The shank usually has two "wings" attached which have the cutting edges milled onto them.

Most bits have pilots that guide the router and control the width of cut without a fence or edge guide. Pilots can be integral or replaceable ball bearing.

Integral pilots, usually found on one-piece bits, turn as fast as the cutting edges, creating considerable friction resulting in burns and indentations in the work if extreme care isn't used.

Pilot bearings, which are characteristic

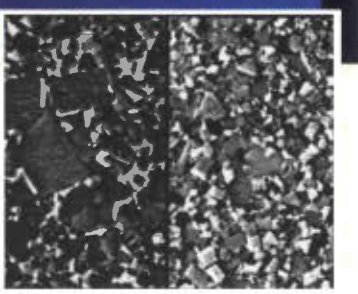

Photo 1. *Carbide steel is a metal powder and binder mixture molded at high temperatures and pressures. Wear occurs because grains of the hard metal powders break away. The larger the grain size, the faster the cutting edge dulls, and large grains create "lakes" of binder which weaken the structure. Pictured above is an example of carbide produced by Freud, one of the few router bit companies who manufacture carbide. In addition to smaller granular composition, Freud includes titanium to protect against chemical attack. (Information and photo provided by Freud.)*

Photo 2. *The shear angle of a bit is the angle that the cutting edge makes with the shank of the bit. The bit shown above employs carbide tips angled to slice through wood fibers similar in principal to using a hand plane at an angle to the direction of motion. The slicing action becomes even more important when cutting cross grain. Bits without shear or with too little shear chop the wood and are more likely to produce tear-out and chatter marks. (Information and photo provided by Freud.)*

R.J. (Cris) DeCristoforo *is a woodworking and tool authority and is a contributing editor to* Popular Woodworking.

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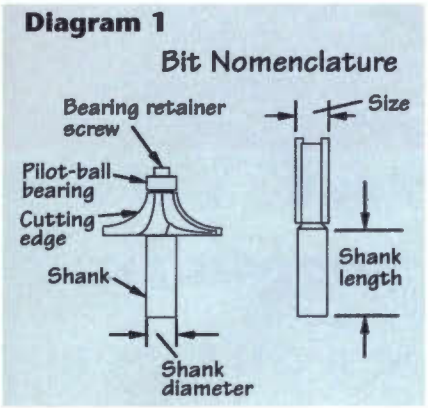
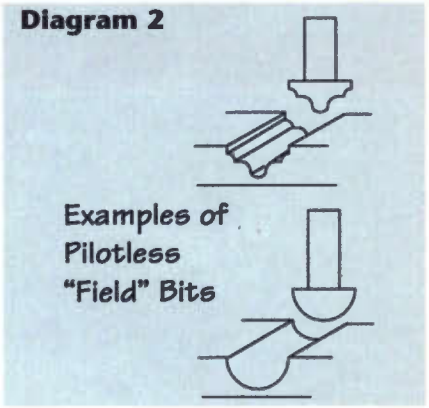




of tungsten carbide bits, rotate independently so the negative factors of the integral pilot are eliminated ***(diagram 1)***. "Field bits" do not have pilots so the router must by steered by an edge guide or by a straightedge that is clamped to the work ***(diagram 2)***.

Cutting radii is the distinguishing dimension on edging bits, many shaped bits and field bits. On straight bits, whose primary function is dadoes, grooves and flush trimming, the full diameter size is used as the distinguishing dimension.

In General

When all else is equal, choose carbide—the thicker the better- not only because of increased mass, but because thicker carbide cutters can be sharpened as many as 15 times while thinner high speed steel ones will have to be replaced after about four or five sharpenings. There's a wide variety of choices in manufacturer's lines, so it pays to check around.

It seems foolish today to think of anything but carbide tipped cutters, but they still haven't completely replaced all-steel tooling. You can save money by choosing from these lower cost products if you need a bit for a particular, short use, project. Generally though, acquiring high quality bits is still the way to go.

Multipurpose Bits

Though most router bits are designed with a single function in mind (the rabbeting "kit" ***(diagram 3)*** includes an assortment of bearings, each of which establishes a specific width of cut), many can be utilized beyond their primary function by controlling the width of cut and depth relative to the router base. For example, a straight bit ***(diagram 4)*** can form dadoes and grooves wider than its diameter by making repeat, overlapping passes.

Another flexible bit is the the multipurpose bit ***(diagram 5)*** which is configured so partial sections of it will produce standard profiles. By varying the cutter's height, fence position and number of passes, you can create a virtually unlimited number of molding shapes.

Bits of this type must be used with a router table. By carefully checking what is available, it's often possible to buy one bit that can do the job of several others.

Starter Set

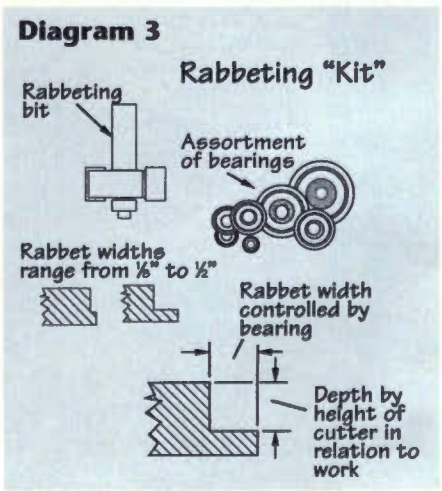
Buying bits in sets is good advice cost-wise, but you must ask yourself if it's practical for your particular woodworking needs. A disadvantage to bit sets is that you may get more bits than your work or designs require. The answer is to avoid jumping into a purchase without checking the primary function of each bit and asking if there will be a need for each one ***(Diagram 6)***.

If you're using your router for decorative edges, extensive joint forming, surface carving and so on, a set of bits may not be right for you because many sets include several profile bits and different diameter straight bits. You may be happy to get along with only one type of each.

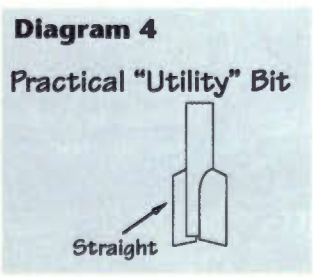
All sets are not alike, so check the contents against your woodworking application in order to make the most practical choice.

Safety bits

The trend today is toward anti-kickback bits. The obvious difference between conventional bits and the newer designs is in bulk or mass. Instead of two wings supporting the cutting edges, anti-kickback bits are solid steel milled almost to the diameter of the cutting circle and with very narrow gullets. In essence, the



A six piece starter bit set from Freud.



design limits how deeply the cutting edge can bite into the wood and guards against wood being jammed too deeply into the gullets. I think extra mass also provides an advantage because more weight means less vibration.

Another safety factor has to do with vertical panel-raising bits that are 1" in diameter as opposed to those that work horizontally and have as much as a 3"cutting diameter. The smaller diameters of the vertical designs reduce tip and surface speeds considerably and require less horsepower. The bits are used in a router table with a high fence to support the work.

Some manufacturers add a colored coating to the bits so they show up more clearly, serving as a warning to keep fingers away. This adds a margin of safety to routing, but raises an important purchasing question: Is the coating an anti-stick product preventing accumulation of pitch and resin? If it's just a paint job, it will soon wear away, especially near cutting edges where the most heat is generated.

Talking safety about router bit design seems a bit much, but let's concede there is no such thing as safety overkill. PW

Diagram 5

Multipurpose Bit

Dozens of shapes are possible by using part of the profile or by making multiple cuts

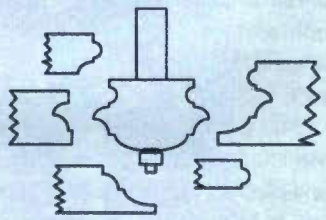
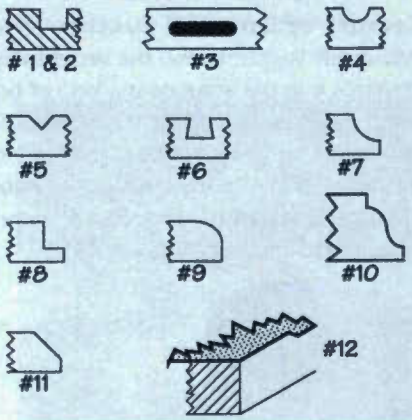


Diagram 6

Carbide Tipped "Starter" Sets

1–1/4" straight
2–3/4" straight
3–mortising
4–*round nose
5–V-groove
6–dovetail
7–*cove
8–*rabbeting
9–*round over
10–*ogee
11–*chamfer
12–flush trim

NOTE-all 12 bits in a starter set (about $167.00). Bits marked with an * included in a 6 piece set (about $125.00)



News and Notes

New products to announce? Send a press release and color transparency or slide to the Products Editor, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207, and we'll consider them for News and Notes.

Secrets of Dovetail Success

Woodcraft Supply® knows the secret to tight fitting hand cut dovetails is in the accurate marking of both tails and pins. Hand made exclusively for Woodcraft, these brass and Pau Ferro marking gauges offer adjustment for angled or straight dovetails up to 1" wide. They are available in 1:6 for softwoods and 1:8 for hardwoods. For more information contact Woodcraft Supply at (800)225-1153.

Don't Come Un-hinged, It's Back!

The Woodworker's Store is once again offering a cedar chest hinge which company officials say has been in great demand since production of the original product ceased four years ago.

The hinge, designed specifically for cedar chests, doubles as a lid support. The hinge is manufactured from high grade steel and then brass plated for a finished appearance. The hinge surface mounts to the side of the case and then to the underside of the lid.

For more information, contact The Woodworker's Store, 21801 Industrial Blvd., Rogers, MN 55374 (800)279-4441.

Gravity is Your Friend

Binks introduces its new M1-G HVLP Gravity Feed Spray Gun that not only complies with all air quality regulations, but also atomizes and sprays as quickly as conventional air spray. The M1-G can spray base coats, clear coats, waterborne and high solids at fast application speeds with material savings of up to 50%. The gun requires only 18 pounds of inlet pressure, and, the cup and nozzle are available in standard aluminum or E-Z Clean Solvent Saver coating. For more information, write to Binks, 9201 Belmont Ave., Franklin Park, IL, or call (800)99-Binks.

Just Keep Scrolling Along

Skil® has introduced the new model 3333 Benchtop Scroll Saw. It offers a quick change blade holder, cam-action tension mechanism, a 1.6-amp induction motor providing 1,725 strokes per minute and a teardrop-shaped work platform adjustable from 0° to 45° for bevel cuts.

The new scroll saw also features a dust collection system, an air blower to clear the cutting line of dust and debris, and a built-in holder for a worklight accessory.

The saw accepts plain or blade-end saw blades and can cut up to a 2" depth at 90°. For more information write to Skil, 4300 West Peterson Ave., Chicago, IL, or call (312) 644-4409.

My Kingdom For A Cordless

Black & Decker presents three new 7.2 volt cordless drills (VP830, VP840 and VP860) which utilize the VersaPak™ Interchangeable Battery System.

The drills are powered by two 3.6-volt detachable/interchangeable batteries which use the three-hour VersaPak Charger.

Both the VP840 and the VP830 have two speeds (300/600 rpm) for drilling and screwdriving, while the VP860 offers variable speed (0-600 rpm) for more versatility. All three drills feature a six-position clutch that allows the user to control the amount of turning force the drills will apply. The clutch disengages when the torque reaches the preset level of resistance.

Black & Decker is currently developing a line of cordless tools and products using the 3.6 volt VersaPak™ system, including the VP210 flashlight.

For more information, write to Black & Decker, Consumer Services, P.O. Box 618, Hampstead, MD 21074, or call (800)762-6672.

So Many Details, So Little Time

Bosch now offers the B7001 detail sander featuring variable speed capabilities as opposed to the model B7000 two-speed model.

The B7001 offers variable speeds between 6,500 and 13,000 orbits per minute using a 3½" triangular sanding pad. The variable speed offers a wider range of sanding applications using different shaped sandingpads and optional coarse sanding to fine polishing using different grit levels.

The B7001 uses the same hook-and-loop accessory mounting system as the B7000 and the Clic™ pad mounting systems allows pad changes without tools. Dust is removed through the pad via an extraction port that accepts all Bosch Air-Sweep accessories. For more information write to Bosch, 4300 West Peterson Ave., Chicago, IL 60646 or call (312)644-4409.

I Came With Saw and Conquered

Jet Equipment and Tools, Inc.'s new 10" contractor tablesaw, model JWTS-10JF includes the quick-release JETFENCE which allows a 30" rip capacity to the right of the blade.

The saw, powered by a 1½ HP single phase motor with thermal overload protection, comes with a built-in dust hood for connection to a dust collector, as well as a miter gauge with an extra long bar for larger cross cutting capacity.

The JWTS-10JF is completely prewired and includes a quick connect motor to switch plug for easy set-up. It is designed to accept optional retractable casters. For more information, write to JET Equipment & Tools, P.O. Box 1349, Auburn, WA 98071-1349, or call (206)351-6000.

Two New Bench–Top Band Saws

A look at Skil's two wheeler, and a three wheeler from Craftsman.

The band saw is, by definition, the fastest wood-sawing power tool. Whether that suggests a must-have machine is not what we are here to discuss. What is important is the band saw takes up where the scroll saw leaves off. There is some overlap in function (a practical band saw for the home shop will turn ⅛" blades so some respectable scroll saw work is possible) but the band saw's plus factor is depth of cut; the ease with which it can slice through thick material.

Even the smallest band saw will not be, or should not be, challenged by 3" thick maple. This capacity affords other practical applications like pad sawing, producing multiple components in a single operation, compound sawing for production of, for example, cabriole legs, and resawing, making thin boards from thick ones. These factors alone have made the band saw a popular stationary power tool, as evidenced by the dozens of models now available. Among them are two new units (one from Skil and the other from Craftsman) I've "put to the test" in my shop.

I should make the point that even though band saws have common features this is not a comparison test. These are different machines, each with its own personality.

An important feature of a band saw is its blade guide system including the blade backup—the "thrust bearing". How the guidance is organized is one thing, but more critical is whether the setup is maintained after the guard is raised or lowered to accommodate stock thickness. In both cases I was satisfied that my initial adjustments did not require a redo.

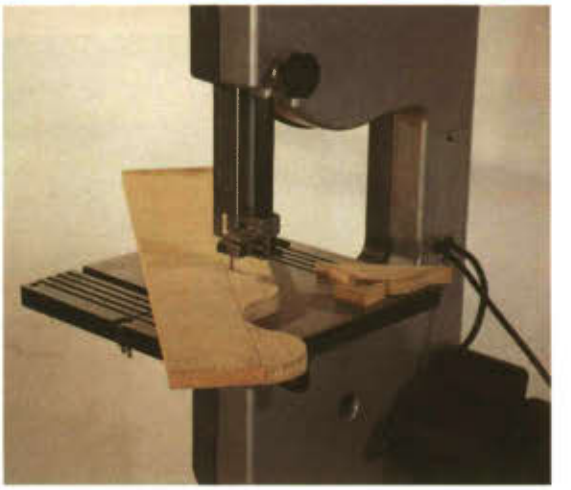
Skil's two wheel band saw supports a 7" depth of cut capacity with a 1/2 HP motor providing ample opportunity for resawing, and good room for such band saw jobs as forming cabriole legs. The machine handles blades from 1/8 to 1/2"–a good range for a multitude of woodworking operations.

Depth of cut capacity is the maximum thickness of stock you can saw through. The "wood", here is Parallam, a man-made material that contains as much adhesive as it does wood. I felt it would be a good test for the machine and found no problem making this and similar cuts.

Guidance components on the Skil Model HD3640 are on the end of a hefty, hexagonal steel bar that rides in a matching casting. Even with the lock knob loosened, the assembly has very little lateral play. The "slide" on the Craftsman Model 244530 is a slotted aluminum casting that is secured with a knob-tightened carriage bolt. With the knob loosened enough to allow the slide to move vertically, side-play was practically zero.

R.J. (Cris) De Cristoforo *is a woodworking and tool authority and is a Contributing Editor to* Popular Woodworking.

The machine's table has four corner holes for securing jigs, like this resaw fence (See drawing) without needing clamps. You can use narrow blades for this kind of work if the thickness and density of the wood allow it, but, generally, a 1/2" wide blade is best. Resawing is most successful when the blade is sharp and the teeth have uniform set.



Distance from the throat to the blade (width of cut) determines how wide a rip cut you can make, but it also tells the freedom available for maneuvering stock when sawing curves. It's always wise to preview the cut-route so you can plan feed direction to avoid interference from the throat.

The guides on the Skil tool are ½" square graphite impregnated plastic. This size makes sense since the tool can operate with ½" wide blades. Those on the Craftsman are actually ¼" screws with the blade end reduced to ⅛". This is suitable since the machine is used with blades that are not wider than ¼". The screws have a plastic patch so they will stay put and can't turn when the blade is running.

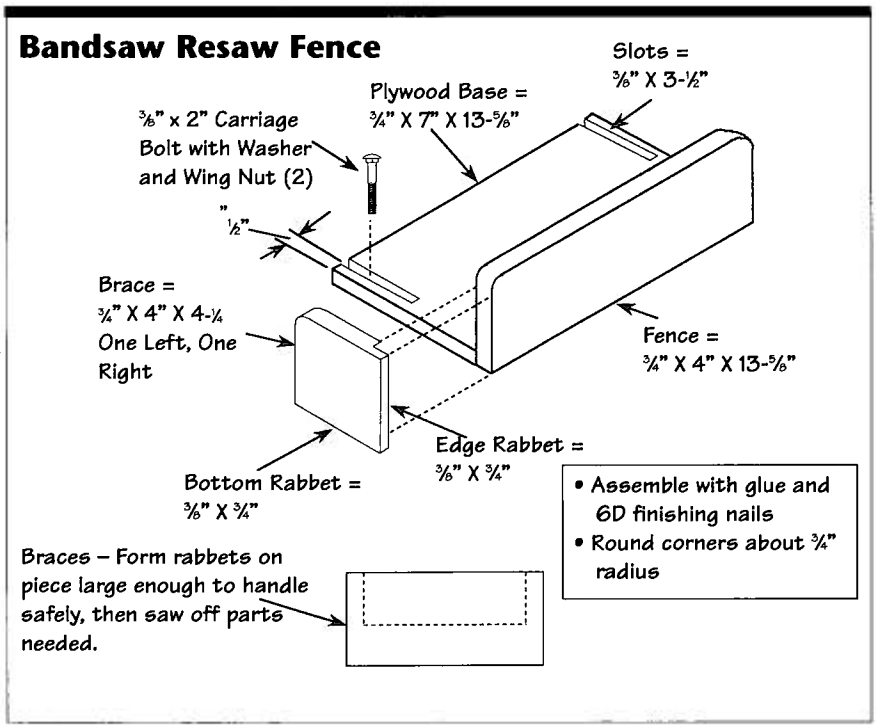
It's often suggested that a dollar bill be used as a gauge to set the space between blade and guides. Since you may not have a dollar bill left after equipping your shop, a piece of 18 lb. typing paper will do as well.

Blade tension and tracking are other critical band saw adjustments. The Skil design is a fairly standard time-proven arrangement. A top-side knob moves the upper wheel vertically to provide slack so a blade is easily mounted or removed; a large, knurled nut on the rear of the frame assembly tilts the wheel to provide correct tracking. A series of graduation numbers under the tracking nut are available as reference points when determining proper blade tension, but they should be used only to get started.

The Craftsman band saw has a non-standard, but practical way to mount blades. A rear-mounted knob releases a catch that is on the end of an interior rod that connects to the upper idler wheel. The rod is raised or lowered so the catch will engage in one of several notches that are cast in the frame. The notch used determines the blade's tension. Tracking is accomplished with an ⅛" Allen wrench that turns a screw located at the back of the frame behind the upper wheel.

Most of us use the "I'll do it my way" system to check blade tension after following the Owner's Manual instructions. Firm finger pressure against the unencumbered blade between the upper and lower wheels should only move the blade slightly.

The two-wheel Skil concept has a 10" cut-width capacity, a factor that, on such band saws, is pretty much determined by the diameter of the wheels. Depth of cut is an impressive 7" and, importantly, the ½HP motor backs up the capacity. How fast you can get through such heavy cuts depends on the blade in use and the density of the material. In my mind it's not critical to judge maximum



Sears' three wheel design allows a low profile while offering a generous 10" width of cut capacity. The table is cast aluminum and has a slot for a miter gauge. Like the Skil product, it can tilt a bit less than zero degrees to the left and more than 45 degrees to the right. The tables have adjustable screws that serve as stops for zero and 45 degree settings.

Sears' tool features variable speed control: 300 to 3000 SFM. To protect the motor, the band saw will automatically shut down if you try to force the cut or cause the blade to bind. The on-off knob has a locking feature to prevent unauthorized use.

cuts in terms of x-seconds to get through. It's more important to control feed to get quality results.

The Sears model is a three-wheeler, a design that affords good 10" width of cut in a "small" machine. Three wheels always brings up the question of metal fatigue with the thought that extra stress on the blade causes premature breakage. Since there are quite a few of these tools about, it seems that manufacturers are judging practicality against metallurgical studies. In my experiences, I've had to replace dull blades before any acted to prove a metallurgist's point.

I found the Sear's tool variable speed a good feature when sawing non-wood materials, and it's also useful when sawing wood. The 3000 SFM works best, generally, but slowing up a bit helped me get through some dense materials in good fashion. The point is that since speed can be varied, what to use can be judged by how the cut is going.

Both band saws are respectable bench-top machines. How to judge compatibility in your shop is to envision the scope of your woodworking efforts. The accompanying chart lists the characteristics of the tools. PW

FEATURE	SKIL	SEARS
MODEL	HD3640	244530
MAX. CUT DEPTH	7"	3"
MAX. CUT WIDTH	10"	10"
BLADE LENGTH	72"-73-½"	56-⅞"
BLADE WIDTH	⅛"-½"	⅛"-¼"
TABLE SIZE	13-⅜" SQ.	11-½" SQ.
SPEED (SFP)	3000	300-3000
HP	½	⅓
TABLE TILT	-0 TO +45	-0 +45
DUST PORT	YES	YES
MITER GAUGE	YES	AVAILABLE
FENCE	AVAILABLE	AVAILABLE
WEIGHT	60 LBS.	43 LBS.
PRICE	$339.00	$139.99

The Sears three-wheeler will cut through 3" stock. Its horsepower proved ample for the wood cutting and non-wood cutting procedures tried including sawing Parallam, maple and metals like brass and copper.

A wood cutting blade can be used to saw aluminum and plastics, but a metal cutting blade, at reduced speed, must be used for other materials like steel, copper, and brass. The Owners Operating Guide offers a chart of efficient speeds to use and recommends against sawing hardened steel.

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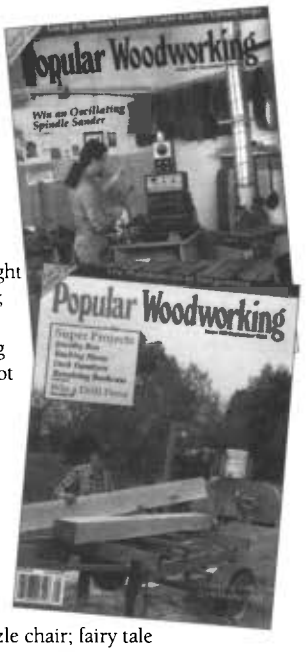

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pwad

Farm Table for Casual Dining

Turnings plus bread-board ends equal country kitchen charm.

By David Camp

The farm table features two drawers, pegged-through mortise and tenon joints, and nicely proportioned turned legs.

This dining table has a charming traditional look that will complement any country style kitchen. The two small drawers in the apron are perfect for storing napkins and place mats. I used clear Douglas fir to match existing kitchen cabinets, although I wouldn't choose it again, because the wood is too brittle for easy turning. It tended to splinter off in large chunks. Maple would have been a better choice.

Turning the Legs

The project is an excellent introduction to turning duplicate spindles. You don't need a duplicator, just an outside caliper and a tape measure. If you follow the procedures carefully, you'll be able to get a very close match on the legs.

I started by cutting blanks for the four legs ***(A)*** from planed 4 x 4s. I made each a couple of inches longer than the finished dimension given in the cutting list so I could trim them all to length after turning. Mark the centers on each end, and mount one on the lathe. Mark a line 6¼" from the headstock end, and use a parting tool to define the end of the flat, upper portion of the leg. Next use a large gouge to rough down the rest of the leg to round. Shape it as a straight cylinder with the largest practical diameter.

Stop the lathe and use a tape measure to mark the transition points along the length of the leg. These points are indicated in ***figure 1*** and should all be cut to the same diameter. I marked an "X" on the waste side of each mark to help me know precisely where to position the parting tool. Set your calipers at 2¾", turn on the lathe and hold them in place with one hand while you guide the parting tool with the other. Stop cutting when the wood will fit between the calipers.

When you've cut all five transition points, it's time to start shaping the other elements. First, use a skew to create flat areas where the two coves are going to be. Next, round down the section between these two flats, striving to make it as spherical as you can. Shape the narrower bead above the first flat; then begin the long taper that starts below the second one. Finish this tapered section with a sharp cove that begins just above the lower transition point.

David Camp *edited* Popular Woodworking *from 1985 to 1993. He is currently building furniture and writing about it in his new home in Santa Fe, New Mexico.*

Figure 1

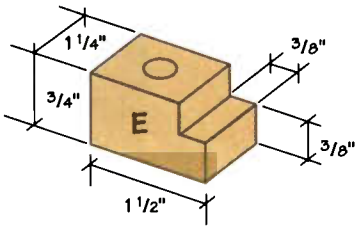
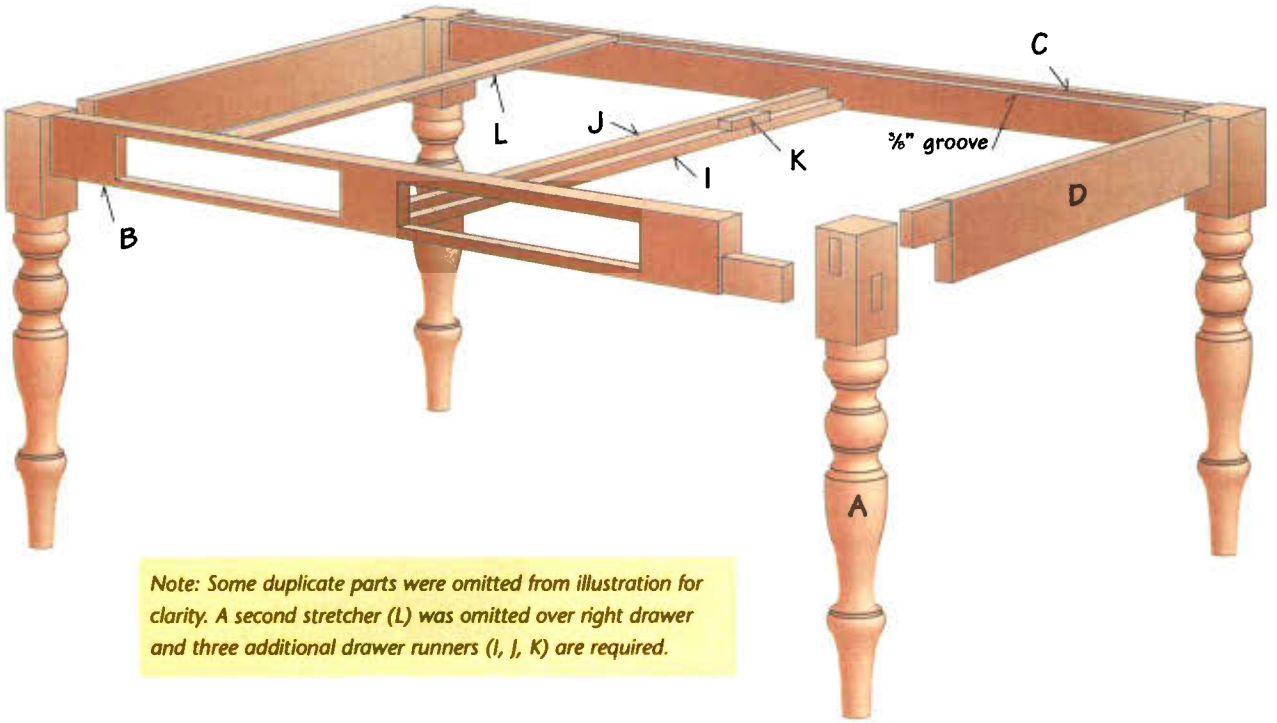


Table Top Fasteners



Note: Some duplicate parts were omitted from illustration for clarity. A second stretcher (L) was omitted over right drawer and three additional drawer runners (I, J, K) are required.

Now go back to those flat areas and cut the two coves using a round-nose scraper. Be careful to preserve distinct 1/8" wide shoulders at the top and bottom of each cove. At the bottom of the second cove shape another small cove that meets the top of the tapered section ***(photo 1)***. Finish shaping the bottom of the taper; then begin a narrow bead similar to the one at the top, and segue into a graceful taper that continues down the remainder of the leg . I used the parting tool to make a deep cut indicating the bottom of the leg but didn't cut all the way through, preferring instead to leave the extra wood in place to protect the leg during the rest of the procedures.

Making the Mortises

Farm tables typically are constructed with wedged through-mortise and tenon joinery. Because the tenons cross, a portion of each must be removed to allow passage of the tenon coming in from the other direction.

Lay out the mortises on each leg as indicated in Figure 1. Mark them on all four sides of each leg ***(photo 2)***, and be very careful to mark them as mirror images on opposing surfaces. It's best to cut through from both ends to prevent chip-out, so

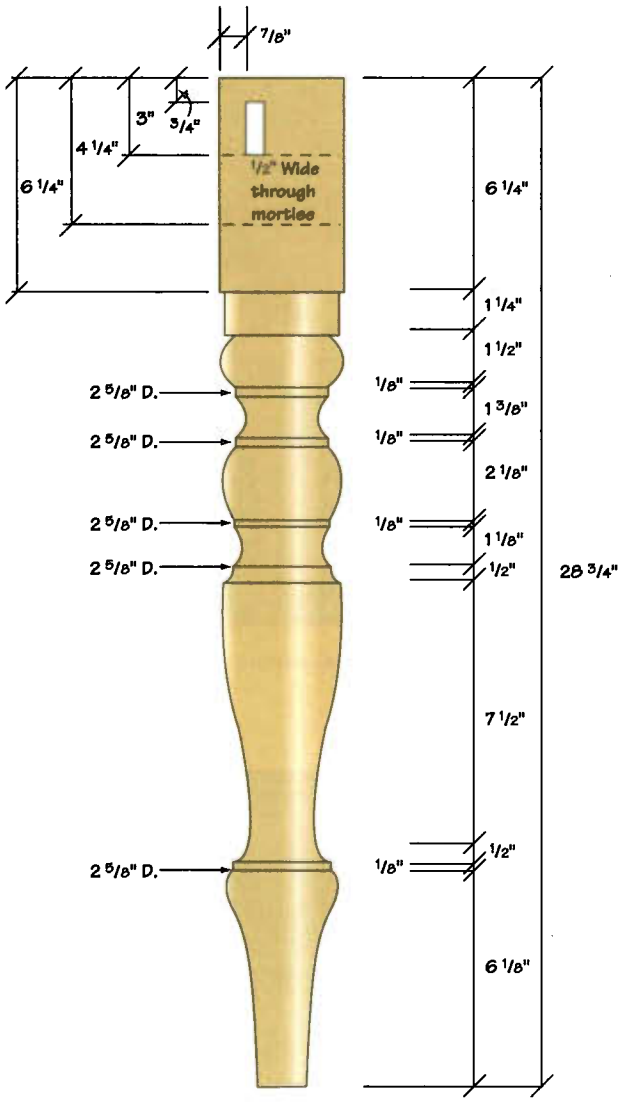
Schedule of Materials for Farm Table

No.	Letter	Th x W x L	Item
❑ 4	A	3½ x 3½ x 28¾	Legs
❑ 1	B	¾ x 4½ x 60	Front apron
❑ 1	C	¾ x 4¼ x 59	Back apron
❑ 2	D	¾ x 4¼ x 31¾	Side aprons
❑ 10	E	¾ x 1¼ x 1½	Tabletop fasteners
❑ 2	F	¾ x 1⅞ x 19¼	Drawer backs
❑ 4	G	¾ x 2⅜ x 20	Drawer sides
❑ 2	H	⅜ x 18½ x 20	Drawer bottoms
❑ 4	I	¾ x 1½ x 28½	Drawer runners
❑ 4	J	¾ x ¾ x 28½	Drawer guides
❑ 2	K	¾ x ¾ x 2	Drawer stops
❑ 2	L	¾ x 1½ x 29¼	Stretchers
❑ 1	M	1⅛ x 35½ x 59¾	Top panel
❑ 2	N	1⅛ x 2⅝ x 35½	Breadboard ends

Photo 1. *David Camp makes another cove cut on his table leg just above the long taper. Coves were cut with a round nose scraper.*

Photo 2. *Layout mortise locations on all four sides of leg top making sure opposing faces match.*

Figure 2



you need to make sure the marks line up.

If you have a drill press with a mortising setup, you can make all these cuts quickly and easily. If you don't, you can use a doweling jig to guide an electric drill for chain drilling the bulk of the waste, then follow up with chisels to smooth and flatten the cheeks ***(photo 3)***. When you're done, go back and remove a little more material at the top and bottom of each mortise so that the hole is slightly flared. Do this only on the leg surfaces that are going to be on the outside; when you drive in the wedges during assembly, the tenons will splay into this area, locking the aprons in place. After cutting the mortises, I put each leg back onto the lathe and eased the corners of the straight sections, to give the piece a more old-fashioned look.

Making the Aprons

The dimensions given include the tenons and an extra ⅛" to sand flush after assembly. Cut the front apron ***(B)***, back aprons ***(C)*** and the side aprons ***(D)*** according to the Cutting List. Cut a ⅜" groove, starting ⅜" from the top, on the back of each piece to accept the tabletop fasteners ***(figure 3)***.

I used a molding plane to cut a bead along the bottom edge of the aprons to add a decorative element. You could rout a

***Photo 3.** After chain drilling the through mortises, the author finishes the joint by squaring the corners and flattening the cheeks.*

subtle detail or leave the edge square if you like; whatever you choose, this is the best time to perform this step.

Cutting the drawer fronts from the front apron ***(B)*** is a simple, fun procedure that will preserve the grain pattern across the piece. Note that this apron is an inch longer and ¼" wider than the back apron. This is to allow for the kerfs you'll make when you cut out the drawer fronts. Put a thin kerf saw blade on your table saw and set the fence at 1" from the blade. Run the apron through, removing an inch from the bottom edge; then turn the piece around and rip 1" off the top.

Now mark the center section as shown in ***figure 2***. Ordinarily, I would take all measurements from one end of a board; if you were to do that, though, by the time you made the fourth cut, you would have removed half an inch of material and thus shifted the figure of the grain. Instead, if you make two cuts measured from the left end of the board (and cut on the right side of the marks), and two from the right end (cut to the left of the marks) the grain should line up nicely. Remove the two drawer fronts, and glue the other three pieces from the center section back in place. Don't joint the edges, and be very careful to position them properly, making sure that the drawer openings are both the same width and just ⅛" wider than the drawer fronts.

Joint 1/16" off each edge of the drawer fronts. Size the other drawer parts to fit these fronts. I used ¾" material for the drawer sides and backs because that was what I had on hand; you might choose to use ½" stock. Make the drawer backs ***(F)*** the same length as the fronts, and just rabbet their ends to accept the drawer sides ***(G)***. Cut a groove ¼" from the bottom edge on all the drawer members. Make it wide enough to accept your thinnest piece of plywood, and cut the drawer bottoms ***(H)*** from this (they won't need to hold a lot of weight.) When you cut this groove in the drawer members, save the backs ***(F)*** for last, and raise the blade to cut all the way through. Assemble the drawers with glue and nails driven through the sides; then slip the bottoms in place to square up the assembly. Nail the bottoms onto the bottom edge of the drawer backs.

Cutting the Tenons

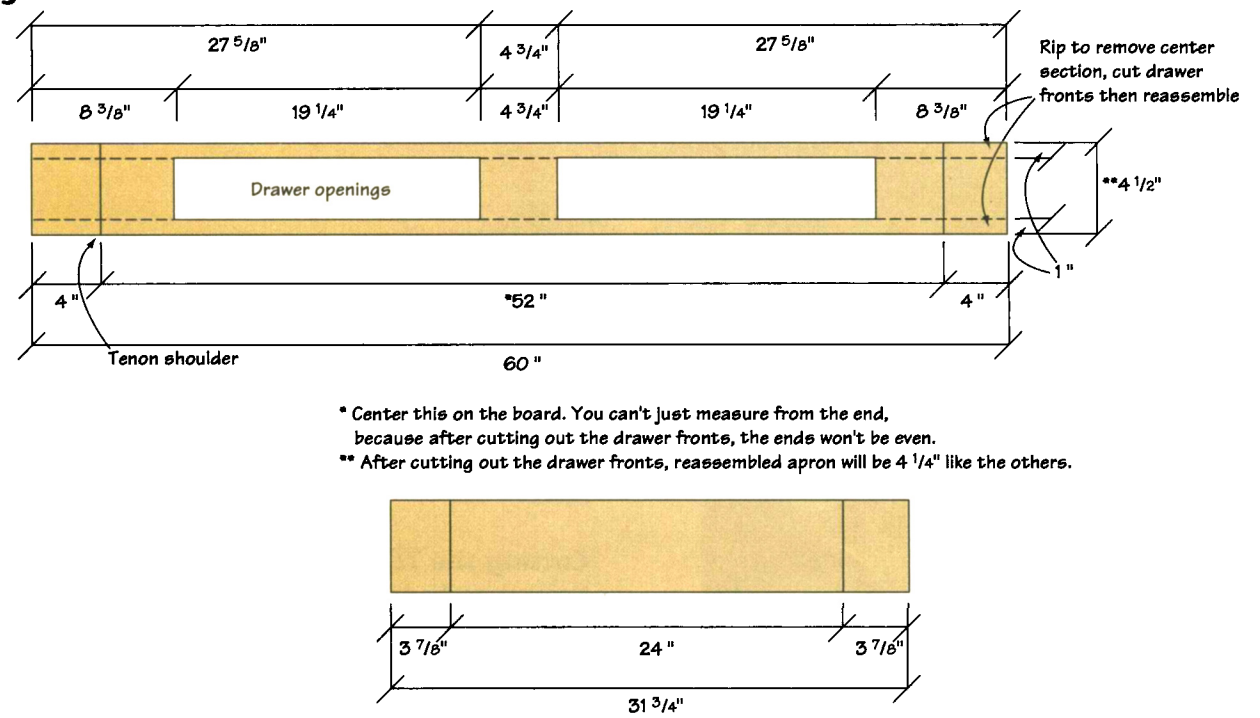
Now let's get back to work on the aprons. On pieces this long, I like to cut tenons using the dado head on the radial arm saw. Make the blade set as wide as you've got cutters, and use some ¾" scrap to check the depth. You want to remove 1/4" from the front of each apron, leaving tenons that are ½" thick.

On the long aprons, make two marks that are 52" apart, centered in the length of the board. On the short aprons, measure 24" from shoulder to shoulder, centered in the board. Start on the outside of these marks (the shoulders) and make several passes with the dado head to cut the tenons to ½" finished thickness.

Use a band saw or a hand saw to remove the top 2¼" of the tenons on the front and back aprons ***(B*** and ***C)***, leaving tenons that are 2" wide. Remove ¾" from the top of the tenons on the side aprons ***(D)***, and 2" from the bottom of the tenons, making them 1¼" wide. Make a pair of band saw or hand saw kerfs in each tenon, stopping just short of the shoulder, to accept the wedges. (When I made my table, I just made one kerf in the center of each tenon. At glue-up I found that this wasn't

***Photo 4.** With the table top upside down, fence properly positioned, and shims supporting a board for router base to run on, rout the bottom edges until flush with the thinner middle boards.*

Figure 3



enough to fill the flared mortise; I quickly made wedges to drive in at the top and bottom of each mortise. Two kerfs for two wedges should solve this problem.) Cut wedges on the band saw, and have them ready for assembly.

Assembling the Frame

At this point you're ready to put together the basic structure of the table. First check each tenon in its respective mortise to make sure of the fit. Put it all together and clamp it; then disassemble and get ready to glue. First glue pairs of legs to their respective end aprons, and when dry add the front and back aprons. Position the clamps in such a way that they draw up tight, yet leave room to drive in the wedges. Then spread glue on the wedges and hammer them home with a wooden mallet. When the glue is dry, remove the clamps, saw off any protruding ends of the wedges and belt sand the tenons flush to the legs.

To make the tracks for the drawers to run on, measure the distance from front to back inside the aprons and cut the runners *(I)* and guides *(J)* to that length. Glue the guides on top of the runners, flush to one edge, forming an "L" shaped track. Remember to make two rights and two lefts. When these are dry, spread glue on the ends and nail them in place at the front of the table. Align the inside of the "L" with the bottom corner of the drawer opening, and drive a couple of finishing nails through the apron and into the runner. Now slip the drawers into place, stopping them flush with the front apron. Have a helper position the back ends of each runner so that they will provide smooth drawer action, leaving about a 1/16" clearance on each side. When the drawers are closed, hold the runners at the proper position to the apron. Nail the back ends of the tracks in place, then set the nails, putty and sand. Glue a drawer stop *(K)* in one of each pair of tracks, locating its position with the drawer in place.

Cut stretchers *(L)* that are ¾" longer than the drawer guides. Cut a ⅜" X ⅜" rabbet on each end to fit into the groove you cut at the top of the aprons. Glue the stretchers in place, on center, over the drawer opening.

While you're set up to cut ⅜" rabbets, rabbet both ends of a couple of pieces of short, wide scrap to use for the tabletop fasteners *(E)*. Cut the scrap at about 1½" from the ends then bandsaw these short rabbeted pieces into individual top fasteners.

Topping It Off

I made the top by first planing some two-by material down to a finished thickness of 1¼". You'll need two pieces the length of the top (**M**), and two for the breadboard ends (**N**). As I mentioned earlier, I used ¾" stock for the center area of the table top. Glue enough pieces together with the thicker pieces at the front and back to make a panel slightly larger than the finished dimensions given in the materials list. You may want to use biscuits to hold the pieces flush during gluing. Plane and sand the top smooth; then trim it to the finished size.

Now you need to rout a 1" long, ⅜" thick tongue on each end of the top to fit into the breadboard end *(N)*. Because of the two different thicknesses of the underside, I needed to run the router base on a board that spanned the surface, and set the depth of the cutter from there. I shimmed under the board at several points in the center so I'd have a firm surface to reference the base against. I used a 2 x 4 as a fence, and clamped it on edge to take out any curve to the surface. Chuck a ¾" straight cutter in your router, and set it to a depth that will remove just a little of the material where the top is its thinnest.

Photo 5. *Rout a long tenon on each end of the table top to join the bread board end piece to the top. The tenon was cut from both the top and bottom side of the top.*

Make the first pass keeping the tool snug against the fence ***(photo 4)***; then come back again to clear the rest of the waste. Turn the top over, reposition the fence, but leave out the extra board for the base to ride on. You may find it helpful to clamp another board on edge, at the other end of the top, to flatten the surface. Reset the depth of cut on the router so that you will leave a ⅜" tongue, and rout as before ***(photo 5)***. When you've cut the tongues on both ends of the top, go back with a hand saw and cut about 1½" from each corner of the tongue so that it won't interfere with attaching the breadboard end.

Locate the groove on the breadboard end by holding it flush along the side of the tabletop and marking the position of the tongue on the end of the piece. Mount a ⅜" straight bit in a table-mounted router, and set it to a depth of a little more than 1". Use the marks you made on the breadboard end to position the fence. You want this groove to stop at 1" from each end, so with the router turned off, set the piece on top of the cutter, 1" past the end, and mark the fence with a piece of masking tape. Slide the breadboard end down as if you were making the cut, stop 1" short at the other end and put another piece of tape on the fence. Now, with the fence marked, you can turn on the router and plunge the material down onto the spinning cutter ***(photo 6)*** at the first tape mark, rout the groove, stop when the end of the piece comes to the second tape mark and lift it off.

Lay the top upside-down on some sawhorses, slip on the breadboard ends and clamp them in place. Drill holes through the underside of the breadboard end and into the tongue for pegs. Use a ⅜" drill with a piece of tape wrapped around it so you'll stop at a depth of ⅞" (you don't want to come through the top). Drill one hole, centered in the width and two on each side, evenly spaced. Now take off the breadboard ends, and use a rat tail file to shape the outer holes into ovals that run across the grain. This will allow for cross-grain wood movement as weather conditions change from day to day. Leave the center hole untouched, but remove a little wood from each side of the holes that are on either side of it—more from the ones furthest from center.

These pegs are all that will secure the ends to the top. You don't want to put any glue on the tongue, because you would be gluing cross grain to long grain and wood moves more across its width than it does along its length. Spread glue on the whole length of the dowel you'll put in the center hole. Drive the remaining pegs in ⅜" and then spread a ring of glue around them and drive them in the rest of the way, so that they're only glued into the breadboard end and not to the tongue.

At this point you should finish-sand everything and apply your finish. Use a hard film-forming finish such as a varnish or lacquer to protect the top from meal-time wear and tear.

Attach the top by laying it upside-down on sawhorses and centering the frame (it should fall at about 2" from the straight section of the legs all around). Fit the tabletop fasteners into the groove in the aprons, drill pilot holes and screw them to the top. All that's left to do is select some drawer pulls and install them. PW

Photo 6. *The mortise for the breadboard end of the table top was machined on a router table. The author placed masking tape on the router fence to indicate stop/start locations since the mortise was not cut through. To begin the cut, the work was lowered slowly onto the router knife while being firmly held against the fence.*

Master Craftsman Project

A Small Buffet

With Editors' Short Cuts to Fine Woodworking

By Kenneth B. Sadler

The dictionary defines a buffet as a large sideboard with drawers and cupboards. This project is a small sideboard that's all cupboard, so I call it a small buffet. It will go nicely in one of the modest sized dining rooms common to so many houses these days. It works well with a small dining table, doubling as a serving counter and freeing up table space. There's room inside to store all kinds of things you want to keep handy in the dining room. If you have a house with a foyer, it could dress up that area, perhaps with a mirror over it. In fact, if you think about it, you'll find many places where this small buffet could enhance the appearance of a room. There are many reasons for building it, as well, not the least of which is that you may find it a bit of a challenge. It's not an easy piece to build. The design is unusual, so the work must proceed in a certain order. You can't simply make all the parts according to the drawings and expect that they will fit together properly.

The Rails

To begin, make the rails as shown in the drawings. It is important that the distance between the dovetail and tenon shoulders on both upper and lower rear rails be exactly the same. This is also true of the upper and lower front rails. Do not cut the tie bar dovetail pockets at this time but mark the top face of each rail. Make all four tie bars. It is very important that the distance between the shoulders of the dovetails be exactly the same on all four. Don't forget the slots used for mounting the top and the bottom panel.

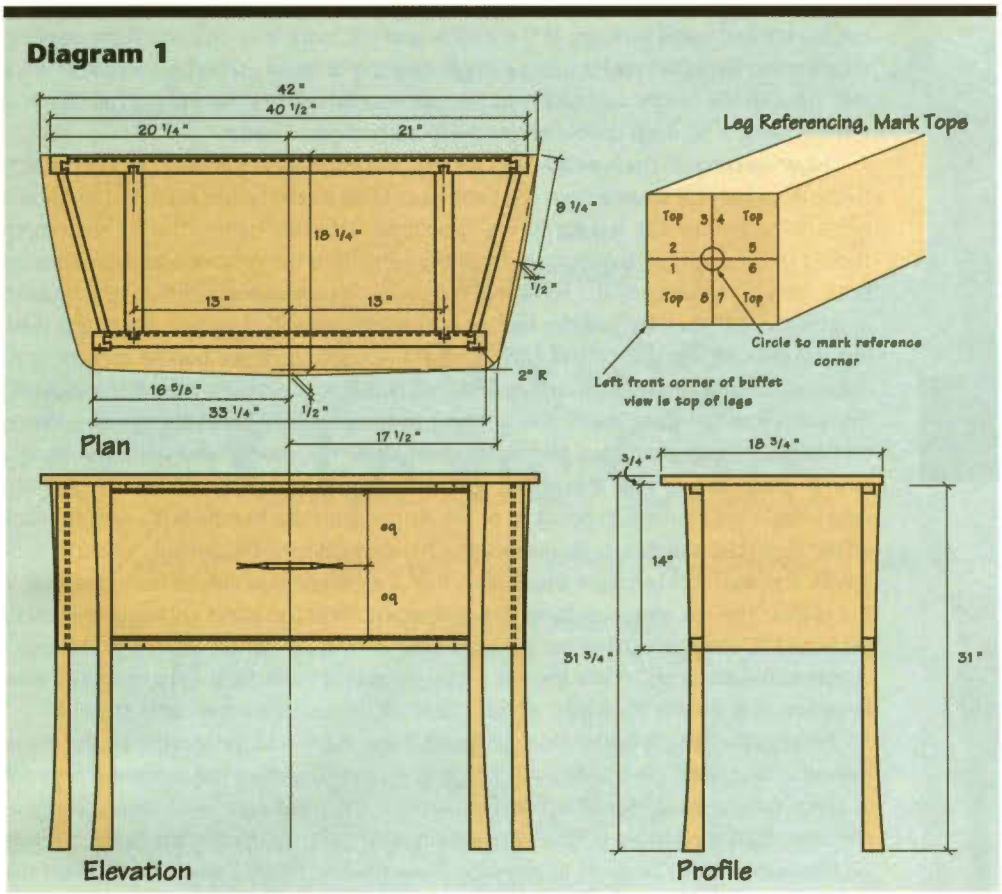
Place the upper front and rear rails face up on the bench and match up center lines. Clamp them together (so they can't move) and locate, then draw, the center lines of the top tie bar dovetail pockets. Place the lower front and rear rails with their bottom faces up and repeat the process. This is very important, because if these dovetail pockets don't line up the assembled case will be all out of kilter. With the layout complete, mark and cut the dovetails..

Next,mount the door hinges on the upper and lower front rails ***(diagram 1)***. The knife hinge is ⅜"x 1¼" with a ⅝" leg. Mortise into the rail the depth of one leaf and insert the screws holding the hinge in place. Now, remove the hinges and set them aside. When it comes time to hang the doors, you'll be very glad this chore is already done.

The Legs

Next, make the legs, starting with four blanks, each 1¾" square x 31" long. Check that they are truly square. Mark the top end of each blank and arrange them in a square with the marked ends up ***(diagram 1)***. Starting with the front left leg, mark the face that mates with the rear left leg as one. Number the mat-

Ken Sadler *is a contributring editor to* Popular Woodworking *who lives in Portland, Oregon.*



ing faces in a clockwise direction to eight, as shown in ***diagram 1***. The center comer of each leg is the reference corner, all dovetail pockets and mortises are located from it, so clearly mark the top end. Do not shape the legs now.

The dovetail pockets are located and marked on the upper rails with the inside face of the rail flush with the reference corner. The rabbets on these rails are on the outside face. The mortise for the lower rail is located and marked from the tenon with the inside face of the rail flush with the reference corner. Mark each dovetail and tenon with the corresponding leg face. Finally, lay out the ¼" x ½" x 12" mortise as shown on the drawing. Note that it starts 1" from the top of the leg. This is an important dimension and it must be exactly the same on all legs since it positions the sides of the buffet. Now cut all the mortises and dovetail pockets. Make the four side mounting splines and fit them. It should be an easy push fit. At this point you should dry assemble (no glue) the base. First assemble the front and rear frames and then connect them with the tie bars. Fit the splines into their mortises. If things don't fit or line up properly, fix the problem now. Check parts that should be square and, if necessary, use clamps to keep them square.

Case Parts

The sides come next with the grain running horizontally. The height is 14" but the length is determined by the space it is to occupy. Using a protractor, set your table saw blade angle at 15°. Crosscut both ends to this angle taking the correct length from your assembled case frame. The top view should be a parallelogram. A good idea is to cut it a little oversize and then take thin shaving cuts until it fits. The fit should be an easy slide but not loose. Care must be taken with this next step. Mark which edge of each side will be the top. Fit them in place to make sure you've marked the correct edge. Now cut the stopped groove in the angled edges. This groove must be in the exact center of the angle faces and it must be stopped exactly 1" from the top edge. Now slide the sides into place on the case frame. The tops of the sides should be flush with the top of the legs. When satisfied, disassemble the case.

Shaping the Legs, Assembling the Case

Prior to shaping the legs, mill the ⅛" bevel on all four edges at the bottom while the blanks are still square. Next, make a template of the leg shape using light-weight cardboard *(see Pull-Out Plans)*. Place it on one outside leg face with the straight edge flush with an inside face and draw the line of the curve. Do this on all four legs and bandsaw this cut, leaving the line. Place the template on the just cut face with the straight edge flush with an inside face, draw the line and bandsaw the cut leaving the line. Save the pieces cut off, as they will be helpful in holding the legs in the vise while smoothing the cut surface with a spokeshave. Finish sand all the worked surfaces and very lightly sand the inside surfaces. Keep the surfaces around the joints flat and true. You can now reassemble the case, except for the sides, using glue. Again, check for square and clamp until the glue has dried. When cured, insert the side mounting splines in the legs. Slide the sides in place over the splines but do not use any glue to allow them to expand and contract with humidity changes.

The Doors

The doors form one of the two major focal points of the piece. As a consequence you should take great care in choosing the wood. Note that the grain lines are horizontal. Make them from one board so that the grain pattern flows across both. If you're lucky enough to find a board wide enough to do the job that would be great. Otherwise, you'll have to glue up narrower stock. Search for two boards with grain patterns that can be closely matched. Choose the boards so that the glue line can be exactly in the center of the doors. The handles go here and will help disguise any slight mismatch. Do not cut the board apart to make two doors until you are ready to install the hinges.

To determine door height, measure the opening in the case and subtract twice the amount of space between the leaves of the knife hinges you're using. To get the width of both doors together, measure the width of the opening and add the kerf of your table saw blade. The reason for this is that you're going to

Ken Sadler's Original Buffet

The Editor's Buffet

cut the finished panel vertically in the middle and you want it to properly fit the opening after the cut. Whether you're using a single board or a glued up panel, make it ¾" thick and cut it to the height and width you've just established. Choose the outside face and run a ½" wide x ¼" deep groove across the exact horizontal center.

Now we come to the handles—this is tricky. You want wood that is a close color match to the door panel. If it came from the same board that would be just right. It should be a piece ½" x 1¼" by the length of the groove in the door panel. The ½" dimension should be a snug fit in the groove. Press the piece into the groove and draw lines on both sides of the piece at the surface of the panel. Remove the piece from the groove, and on the 1¼" face lay out the handle shape ***(diagram 2)***. Bandsaw the shape leaving the lines all the way to the ends. Shape the contour of the handle according to the cross section drawing ***(diagram 2)***. Be careful not to cut below the line indicating the surface of the door panel. Do nothing to the part that fits in the groove. When you've finished shaping, put glue in the bottom of the groove and press the handle strip in place. Make sure it bottoms out along its entire length. When the glue has dried, use a spokeshave to bring all of the strip except the handle flush with the face of the door. Use sandpaper to smooth the handle and blend it carefully into the door panel. The object is to create the illusion that the handle was carved from the face of the doors. The last step is cutting the door apart. Find the exact center of the panel and mark it. Place the panel on the table saw so that the center mark is in the exact center of the blade and make the cut. If you measured correctly the doors should now fit perfectly. If they're too wide, shave a little off the outside edges until they fit.

Position the hinges as shown in ***diagram 2*** and cut the hinge mortise by the thickness of a hinge leaf. As you fit each hinge to its mortise, drive the screws to fasten it in place ***(photo 9)***. When all is finished, remove the top hinges and mount them in the case. Turn the hinges to the 90° position and, carefully tipping the bottom hinge on the door into its position in the case, slide the top hinge into its position on the

Editors' Buffet

(**Editor's Note:** Most Master Craftsman projects are built by the editorial staff of *Popular Woodworking* so that photos of the construction process can be taken. In building this project, we decided to give you an alternative method for constructing the buffet and to also explain the thinking behind our changes. Some of the reasons are purely a matter of design aesthetics while others can only can be considered simpler, less time consuming methods. The alternatives presented here are not a matter of what's best, rather an option we feel results in an equally well crafted, handsome project. The drawings provided in this project give you the details and dimensions provided by Master Craftsman Ken Sadler. The text of his article refers in detail to the drawings and diagrams. The photos illustrate where we took an alternate route to that presented by Ken. The cutting list is specific to the buffet built by us. Steve Shanesy, Editor)

There are two basic differences between the buffet as presented by Master Craftsman Ken Sadler and the one built by myself and associate editor, David Thiel. The most obvious difference is visual. Ken elected to run the grain for his buffet doors and sides horizontally while we chose vertical. He also built his piece to 31¾" high while I elected to add a bit more height and netted an overall dimension of 36". While changing the grain direction presented opportunities and challenges (will the doors be more likely to warp?) with regard to construction, I simply have a strong personal preference for vertical grain on case sides and fronts. Regardless of the grain direction you selected, the doors and top of this project are the focal points, so particular care should be given to the selection of wood.

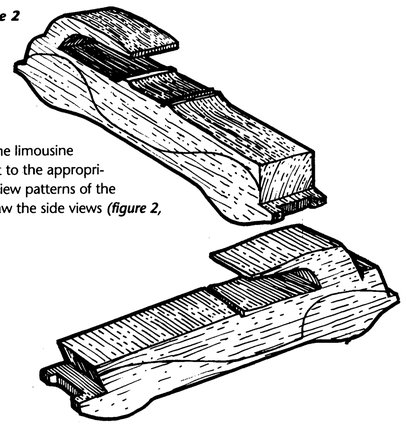
Photo 1. *A Plan (top) view full size layout shows half the cabinet.*

Photo 2. *Laying the side on the layout varifies its size and angled end cuts are correct.*

For the top, we found an ¾ walnut board wide enough to resaw and bookmatch. It is striking and adds considerably to the overall presentation of the piece. For the doors and sides, we paid particular attention to gluing up pieces that gave us relatively closely matched grain cathedrals with centered seams. We were lucky with this and it merely required planning rather than sorting or buying additional lumber.

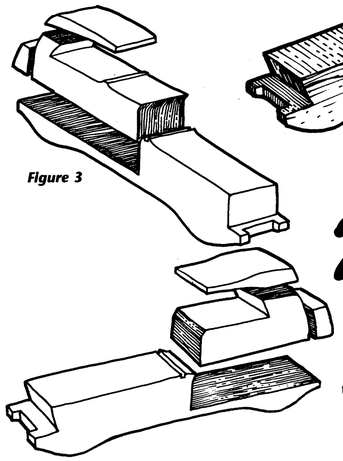
The change of grain direction lead us to the second basic difference between our buffet and Ken's. We were able to build what may be a cabinet with con-

Figure 2



1 Saw the side views.
The roadster is 7½" long and the limousine is 8½". Starting with 2 x 4s, cut to the appropriate lengths and trace the side view patterns of the bodies on their flat sides. Carefully saw the side views *(figure 2, side views)*.

Figure 3



2 Saw the passenger compartment.
The dotted lines on each side view of the car bodies show the passenger compartment. Trace the lines onto the side view cutout, and saw out the compartment including the tops and trunks. (The limo has the larger compartment.) Also saw the groove for the front windshield *(figure 3, passenger compartments)*.

3 Saw apart the inside.
The top and trunk. Saw off the top and trunk of each passenger compartment. You'll glue these back on when you're done with the inside, after sawing the trunks narrower.

The inside. The small dotted line on the top view pattern shows what to follow to remove the inside of each compartment. The larger, curved dotted lines indicate the actual width of the passenger compartments if you're using a full 2" thick wood. A jigsaw is best for sawing out the inside of the compartments *(figure 4, inside compartments)*.

The seats. The dotted lines on the side view patterns indicate the seats. The roadster has one, the limousine two. Trace these onto one side of the curved, inside piece of the passenger compartment. Saw out the seats. These are the smallest, and consequently the most dangerous, pieces to carve. A coping saw is the safest saw to use on the seats; c-clamp the seats to the sawing table before sawing them.

The back window. Using a coping saw, cut the smaller window on the roadster. First saw the window section from the the passenger compartment, then saw the window from the bottom up. On the limousine, saw the groove for the windshield between the back and front seats.

Figure 4

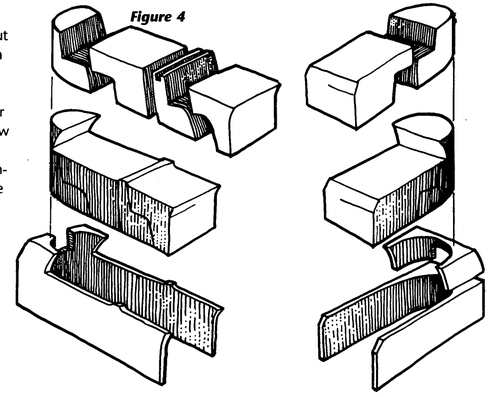
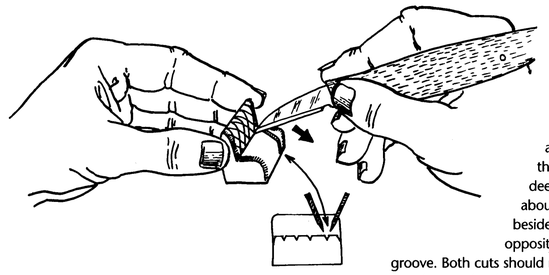


Figure 5

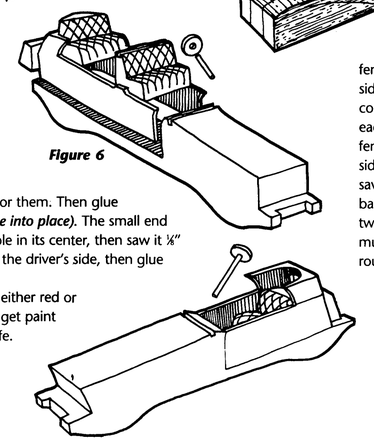


4 Finish the inside.
The seats. Carve the seat edges round. Using the very tip of your knife, carve diagonal V-cuts on the seat for a sewn upholstery look *(figure 5, V-cutting the seats)*.

V-cuts. To make V-cuts, hold your knife as you would a pencil, and draw it along the pattern line making a cut about 1/16" deep. Turn your wrist so the knife is angled about 30° to the wood. Make a second cut beside the first one about 1/16" from it at the opposite angle so you produce a V-shaped groove. Both cuts should meet 1/16" deep into the wood. The V-shaped scrap should come out cleanly. Make several V-cuts on the bottom and back of the seats.

The dash. V-cut the speedometer on the dash, which is on the body of each car. Add additional instruments if you like. You could instead draw these with a ballpoint pen, pressing hard enough to leave indentations in the wood.

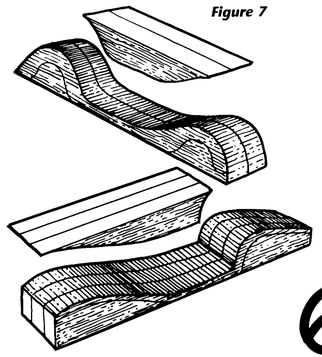
Figure 6



5 Reassemble the passenger compartment.
Glue the seats back into the curved openings you sawed earlier for them. Then glue the entire piece with the seats back into the bodies *(figure 6, glue into place)*. The small end of a broken pool cue makes a good steering wheel. Drill a 1/16" hole in its center, then saw it 1/8" thick. Glue it onto a " dowel. Drill another hole at an angle in the floor of the driver's side, then glue the steering wheel into place.

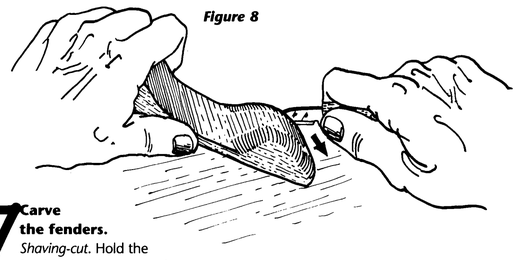
After the glue has dried, paint the inside of the passenger compartment either red or bluegreen (or your color choice), including the dash and floor. Try not to get paint on the top edges of the compartments. If you do, trim it off with your knife. Now glue the top back on.

Figure 7



6 Saw the fenders.
The roadster fenders are 8" long; the limo's 8½". Trace the side views of the fenders onto 2 x 4s of the correct lengths and saw only the top parts of each. *Note:* Don't saw the wheel wells of the fenders until after you've carved the top outside edges of the fenders round. Be sure to save the top pieces of the fenders to tape back on when you finally saw the fenders in two. Before sawing the fenders any more you must make the outside edges of the fenders round *(figure 7, saw the fenders)*.

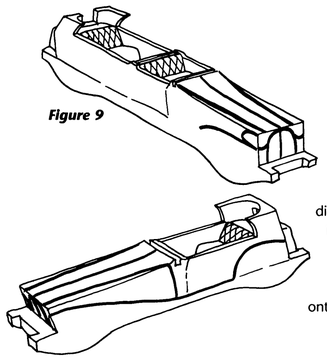
Figure 8



7 Carve the fenders.
Shaving-cut. Hold the fender piece by one end with the other end resting on your work surface. Hold your knife as you would a screwdriver, with the cutting edge down. Begin at the top of the front wheel and push the knife straight downward, shaving the front corner of wood about 1/16" at a time, continue until at least half the fender is as round as possible. Use these same shaving-cuts on all the corners. The limousine fenders are carved much rounder than the roadster fenders *(figure 8, carving the fenders)*.

To carve the rest of the fenders down to each running board, set the entire fender piece flat on your work surface. Hold the carved end of the wood with your finger tips and use the shaving-cut on the rest of the fenders as you did the ends.

Figure 9



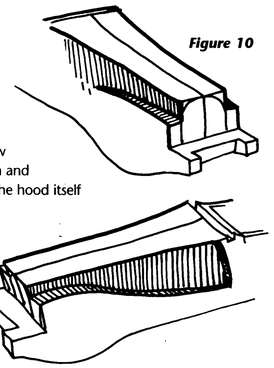
8 Finish the fenders.
Saw the wheel wells. Finish sawing the fenders by first sawing each wheel well and taping each piece back on to keep your wood strong. Also, tape the top piece you initially sawed off in step six back on. On the top of this piece draw a perfectly straight line for the inside of each fender. The straighter you draw and saw this line, the easier it will be to glue the fender onto the body and the better the finished car will look.

Saw the top views. The limo's fenders are ¾" thick so you can saw that 2 x 4 fender piece in half. The roadster's fenders are only ½" thick, so you have to draw and saw two lines and discard the extra inside pieces after you've sawn it.

Wider bodies. If you're using wider wood for the body, the inside line of each fender must perfectly match the curve of the body. The fenders will be narrower in the back.

Limousine wheel wells. When you sawed the limousine fenders in two, you also sawed the wheel well pieces in two. Now, saw each piece in two again, and when you glue the fenders onto the body, glue these half-pieces in as well so the wheels will be far enough apart.

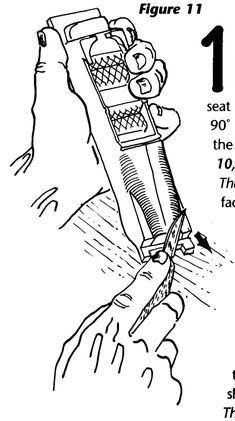
Figure 10



9 Draw the hood.
Center line. Draw a center line down the front half of each car, starting at the passenger compartment and ending at the front bumper. Using the center line as a guide, draw the top view of the hood, copying the pattern and measuring on each side of the center line so the hood itself is centered *(figure 9, drawing the hood)*.

Fender lines. Draw the outline of each roadster fender on each side of the body. Do this by holding the finished fenders against the body, aligning them along the bottom of the running boards and tracing the top edge of each fender with a pencil so you'll know where it will be glued later. On the limousine, mark where the fenders will join the body along the bottom edge of each headlight.

Figure 11

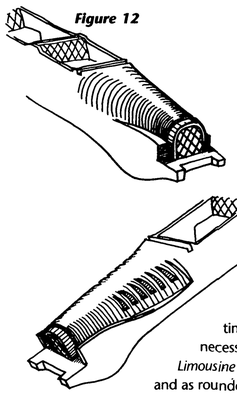


10 Carve the hood.
The front fenders. Hold or clamp the body firmly on one side so you can carve the top of each front fender along the angled hood. V-cut along the pencil lines of the hood about 1/4" deep, as you did for the seat upholstery, only cut much deeper toward the front end of the body. V-cut at a 90° angle to remove the corners of the hood, down to the top of the fenders on the roadster, and down to the bottom of the headlights on the limousine *(figure 10, carving the hood)*.

The push-cut. Hold the body of the car with the front resting on the carving surface. Use the shaving-cut on the top edge of the hood to remove wood as you did on the fenders, angling the cut until you reach the pencil line of the hood. Remove all the wood along the hood and over the fender by using the push-cut, which is similar to the shaving cut *(figure 11, the push-cut)*. Put your forefinger on top of the blade and, keeping the blade nearly flat against the wood, push straight down to cut all the wood from the top of the hood to the top of the fender. Go only as deep as the V-cut along the top of the fender. Remake the V-cut until it is nearly ¼" deep at the grill. Keep push-cutting until both sides of the hood are angled and curved like the pattern. The edges between the top of the fenders and the sides of the hood should be clean and sharp.

The roadster hood. Continue cutting both sides of the roadster hood, using V-cuts and push-cuts, until you've reached the level of the bottom of the grill. Be careful not to remove any wood that will be behind the front fenders of the roadster, as this will be needed to attach the fenders firmly to the front of the roadster.

Figure 12



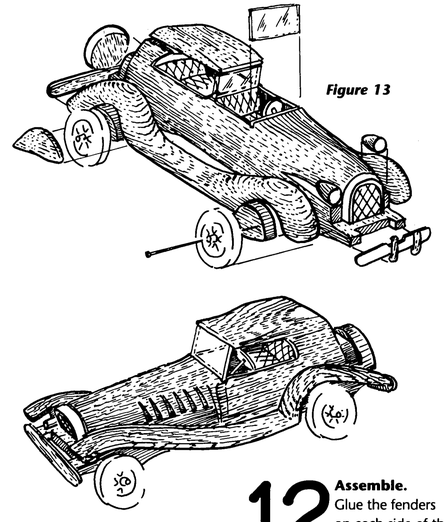
11 Carve the details.
The grill. The limo's grill is 1" wide while the roadster's is only ¼". Obviously, this means you must to carve more on the roadster. Carve the hood round the same as you did the outside of the fenders. The hood of the limousine is rounder than the roadster. V-cut the line between the grill and the hood, at least 1/4" deep. Criss-cross the front of the grill with V-cuts as you did the upholstery *(figure 12, carving the details)*.

The vents. On the roadster, V-cut five vents along each side of the hood, nearly ¼" deep. Hold the body firmly with its side on the work surface, and cut the vents in straight, parallel lines, 1/16" deep at a time. The v-shaped piece of wood should come cleanly out of each vent; recut as needed to free the wood. Do not pry with your knife, or tear the wood.

The headlights. Cut headlights from dowels, ⅜" thick for the limo and ⅛" thick for the roadster. If you cut the dowels with a knife, you can round the backs of the headlights at the same time. Glue the headlights into place between the front fenders and the hood; V-cut the body if necessary so headlights will fit.

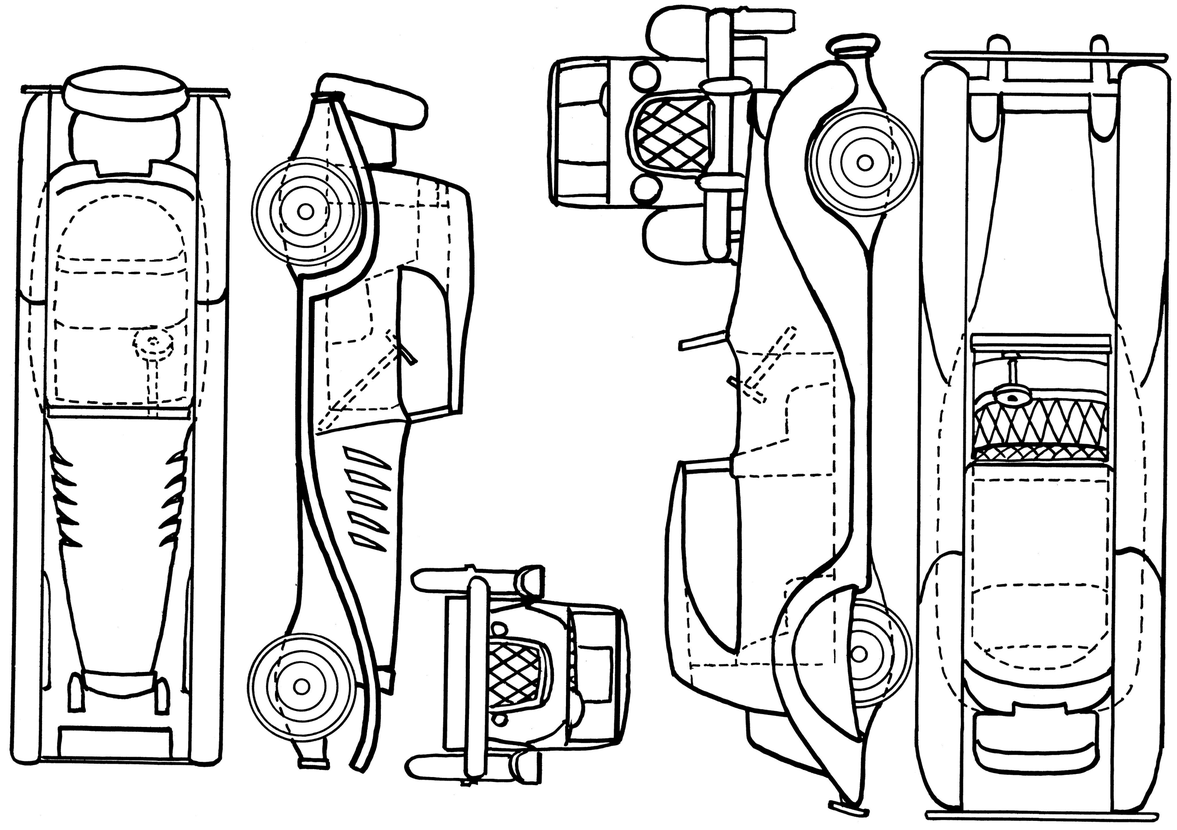
Limousine pieces. Shape the rear wheel covers of the limousine from thin scrap wood. Sand them smooth and as rounded as possible, and glue them to the fenders after the back wheels have been installed. Shape the two front bumper guards from scrap wood as well; sand and glue them onto the front fender.

Figure 13



12 Assemble.
Glue the fenders on each side of the body. Glue the windshields into the shallow grooves you've sawn to fit the width of the plastic. Saw or carve the bumpers following the lines of the patterns and glue into place. Bumpers can be cut from popsicle sticks. Cut the large end of a broken pool cue or broom handle for spare tire covers and glue them onto the backs of the trunks. The best way to attach the wheels is with small finishing nails which can be bent a little to make the car level *(figure 13, assemble)*.

13 Finish.
Sand thoroughly, especially the glue lines of the passenger compartment. Paint the grill and bumpers of the limousine gold, and silver for the roadster. Paint white sidewalls on the wheels. Varnish the cars at least twice, sanding between coats for a smooth finish.



CARVING SAFETY:

Bandsaw:

1. Keep fingers at least 2" away from the front edge of the bandsaw blade.
2. If you must cut small pieces of wood with a bandsaw and your fingers are closer than 2" to the blade, keep them behind the blade and pull the wood through.
3. Keep your saw guard close to the top of the wood you're cutting.
4. Keep the wood you are cutting flat and firm on the saw table.

Knife:

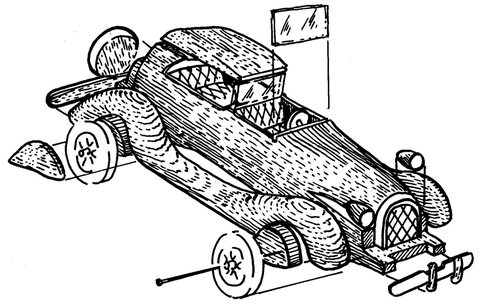
1. Always try to rest the end of your carving wood on a flat surface; cut down to the surface so your knife stops on the surface and does not fly into the air.
2. Keep all your fingers behind the knife blade.
3. Never force the knife.
4. Cut only small pieces, only about 1/16" deep.

The Mallet

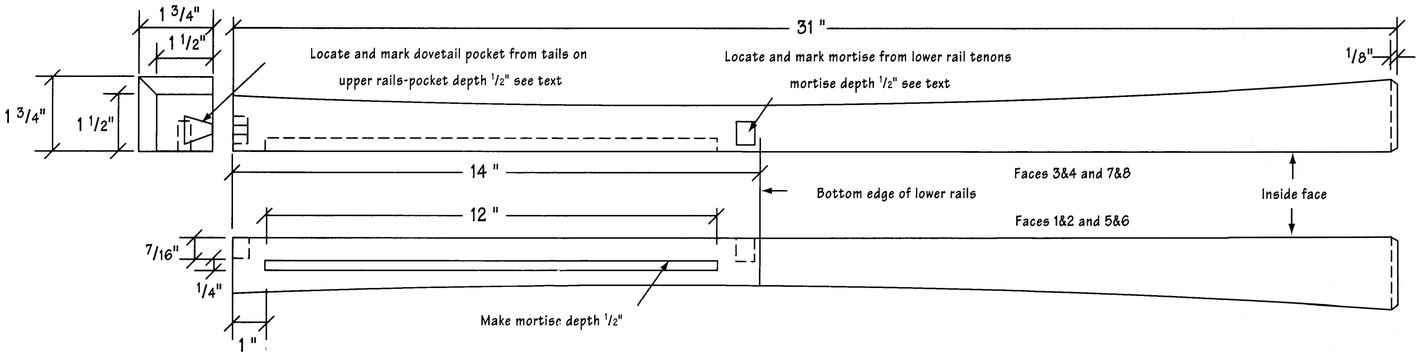
Carving Classic Cars

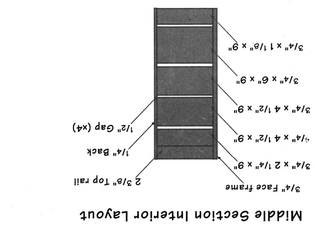
Two great vehicles for novice carving project.

By Jack Ekstrom

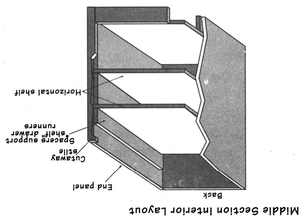


The 1932 Mercedes roadster and the 1934 Rolls-Royce limousine are two custom classic cars that you can easily carve from scrap 2 x 4s. When you're done, you and your guests will have great fun playing with and looking at them no matter what your ages.

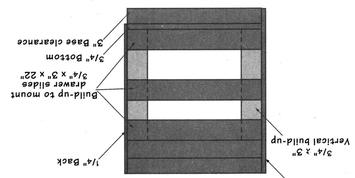




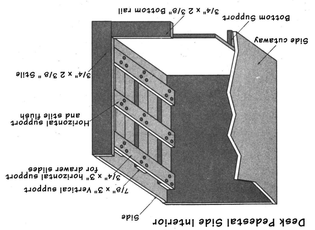
Middle Section Interior Layout



Middle Section Interior Layout



Desk Pedestal Side Interior



Desk Pedestal Side Interior

Sportsman Desk Case Interiors

door. Run the screws in, but not too tight. Do this on both doors and test. They will probably overlap slightly. Remove the doors one at a time (reverse the order in which you installed them) and use a plane to relieve the mating door edges starting at the inside corner. Be careful not to do anything to the mating edges of the handles. Do this a little bit at a time, replacing the doors each time to see how they fit. This is a tedious operation that is essential. Don't take too much or you will have a gap at the mating edges, which won't look very nice. The last operation on the doors is to install ¼" bullet catches under the bottom edge of each door about 1" from the mating edges.

The Back Panel Assembly

This is really quite simple. The frame stiles and rails are ½" x 1½". The joints are open mortise and tenon. Notice that only the upper and lower edges will be rabbeted to fit into the upper and lower rear rails on the case. These rabbets are not cut until the assembly is finished.

Glue up the panel to rough size first. You can get the ⅛" boards by resawing ¾" stock. Don't use plywood for this panel. Remember, just because it's the back doesn't mean that it can be poor quality work. While the adhesive dries, build the frame. Cut the stiles and rails to exact length as determined by measuring the opening in the case. While measuring the height, be sure you measure from the rabbet shoulders and not from the inside surface of the rails. The first step is to determine and mark which edge of all stiles and rails will be the inside edge and which face will be the outside face. Here is an easy way to cut the groove and the mortises with the same set up. Attach a high auxiliary fence to your rip fence. Use a sawblade to cut a ⅛" x ¼" deep groove. Set the fence to cut this groove in the exact center of the inside edges of stiles and rails. With the outside face against the fence, cut the groove on all four parts. On the rails, measure the distance between the bottom of the groove and the outside edge of the rail. Set the height of the saw blade to this measurement. The stiles get the mortise, so stand the stile on end with the outside face against the fence and slowly and carefully cut the mortise on both ends of each stile. To stablilize the work, use a back up block to help push the stile through the cut. Cut the tenons on the rails by cutting the shoulders first and then making the vertical cut. Be sure the waste piece falls to the outside of the blade. Fit the joints together and mark. An open mortise and tenon joint should be a light push fit. If it's too tight it will spread the mortise cheeks resulting in a poor fit. If it is too tight, shave the tenon rather than the mortise. It's easier. Assemble the frame dry and test fit. If it's way too large, you'll want to correct it now. If it's slightly too large, you can size it after it's been glued up.

With the frame assembled dry, measure the height and width from the bottoms of the groove and cut the panel to these measurements less ⅛" in each direction. Rabbet all four edges of the panel. Adjust the ⅛" dimension so that it slides easily in the frame groove. Assemble the panel with the frame,

***Photo 3.** Note rabbets for housing the back and top stretchers. See the relationship between strechers and legs, front rail.*

siderable structural integrity, more, perhaps than it requires. This results from the sides being glued long grain to long grain with the legs, the use of a glued-in bottom and the substitution of stretchers at the top in lieu of tie bars used by Ken.

Getting Started

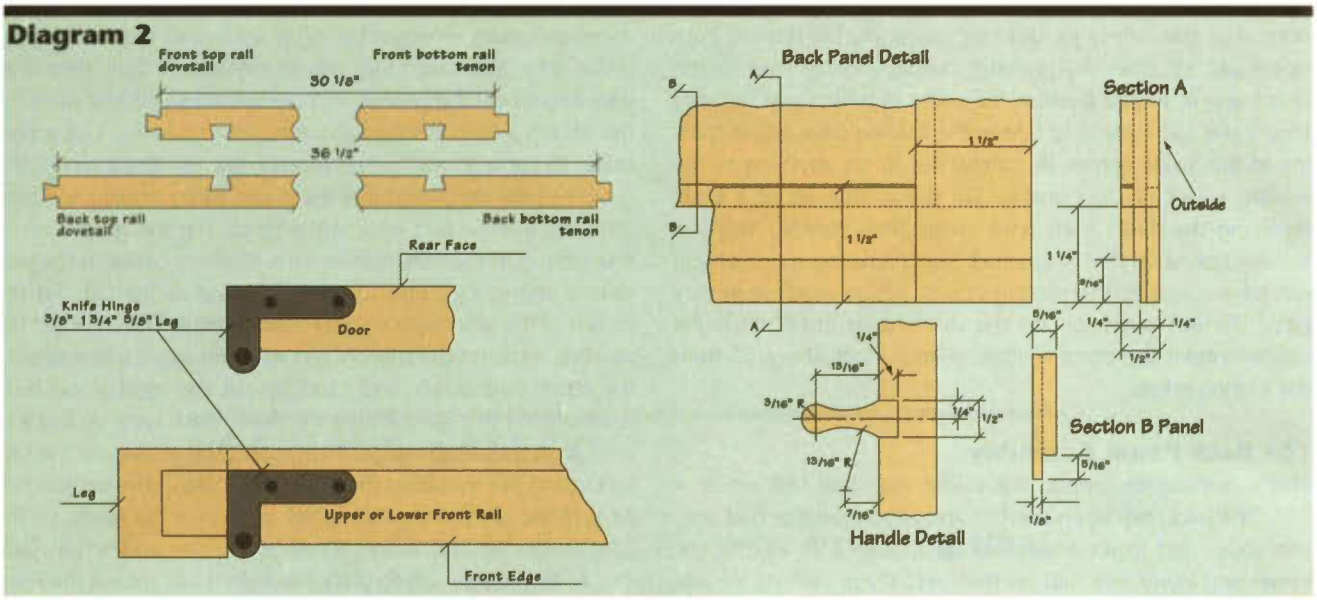
Before going to the lumber yard, I made up a cutting list of all the material needed. This also gave me the total number of board feet required, including a waste factor which I usually calculate between 20 and 30 percent. We also picked up the knife hinges while getting the lumber, since mortising them prior to assembly is an extremely time saving advantage.

Back at the shop, David began preparing the stock and gluing up the panels we'd need while I made a full-sized layout of the plan (top) view of the buffet ***(photo 1)***. For this project, the difficult and critical parts are the angled sides, bottom and stretchers. Seeing how these interrelate is very useful. Making a full-size layout allows you to physically place each part on the layout after it's made and confirm that it is correct ***(photo 2)***. In drawing the full-sized plan, I only drew half the cabinet from the center line front to back since the other side would be a mirror image. From the layout, you can also take off precise dimensions, fine tuning the cutting list already prepared if necessary. I also layed out the front and side curves of the top. Later, I bandsawed the layout board along the curved top lines using it as a template for the actual top. Lastly, I made a template for the leg shape.

Cutting the Parts

With panels glued up to rough size, including doors, sides, top, bottom and back, they were cut to size. I also cut the leg squares, top and bottom front rails, and front and rear stretchers to size at this time. This cutting included the 15° angled edges of the sides, and angled ends of the bottom and stretchers. While on the table saw, I machined the top rabbet for the sides (½" W x ¾" D) that will receive the stretchers, rear the stretcher (½" W x 1" D) ***(photo 3)*** that will receive the back, and the dado to receive the bottom. The bottom dado is ⅜" W X ⅜" D and starts ⅜" up from the bottom edge of the side. This dado position makes the top edge of the bottom flush with the top edge of the bottom front rail. I next cut a tongue, ⅜" x ⅜" on each end of the bottom. I cut the tongue taking the waste from the bottom edge so that any gap which could occur would be on the bottom of the cabinet, leaving the visible inside joint perfect.

***Photo 4.** Routing stopped rabbet in rear legs for back.* ***Photo 5.** Dowel postions for joining legs to front rails (far right).*



again dry, to see that all joints go home properly and that it is square. When satisfied, glue up the assembly. The best way to glue an open joint is to put glue on the top half of the sides of the mortise and press the tenon down from the top or up from the bottom. Do not put glue in the grooves. The panel must float in the frame. When the glue is dry, cut the ¼" x ⅜" rabbet on the top and bottom edges and fit it to the case. The frame assembly is held in place with #5 x ⅜" brass flathead wood screws along the top and bottom edges. Use five to each edge evenly spaced.

The Top and the Bottom

The top is the second focal point of this piece. It is just as important as the doors, if not more so. Great care should be taken in choosing the wood for it. Look for striking grain patterns that you can match to make the finished panel look like

Photo 6. *Cutting the biscuit pockets for the sides required a build-up for the fence to rest on making the cut perpendicular to the 15° edge.*

Photo 7. *Legs, sides and front rails ready for assembly. Glue the legs and sides first as sub assemblies. After the adhesive has dried, glue the rest of the case together.*

The sides I made were 1" thick because I had good looking, heavier material to work with. This gave me an advantage by allowing the inside edge of the sides to be flush with the inside mating edges of the legs. If you use ¾" thick sides, you will only have to notch the front corners of the bottom to go around the leg. You may need to notch the back corners slightly as well, depending on the leg thickness and position of the back at the point where these three parts come together.

With table saw work complete, I set up a router in a table to mill the stopped rabbets in the two back legs that receive the back ***(photo 4)***. I used a ½"straight router bit and made the ½" W x 1" D rabbet in three successive passes. I set up a stop block on the outfeed side of the fence to assure my cut was 14" long, the total height of the case portion of the buffet. When done, I squared up the corner of the cut with a chisel. The rabbet in the leg (and corresponding rabbet in the rear stretcher) is twice the depth of the ½" back. This is important because of the curve of the leg which sweeps in and reaches its narrowest point where the back and bottom come together. A 1" deep rabbet made the back flush with the back edge of the leg at this point.

The last steps in making parts is doweling for joining the front legs to the rails and biscuiting (you could spline) the legs and sides. I started with the rails and carefully positioned two dowels in each end, making sure both rails were flush to the inside back edge of the legs ***(photo 5)***. For joining the sides to the legs, I used biscuits that will position the parts properly during gluing and clamping ***(photo 6)***. The biscuits add no strength since long grain is gluing to long grain, but clamping would be impossible without some form of indexing devise. The biscuit slots were easy to cut on the legs because of the square edge. But because of the angled edges of the sides, the biscuit pockets had to be made at a 90° angle to the 15° angled edge. I accomplished this by setting a ½" build-up on the side front or back at a calculated distance ***(photo 7)***. Be sure to keep your angles straight when cutting these pockets. Take your time and think it through. Lastly, before bandsawing the curves of the legs, make the ⅛" chamfer on all

Photo 8. *Trimming the bevel on the leg bottoms using the table saw was quick and easy.*

one board. Since the rough panel should be ¾" x 19½" x 43", you will probably have to glue it up with three boards. Try to keep the major elements of the grain pattern toward the center of the 43" dimension, rather than toward one end.

When made to rough size, lay out the top. Here is an easy way to do it. Draw a center line front to back. Next draw a trapezoid using the back edge of the board as the bottom, 42" x 18¼" (on the centerline from the back edge) x 35". On the lines connecting the ends of the 42" line and the 35" line, find the center point. At points just outside the intersection of the side lines with the front and back line, drive a brad, just enough to be firmly fixed. Place a thin, flexible stick against the brads at the front and each of the sides, and at the center point pull the stick out ½". Now draw the line. With the lines drawn, scribe the 2" radius curve at the front corners. Using a bandsaw or jig saw, cut the shape of the top, leaving the lines. With a spokeshave and sandpaper, finish the edges to the line. Round the top and bottom edges of the front and sides to a ½2" radius. Leave the back edges sharp. Mount the top with #8 x 1" roundhead wood screws through the slots in the top tie bars. Note that the back edge of the top does not line up with the top of the back legs but with the bottom. The top will extend ¼" beyond the top edge of the legs so that when placed against a wall, the top will not be held away from the wall by the bottom of the legs.

The bottom is quite simple. Glue up a ½" thick panel 14" x 39". When it is dry, lay out the bottom shape with dimensions derived from the opening. The bottom should be 1/16" less in length and width than the measurements. Cut the shape, clean up the edges and fit it to the case. It is fastened in place with #8 x ¾" roundhead wood screws up through the slots in the bottom tie bars.

The small buffet is ready for finishing. As usual, I'll just suggest a finish and you can decide how you want to do it. But please, do not use any stain. It will spoil the beautiful grain patterns you have taken so much trouble to find. I would use a clear finish, either tung oil or polyurathane. A low luster sheen will do nicely. I use a brush with either of these. Apply the first two coats generously, allowing it to soak in for five or ten minutes and then rub off the excess with a clean cloth. After two coats I brush it on sparingly because only a small amount will soak in and you don't want to waste the stuff. It's expensive! Apply as many coats as necessary to get the degree of finish you want. Remember to dispose of oily rags properly by submerging in water to prevent spontaneous combustion. PW

Schedule of Materials

Qty.	Item	Th x W x L	Notes
❑1	Top	¾ x 18¼ x 42	Curve ends, front
❑4	Legs	1¾ sq. x 35¼	
❑2	Ends	1 x 13½ x 14	15° Angle ends
❑1	Bottom	¾ x 14 x 37⅜	15° Angle 2 ends
❑1	Back Stretcher	¾ x 3 x 38	15° Angle 2 ends
❑1	Front Stretcher	¾ x 3 x 30⅜	15° Angle 2 ends
❑1	Back	½ x 13¾ x 38	
❑2	Doors	¾ x 15 x 12	
❑2	Handles	½ x ¾ x 3	
❑1	Top Rail	¾ x 1½ x 30⅛	Dowel to legs
❑1	Bottom Rail	1 x 1⅛ x 30⅛	Dowel to legs

four bottom edges of the legs *(photo 8)*.

Glue up in Stages

After test fitting your parts (you can actually assemble the entire project without glue at this point), you can begin by gluing the legs and sides together. Once dry, glue the completed leg/end assemblies to the bottom, rails and top stretchers. You should glue the front edge of the top stretcher and the bottom to the mating edges of the top and bottom rails. Also glue the stretcher ends in their rabbets and nail down through the side (drill pilot holes for the nails so they don't split the ends of the stretchers). After clamping and before the glue has set, check for square where you have parts meeting at right angles. Correct as necessary and allow the glue to cure. After the glue has dried, remove the clamps and put the back in place. It is housed by rabbets on the top and both sides and overlays the back edge of the bottom. It should be a good press fit on the ends and top. Screw it in place with flathead screws without glue.

Photo 9. Fitting the hinge in the mortise on the door edge.

I could not glue the door handles on as Ken did because of the change in grain direction. To fasten the doors, I used a brass, pan-head screw. To prevent the handle from turning, I clipped the end of a brad nail, set the cut end in a hole of the same diameter on the back of the handle leaving the sharp point projecting about ⅛". When screwing the handle in place, the brad point "bit" the door front, preventing it from turning.

Finishing

Sanding was done with 150 grit followed by 220 grit. Since we were using walnut, I used a paste grain filler tinted and thinned to a consistency of heavy cream using a walnut oil stain and naptha in basically equal part. The stain colors the cream colored grain filler to match the natural walnut color or darken it slightly, if you prefer. The naptha thins the filler so it's easier to work and makes it dry faster. Brush the filler on with the grain a section at a time. When it starts to loose its wet look, rub off with a rag, first against the grain. This drives the filler into the open pores. Then wipe off any excess with a clean rag. I filled all exterior surfaces and lightly stained the interior of the case and the bottom.

After the filler dried over night, I applied tung oil. Follow Ken's instructions for application. You may want to rub with steel wool after the last coat of oil has been allowed ample time to dry. When using grain filler, you will want to allow some extra drying time between oil coats. If you rub it out, rub gently around corners and edges so that you don't rub through any stain color.

Finishing With Wax

A paste-wax finish may be best for some projects.

By Tom Wisshack

Wax is one of the most beautiful finishes available to the woodworker. It has the peculiar ability to give wood a lustrous sheen while leaving very little accumulation on its surface. It is, in fact, the thinnest of any film finish. In this article I'll discuss the advantages of wax to anyone looking for the right finish on very special projects, as well as some of the results I've gotten with wax and how I achieved them.

When to use wax.

If you've made a small cabinet, a table or a jewelry box out of high quality wood and have taken great care in its construction, you may not want to risk changing the character of the wood with varnish, lacquer, shellac, oil or some other finish. These products all have their place in the wood finishers arsenal of finish materials, but sometimes we want a more low-key finish that will retain the wood's character without drastically altering its color, figure or open-pore nature. For objects that won't be exposed to hard use or moisture, traditional finishes provide more protection than necessary. On certain pieces we may only be concerned with the oil from people's hands marring its surface. Beyond that, the degree of protection a finish gives isn't critical. Knowing this allows us to place more importance on the aesthetic value of a particular finish. In many cases this points to wax.

Objects that have been carefully hand planed or carved have a very tactile surface that can be destroyed by a thicker fim finish. What is needed is a finish that gives moderate protection without obscuring the wood's markings. These surfaces respond dramatically to a coat of paste wax. The amount of surface accumulation wax leaves on the wood is so slight that it's the next best thing to having nothing at all. This concept should appeal to craftsmen that have spent many hours perfecting the surfaces of their projects.

Preparation

Applying a coat of wax to a wood surface that has not been properly prepared is ineffectual. The wax will sink in and disappear. The surface to be waxed must be glass smooth before any wax is applied. Wax alone will not magically give you a beautiful finish. If you're relying for the most part on sandpaper to achieve this smoothness, don't expect to stop at 220 grit and open a can of wax. My advice would be to follow up with 280, 320 and finally 400 grit paper. On some projects it wouldn't be considered extravagant to use a piece of 600 grit and bring the wood surface to perfection. With the finer

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Photo 1. *The secret to a successful wax finish is a properly prepared surface. The top of this zebra/walnut coffee table was carefully hand scraped and sanded to 600 grit before any finish was applied.*

***Photo 2.** The open pores of this African Wenge table top have been retained by using an oil and wax finish. A thicker varnish or shellac finish, would have spoiled the look.*

grades of sandpaper you'll actually see the wood grain and color come into sharp focus. You'll see details you missed when using coarser grits. Vacuuming between each sanding step ensures that abrasive particles from the previous step won't mar the work. Use a cork-covered, wood sanding block on flat surfaces, and always sand in straight strokes along the wood grain.

Surfaces that have been very carefully hand planed, scraped or carved have a different kind of smoothness from ones relying on sandpaper. A hand-worked surface may be ready for waxing without further preparation. Occasionally I've gone over such surfaces with 1000 grit wet or dry paper which does a nice job of final smoothing (polishing seems to be more descriptive here) without harming the integrity of the surface.

Methods of Application

One of the truly great things about paste wax is that there are no cut and dried methods of application. You can use whatever tools, materials and techniques give you the best results. There is tremendous room for creativity when we choose wax as a finish, allowing us to modify or invent techniques as we go along. The methods we'll explore attest to the versatility of wax as a wood finish.

1. The Cotton Glove Method. On small to medium sized projects you might try applying the wax with a cotton glove. The advantage is that your fingers are in direct contact with the wood. Not only will this bring you closer to the surface of your furniture, it's much easier to know when you've applied the wax evenly. You're also less likely to miss spots that later must be recoated. This can be a problem when using an ordinary cloth applicator. Spread a small amount of wax on your glove and apply in a circular motion, overlapping the area you just finished as you proceed. Re-coat your glove as needed.

2. Damp cloth method. On larger projects it's more practical to use a cloth applicator because you have more surface to cover. Find an old cotton T-shirt and cut off a piece about 18" square. Wet the cloth with tap water and wring out all the water, leaving the material uniformly damp. Fold the cloth into a small square, ball or any configuration you like. Wipe the cloth across the surface of the wax, picking up just enough to "lubricate" it. Apply, as before, in a circular motion. You'll find that having the cloth damp helps apply the wax more evenly, but if you still miss an area, simply recoat. You'll be buffing all the surplus wax off anyway.

3. Steel wool applicator. Many wood finishers advocate the use of fine steel wool as a tool for applying wax. Though it doesn't work in every situation it can be useful when covering large, flat areas. One advantage of steel wool is you can apply the wax more uniformly. The result is often a thinner coat of wax which is less work to buff off.

Begin by opening up a pad of fine (0000) steel wool so that the maximum surface area is revealed. Spread a fairly liberal coat of the wax onto your steel wool and apply it to the wood in long, even strokes along the grain of the wood. Remember that the steel wool will be lightly abrading the surface as you go. If you're not careful this may cause the steel wool to "pick up" the wax you just applied, leaving very little on your project. The trick is to rub lightly, using as few strokes as possible to apply the wax. With practice you'll get the hang of it.

If you've polished the surface to perfection using very fine sandpaper, steel wool may harm the surface by abrading it. Though you'll be using the finest grade of steel wool available, the product produces its own scratch pattern on the wood, which may be more coarse than your polished surface. This is the chief reason I don't advocate steel wool as the perfect applicator in all situations, though some woodworkers do.

4. Shoe polish applicator. Woodcarvings require a special approach because the usual methods of application don't always work. What's needed is a tool that reaches into the deeper portions of the carving and allows you to spread the wax evenly. A natural bristle shoe polish applicator does a superb job. Simply wipe the applicator across your paste wax so that it picks up enough to saturate the bristles about one quarter of an inch. Apply the wax in a tight, circular motion,

Photo 3. *Woodcarvings are good candidates for a wax finish. Here, the faceted surface of this mahogany mirror frame, created by razor sharp carving tools, is at its best with a wax finish. A mahogany tinted wax (Liberon's Black Bison line) accentuates the colors already present in the wood.*

spending extra time on the portions of your carving that are especially deep.

When applying wax to carvings, I recommend introducing a certain amount of friction. Do this by bearing down a little harder than you would when using one of the other applicators and spending several minutes in each area. You can sprinkle a small amount of rottenstone abrasive powder onto the surface as you go along. It will blend into the wax and act as a fine polishing agent. It's not important to follow the grain of the wood when using this technique because the abrasive is so fine it won't make any visible scratches. You'll be amazed at the luster and depth of shine this method will produce after you've buffed the wax off.

The Buffing Process

Enormous controversy exists over just how long you should allow paste wax to dry after application. Directions on the labels of store-bought products vary from 10 minutes to an hour in their recommended drying time. This may seem confusing but it's fairly easily explained by the fact that each company uses a unique blend of solvents when formulating their wax, and the proportions of the wax ingredients can vary. *(See "What Is Paste Wax".)* The answer is to leave the wax on for as long as you can. If you find it's hard to buff off, simply adjust the drying time until it works for you. The worst that will happen is that you'll need to recoat your project with wax, which attests to the forgiving nature of wax as a wood finish. By experimenting with a few of the better waxes available you'll learn their working properties and you can fine-tune a finishing system for the particular job at hand.

There are three types of cloth that are useful for buffing. They are:

1. Cotton. Old T-shirts are the best. They provide an all-purpose application cloth that works in most situations and last a long time .

2. Terrycloth. This material has a coarse texture due to the nap

What Is Paste Wax?

Paste wax is one of the simplest wood finishes in terms of ingredients. It can contain as few as two substances: some type of raw wax and a solvent. Beeswax polish is a good example. It's been used for centuries and the basic formula (shredded beeswax dissolved in turpentine) hasn't changed much at all. In this case the solvent (turpentine) is chosen because it will dissolve the beeswax and form a paste, which makes it easy to apply. Once applied, the solvent evaporates and leaves only the wax on the wood's surface. After buffing, the result is a lustrous surface that improves with age. From a finishing standpoint this means wax is the simplest of evaporative finishes. One thing that makes it unique when compared to other finishes is that friction is required for it to be successful.

Commercial waxes have similar working characteristics but vary tremendously in terms of ingredients, which effect the wax's durability. A good quality wax will usually contain a mixture of camauba[1], which is a hard, fairly water resistant substance, along with softer ingredients like beeswax[2]. Some waxes contain Candelilla[3], and many utilize synthetic counter parts in their formula. It should not be assumed that these synthetic waxes are inferior, though, as a general rule ,waxes that contain paraffin are to be avoided in fine wood finishing.

The kind of solvent utilized in a particular wax formula has a bearing on how it performs. Waxes containing fast-evaporating solvents like Naptha cannot be left on the wood as long prior to buffing. Waxes containing slower-evaporating solvents, or a blend of solvents, are the most forgiving. Experimentation is the key to determining which type of wax is best suited to the job at hand. Stocking an assortment of commercial waxes can be beneficial to the wood finisher because each has characteristics that may be desirable in certain applications.

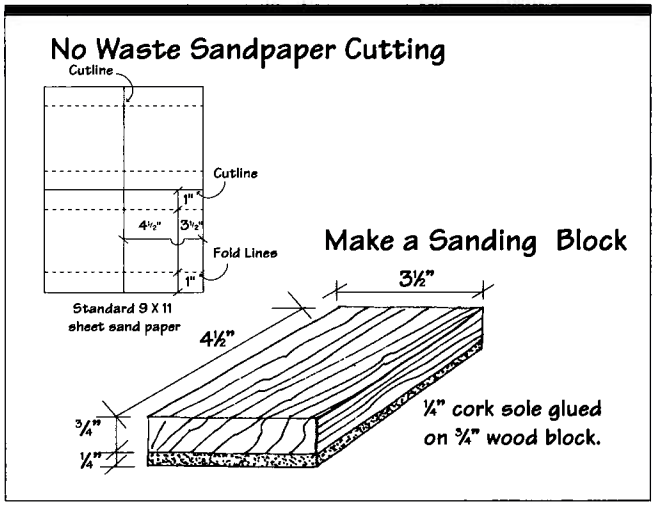
There are store bought waxes that give good results. In general, ones that contain camauba are the best for fumiture. This makes a harder, longer-lasting shine. Treewax™ and Butcher's Wax™ are two examples that come under this heading. The problem with many store bought waxes is they are intended for general use on fumiture, woodwork and floors. Because of this, they are made user friendly; easy to apply and buff off. Unfortunately, the trade off is that the ingredients are not always top quality. Some even contain paraffin which is an inferior wax for fine fumiture. Johnson's Wax™ is a good example of this. It's easy to use and you don't end up short of

of the material. This makes it ideal for coarse-grained woods and even for some low-relief woodcarvings since it reaches into the intricacies like no other material.

3. Linen. Attend an estate sale and you may have a chance to pick up old linen tablecloths or napkins at a reasonable price. Linen is superb for buffing, especially on delicate woods and very fine projects requiring special care. The shine it produces is superior to any other material and it has the ability to hold a portion of the wax because of it's weave. This means linen cloths can be used over and over and, in fact, get better with time. A buff with a wax-impregnated linen cloth may be all that's needed to maintain the surface of pieces you've finished with wax. Remember to save all your buffing cloths and use them until they fall apart. An old cookie tin or oatmeal box makes an ideal receptacle. Be sure to keep the various types separate, especially any cloth that has come into contact with rottenstone.

Begin the buffing process by crumpling a large piece of material, say 24" square, and work in a circular motion initially. This removes the majority of the superfluous wax efficiently. Switching to a fresh cloth and buffing with the grain of the wood finishes the process. At this stage you'll want to apply as much downward pressure as you can. If you're breathless after a few minutes you're probably doing a good job. Rotate your cloth as you go so you're exposing fresh material, and switch to fresh cloths until the surface has no streaks. Remember the key to success lies in removing all the visible wax from the surface of your project. Only the portion that won't buff off should remain on the wood. This finish is so thin it would require a microscope to see, which is exactly what you want.

Your waxed surface will look good for many months, and in some cases years. To maintain it, simply apply a fresh coat, or buff it with one of the wax-impregnated cloths. Scuffs and other light abrasions can be removed using the steel-wool applicator. Remember that in the process you'll be removing a good portion of the wax you first applied and it will take some work to obtain the depth and sheen you first had. The same technique applies to surfaces that have had water spilled on them (providing the water is wiped off right away). Whatever grain raising that has taken place should smooth back down in the process. To restore the shine on certain objects, you can use rottenstone with the wax as a tool for rejuvenating the original look.



Wood finishers Disagree

It's interesting to observe the various techniques used by wood finishers, both professional and amateur. Many claim that applying several coats of paste wax over a period of days or hours results in a more lustrous surface. These people claim they're able to "build" multiple coats of wax in a short time. Common sense tells us that because wax is a soft-curing finish and may take months or even years to completely harden, applying multiple coats is fruitless. Subsequent coats simply dissolve previous ones and the result, in the end, is a single coat of wax. If anything, the friction that's introduced during the process of applying these multiple coats in a short duration of time should be given the credit and I have nothing against ambitious buffing. It's probably more important than the kind of wax you use. PW

breath after buffing, but the film left behind is not especially durable. It will require frequent maintenance.

What this means is if you want a superior wax finish, you should choose a wax made especially for fine furniture. Your work will need less upkeep and develop a beautiful patina over time.. It's true better quality wax will be a little harder to buff off, but the friction introduced by the process is part of a successful wax finish. The waxes I recommend are made exclusively for fine furniture and utilize the finest possible ingredients. The slight inconvenience in having to order through woodworking catalogues more than pays off in the results you'll achieve. There really is a tremendous difference among waxes, so why not spend a few dollars more for the finest waxes available to apply to those surfaces you have so lovingly prepared.

1. Carnauba wax - a yellow to dark brownish grey, hard, brittle, high melting wax obtained from the surface of leaves of the carnauba palm and used chiefly in polishes for floors and furniture, as well as phonograph records, paper coatings and pharmaceutical and cosmetic preparations.

2. Beeswax is a yellow-brown solid obtained by melting a honeycomb in boiling water, straining and then cooling.

3. Candelilla is a hard, yellowish-brown wax composed chiefly of hydrocarbons found as a coating on candelilla shrubs native to northern Mexico and the Southwest United States.

Source List

Antiquax - A high quality paste wax used by museums and fine wood finishers. Made in England, it is available in the U.S. through:
Marshall Imports, P.O. Box 47, 816 N. Seltzer St.
Crestline, OH, 44827 (800)992-1503

The Liberon Fine Wax line includes a complete range of tinted waxes, as well as buffing brushes and a large selection of wood finishing supplies. Available through:
Liberon/Star™ Supplies, P.O. Box 86,
Mendocino, CA, 95460 (800)245-5611

Mycrocrystalline waxes as used by the British Museum are available through:
Woodcraft Supply, 210 Wood County Industrial Park
P.O. Box 1686, Parkersburg, WV, 26102-1686 (800)644-3106

Make a Wooden Drum

A quick project that's lots of fun for everyone.

By Hugh Foster

***Photo 1.** A fine example of how the natural beauty of wood can compliment the "playability" of a musical instrument. This drum by Calvin Greer uses the African pentatonic scale and can be played with a mallet or hands like a bongo.*

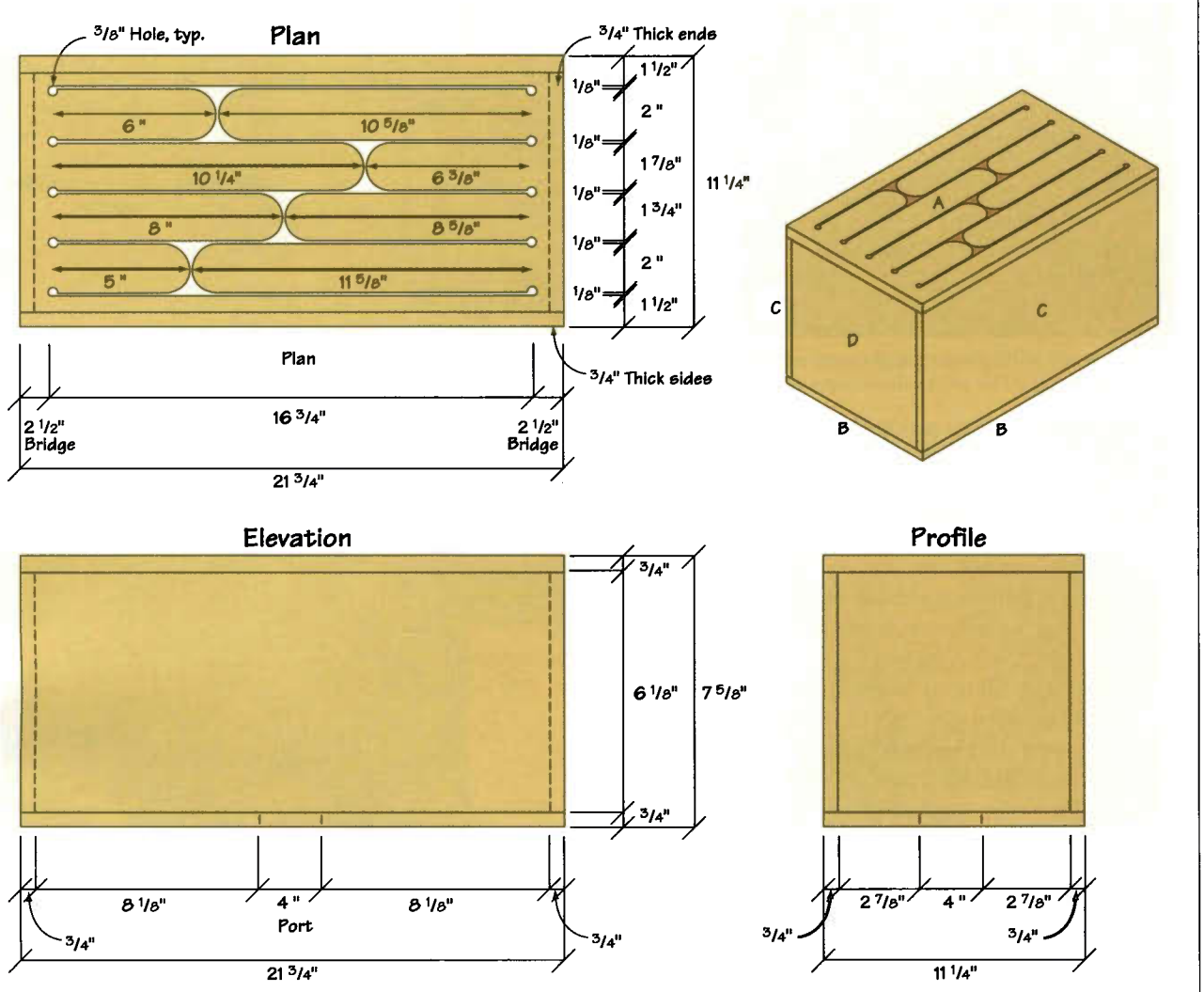
I had seen wooden drums at craft fairs and in catalogues, with prices ranging from a modest $35 to several thousands of dollars. Making one struck me as an intriguing project, but I could never figure out what governed their sound qualities (since they come in a wide variety of sizes, wood thicknesses and materials). Recently, however, long-time drum maker Calvin Greer demystified the process for me, and revealed that there are only a few secrets behind successful drum construction. Greer earns his livelihood, and provides part time employment for his sons, making and selling his drums and turnings on the mid-west craft show circuit.

Before we look at actual drum making, let's consider how a drum works. Most affordable wooden drums are generally not tuned, but are played according to the African pentatonic scale. The beauty of this scale is that there are *no wrong notes.* More expensive wooden drums are tuned to westem musical notation. (Greer knows of one fellow who makes drums on the western "do-re-mi-fa-so-la-ti-do" scale by shaping the drum, then shaving each key and testing it after installation on the drum. These drums often cost as much as an inexpensive automobile! Because humidity can knock such a drum "off-key", part of the high price includes up to three re-turnings.) Greer makes his pentatonic scale drums with six or eight keys which are played using a mallet. Mallets can be purchased for as little as $1.50 at many music stores. Greer says heavier mallets generate more sound, but suggests the drum might best be played by hand like a bongo drum.

He adds that a drum played with the hands should have only four keys. Greer says that a true tongue drum has only one key and produces different sounds according to where the key is struck. When you consider that there are no wrong notes, you can understand why your guests won't leave this kind of drum alone when they discover it on your coffee table. Greer says dentists have been known to put these drums in their waiting rooms to help patients relax; and lawyers who have bought them, call the instruments "frustration boxes." Regardless of musical ability or training, most people enjoy the drum's natural, gentle melody.

***Hugh Foster** is a noted woodworking writer and a Contributing Editor to* Popular Woodworking. *Hugh lives in Manitowoc, WI.*

Figure 1



The Process

Greer cuts out enough wood for ten drums, then completes one each day. Gluing and clamping is his last activity of the evening, with planing and sanding his first activity the following morning. When the whole batch has been cut, glued and sanded, he applies an oil finish to them all in one session.

Laying out and cutting the top is the most mysterious and important part of making a drum. The *only* fact that you absolutely *must* remember is that the shorter the "bridge" at the ends ***(see figure 1)***, the brighter the sound. The converse is also true and a longer "bridge" will generate a more muted sound. Shorter keys produce higher pitch—but when you go much over half the length of the drum, you may get the highest note rather than the deepest. Greer says that tongues (so called because of their rounded ends) are more work but the improved tone quality is worth the effort. Greer mentioned that many drum makers simply drill holes at the axis of the long and short key layout lines and then cut between them to make their keys.

Greer used oak for the tops in this batch of drums in order

Schedule of Materials

No.	Letter	Th x W x L	Item
❑ 1	A	¾ x 11¼ x 21¾	Top (hardwood)
❑ 1	B	¾ x 11¼ x 21¾	Bottom (pine)
❑ 2	C	¾ x 6⅛ x 21¾	Sides (hardwood or pine)
❑ 2	D	¾ x 6⅛ x 9¾	Ends (hardwood or pine)

"...There are no wrong notes...your guests won't leave this kind of drum alone."

Photo 2. *Lay out of the tongues is the most important part of the construction process. This photo shows a six key design.*

Photo 3. *The cuts on the top are done with a bandsaw, cutting first along the length of the tongues, and then dividing the tongues by length. The entry cut at the bridge is later glued back together.*

Photo 4. *A jigsaw is used to widen the narrow bandsaw kerfs.*

to make the projects affordable for craft show customers. He says walnut and hickory sound the best, and that some exotic timbers make a drum that sounds just like a piano. No matter which wood specie you use, the oil finish will change the sound because it changes the density of the material. When he makes a ¾" top, he gets deeper pitch; thinner wood gets a higher pitch.

The day I visited, Greer was making drums with four rows of notes. He began with a piece of oak that was 10 ¾" wide and 22" long (Diagram 1). He scribed a line 2" from either end of the board, then drilled 3/8" holes on the scribed lines approximately 1 ½" from either edge, then continued along the scribe line spacing hole centers at 2", 1 ¾", 1 ⅛", and 2" ***(photo 2)*** with allowance for a ⅛" kerf space between each tongue. Then he laid out tongue lengths in pairs along the length of the top as follows: (5", 11 ¾"), (8", 8 ¾"), (10 ⅜", 6 ⅜"), and, (6", 10 ¾") ***(see figure 1)***.

The Top

After it's laid out, cut the top with a band saw, scroll saw, or jigsaw. Greer notes that the scroll saw is slow for this job, but offers the advantage of not causing a glue joint on one end of the top. Greer cuts his tops with a band saw ***(photo 3)*** that has a ¼" blade. After the cutting, he joins the entry hole back together with "Hot Stuff Super T™," which he says is both quick and effective. After the glue joint has dried, he uses a jigsaw to widen the narrow band sawn kerfs ***(photo 4)***. It's worth noting that he saws with full orbit *in both directions* to prevent the keys from touching and resulting in a drum that is likely to sound "like a box full of bees" when played.

The Body

The body of the drum can be made from any wood, but Greer always uses pine for the bottom. He prefers very wormy oak, maple with holes from syrup taps, knotty pine (with see-through knots) and other defective stock ***(photo 5)*** for the body. The defects in the woods provide natural sound holes and may render the the bottom port unnecessary.

The body is simply butt glued together without any "formal" joinery. When I asked about the desirability of using biscuits or *something* to stiffen these joints, he remarked that he hadn't heard of one coming apart in the 18 years he has been making them. Greer joins the drum parts using lots of glue and heavy clamping pressure to ensure there are no gaps in the joints. ***Photo 6*** shows that anywhere from 6-10 clamps may be used to attach the top and bottom to the sides. Should gaps be present after gluing they're filled with a putty made of epoxy cement and fine sawdust from the project.

Greer strives for a good fit because any excess material must be planed and sanded flush, which Greer describes as a difficult, tedious and boring chore. Because he prefers to do this sanding at floor level rather than up on a bench, Greer uses a couple of clamps to stabilize the work. This is a tip we all can use in our shops, whether we're making drums or not ***(photo 7)***.

After the drums are assembled and sanded, Greer often applies designs using pyrography or carving ***(photos 8 & 9)***.

Photo 5. *A few examples of wormy and knotty woods which many woodworkers would consider defective. To the drum maker they provide natural sound holes.*

Photo 6. *Heavy clamping insures there will be no gaps in the glue joints.*

Photo 7. *Clamps are used to stabilize the drum while finish sanding is completed.*

Photo 9 shows a drum which Greer's wife insisted he not sell—instead she added it to her excellent collection of Africana.

After you've made a couple of drums, you'll be ready to start experimenting. Once Greer built a very large drum with the tongues on one end, a baffle inside, and the port at the other end. Never before had he achieved such deep notes from a drum. Even though this drum sold quickly, Greer has not built another since most customers prefer a smaller and less expensive drum. He says people who buy larger drums often don't use them as drums at all. He told the story of the woman who came to his booth, drummed on a large all-walnut drum, then bought it to use as a pedestal for a statue. The woman, worried that someone else might drum on it, carried the piece with her the rest of the fair. "Takes all kinds," he said. True enough, and aren't we glad! PW

Photos 8 & 9. *Two examples of detailing Greer uses on his drums. The left drum is carved, and the right has a design applied using pyrography.*

Sportsman's Desk

Customized workstations put all your gear in place.

By Hugh F. Williamson

The avid sportsman enjoys working at home on his firearms and tackle almost as much as he enjoys the actual field outing. However, there seems to be one universal problem regarding storage of the gear and a suitable place to work. Your wife has warned you that if you clamp your fly-tying vise to the dining room table one more time you risk divorce! Even if you're not a sportsman, a dedicated work space for organizing craft projects or paperwork will make these tasks easeir and more enjoyable.

To that end, the answer is to build an attractive workstation where you can load cartridges, or tie your favorite flies with all of your equipment safely stored out of sight, yet readily accessible, when not in use.

Because of its size, the workstation is made in three sections: the lower desk designated as I; the middle drawer cabinets, II; and the top cabinet, III. ***(Diagram 1).***

The desk (I) consists of a plywood top covered with plastic laminate and supported by two base cabinets. One cabinet is designed to hold your loading paraphemalia and fly tying vise, etc. The other base cabinet consists of large, divided pull-out storage drawers hidden behind a door. The laminated desk top has an opening conveniently located above the knee-well that accepts various inserts attached to your loader press and fly tying vise. The drawers feature through dovetails that can be cut by hand or with a dovetail jig, and a single center divider. I mounted the drawers on metal drawer slides.

The middle section (II) consists of two matching drawer cabinets for small parts. A plywood back runs between the two cases.

The top cabinet (III) consists of compartments with hinged doors for storage of larger supplies. A fluorescent task light mounted on the bottom provides illumination for the desktop below.

All doors and cabinet sides (except inside the knee well) use raised panels that can be made on a router table, shaper or table saw ***(photo 1)***. The stiles and rails are best cut with matching carbide router bits or matched shaper knives.

After milling all parts to size, stain and apply at least one coat of varnish to the raised panels before assembly. The panels should float free in their frames to allow for panel expansion and contraction due to changes in humidity. So watch the glue!

Using a two-sided, square-frame worktable makes the gluing of the large panels much easier and keeps the panels flat and square ***(photo 2)***. The same frame aids in gluing up the drawers. Place a piece of waxed paper beneath the panel at any point where glue may squeeze out and bond the work to the table.

After all the side panels are completed, cut a ⅜" x ¾" rabbet on the top edge and bottom edge to receive the plywood tops and bottoms; the bottom base cabinets are the only exception. (***Photo 3*** & ***Diagram 2***.) Mill a dado with the top edge 3" up from the bottom on the *inside panels only*. A butt joint and blocks are used on the panel ends ***(figure 6)***. Before assembling the lower drawer cabinet attach the interior panels, which will make up the mounting surface for the drawer slides ***(See PullOut Plans™)***. These panels will also hold the slides out from the cabinet side to provide opening clearance for the

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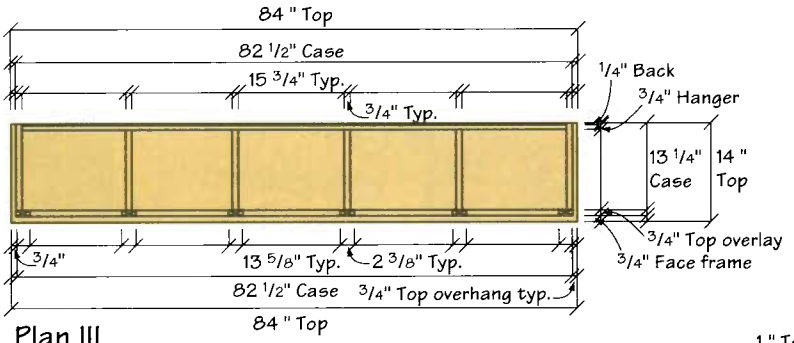
Hugh Williamson *is a woodworker and sportsman who lives in Tucson, AZ.*

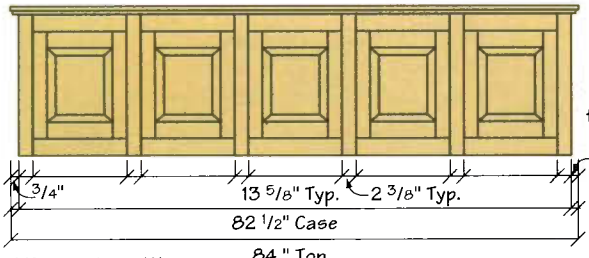
The workstation provides ample work top area for most hobbies and projects. The upper, middle and lower storage areas will keep all your equipment neatly stowed yet close at hand.

Photo 1. *Throughout the project frame and panel construction is used. The raised panels float in stile and rail frames. A standard cope joint is used to join stiles and rails to make the frames. All these details can be milled using a table-mounted router or a shaper.*

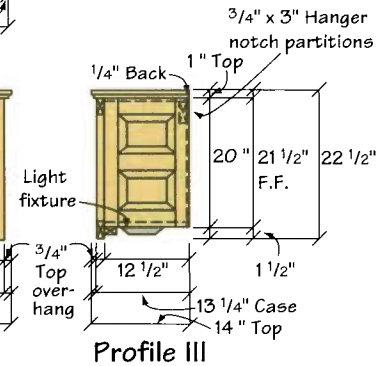
Part III



Plan III

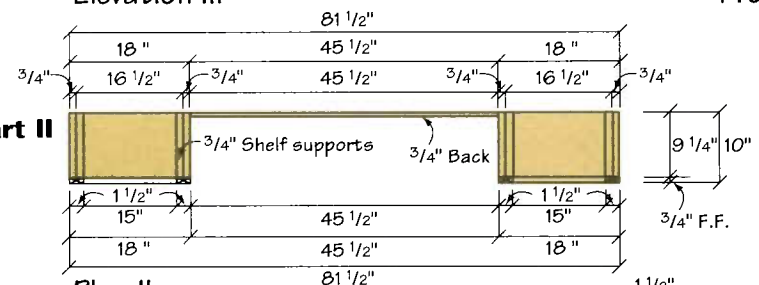


Elevation III

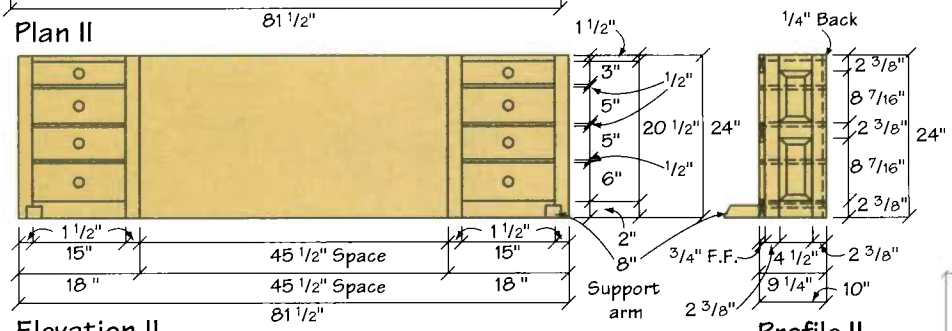


Profile III

Part II



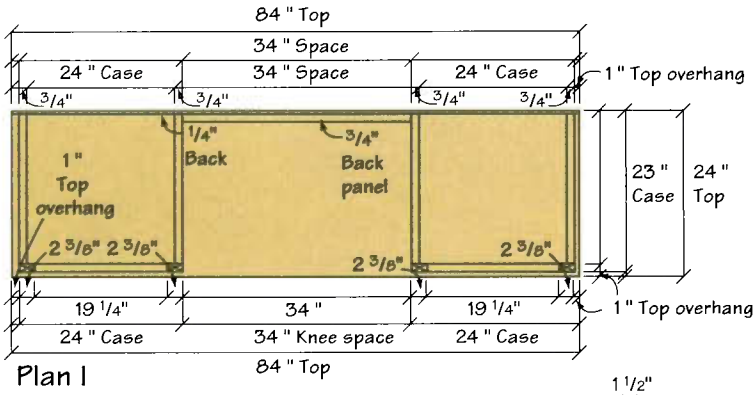
Plan II



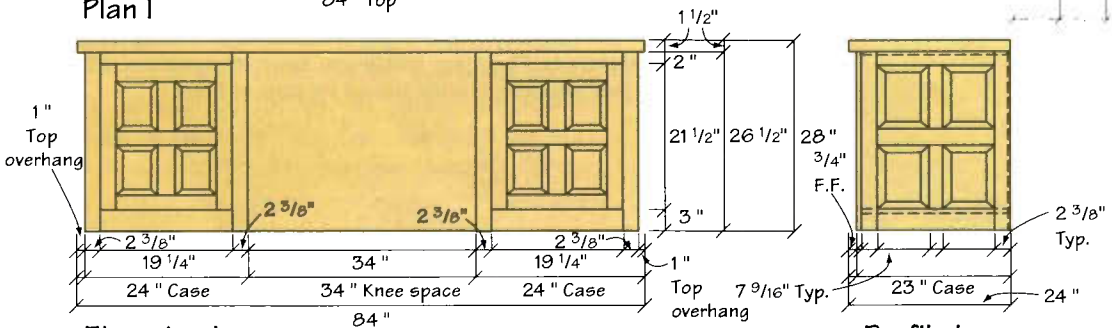
Elevation II

Profile II

Part I



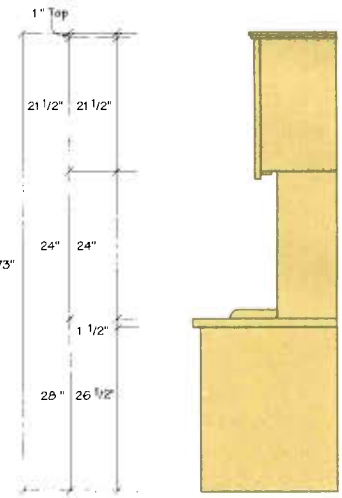
Plan I



Elevation I

Profile I

Sideview



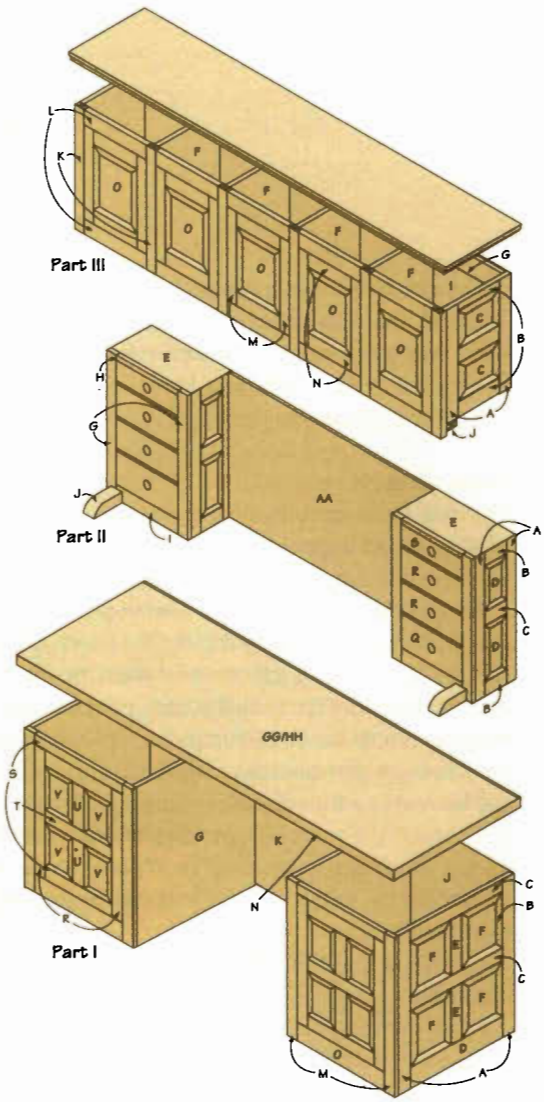
Schedule of Materials

III Top Cabinet

#	Letter	Dimensions	Item
		Side Panels	
❑ 4	A	¾ x 2⅜ x 20	Stiles
❑ 6	B	¾ x 2⅜ x 8½	Rails
❑ 4	C	¾ x 7⅛ x 8⅜	Panels
		Carcase	
❑ 2	E	¾ x 12½ x 81¾	Top & Bottom (plywood)
❑ 4	F	¾ x 12¼ x 19¼	Dividers (plywood)
❑ 1	G	¾ x 3 x 81	Back rail
❑ 2	H	½ x 12¼ x 16⅜	Shelves (plywood)
❑ 1	I	¼ x 19¼ x 81¾	Back
❑ 2	J	¾ x 1¼ x 2⅜	Bottom blocks
		Face Frame	
❑ 6	K	¾ x 2⅜ x 21½	Stiles
❑ 10	L	¾ x 2⅜ x 13⅜	Rails
		Doors	
❑ 10	M	¾ x 2⅜ x 16⅜	Stiles
❑ 10	N	¾ x 2⅜ x 9½	Rails
❑ 5	O	¾ x 9¼ x 12½	Panels
❑ 1		¾ x 1 x 144	Molding

II Middle Drawer Cabinets

#	Letter	Dimensions	Item
		Side Panels	
❑ 8	A	¾ x 2⅜ x 24	Stiles
❑ 8	B	¾ x 2⅜ x 5¼	Rails
❑ 4	C	¾ x 2⅜ x 5¼	Center rails
❑ 8	D	¾ x 5⅛ x 9⅛	Panels
		Top, Bottom & Back	
❑ 4	E	¾ x 9¼ x 17¼	Tops & bottoms (plywood)
❑ 2	F	¼ x 17¼ x 23¼	Backs (plywood)
		Face Frame	
❑ 4	G	¾ x 1½ x 24	Stiles
❑ 2	H	¾ x 1½ x 15	Top rails
❑ 2	I	¾ x 2 x 15	Bottom rails
❑ 2	J	1½ x 2 x 17⅜	Arm supports
		Drawer Shelves	
❑ 6	K	½ x 8¾ x 16½	Shelves (plywood)
❑ 2	L	½ x 8¾ x 16½	Bottom shelves (plywood)
❑ 6	M	½ x ½ x 16½	Shelf facing
❑ 4	N	¾ x 6 x 9	Shelf supports
❑ 8	O	¾ x 4½ x 9	Shelf supports
❑ 4	P	¾ x 2¾ x 9	Shelf supports
❑ 4		¾ x 1⅛ x 9	Shelf supports
		Drawers (8)	
❑ 2	Q	¾ x 6 x 14⅞	Fronts
❑ 4	R	¾ x 4½ x 14⅞	Fronts
❑ 2	S	¾ x 2¾ x 14⅞	Fronts
❑ 4	T	½ x 6 x 9	Sides
❑ 8	U	½ x 4½ x 9	Sides
❑ 4	V	½ x 2¾ x 9	Sides
❑ 8	W	¼ x 8⅝ x 14¼	Bottoms (hard board)
❑ 2	X	½ x 5⅜ x 14¼	Backs
❑ 4	Y	½ x 3⅛ x 14¼	Backs
❑ 2	Z	½ x 2⅛ x 14¼	Backs
❑ 1	AA	¼ x 24¾ x 46¼	Back



I Desk

#	Letter	Dimensions	Item
		Side Panels	
❑ 4	A	¾ x 2⅜ x 26½	Stiles
❑ 4	B,C	¾ x 2⅜ x 18¼	Top & center rails
❑ 2	D	¾ x 3 x 18¼	Bottom rails
❑ 4	E	¾ x 2⅜ x 10⅛	Muntins
❑ 8	F	¾ x 8⅜ x 10	Panels
❑ 2	G	¾ x 22¼ x 26½	Inside panels (plywood)
		Carcase	
❑ 2	H	¾ x 22¼ x 22⅞	Bottoms
❑ 2	I	¾ x 22¼ x 23¼	Tops
❑ 2	J	¼ x 23¼ x 23½	Backs
❑ 1	K	¾ x 26⅞ x 34¾	Knee space back
❑ 2	L	¾ x 2¼ x 22¼	Base support
		Face Frames	
❑ 4	M	¾ x 2⅜ x 26½	Front panel stiles
❑ 2	N	¾ x 2 x 19¼	Top rails
❑ 2	O	¾ x 3 x 19¼	Bottom rails
		Drawer Supports	
❑ 6	P	¾ x 3 x 22¾	Vertical supports
❑ 6	Q	⅞ x 3 x 22	Horizontal supports
		Base Doors	
❑ 4	R	¾ x 2⅜ x 21⅜	Stiles
❑ 6	S,T	¾ x 2⅜ x 15⅛	Rails
❑ 4	U	¾ x 2⅜ x 7⅞	Muntins
❑ 8	V	¾ x 6⅜ x 7¾	Panels
		Drawers	
❑ 1	W	¾ x 8 x 18¼	Front
❑ 1	X	¾ x 6 x 18¼	Front
❑ 1	Y	¾ x 5½ x 18¼	Front
❑ 2	Z	¾ x 8 x 22	Sides
❑ 2	AA	¾ x 6 x 22	Sides
❑ 2	BB	¾ x 5½ x 22	Sides
❑ 1	CC	¾ x 7⅜ x 17½	Back
❑ 1	DD	¾ x 5⅜ x 17½	Back
❑ 1	EE	¾ x 4⅜ x 17½	Back
❑ 3	FF	¼ x 17½ x 21⅛	Bottoms (Hardboard)
		Top	
❑ 2	GG	¾ x 23¼ x 82½	Tops (Plywood)
❑ 1	HH	¾ x 1½ x 140	Top trim

Hardware

❑ 3 pr.	22" Metal drawer slides	❑ 5 pr.	Barrel hinges, 14mm	❑ 7	Bullet catches
❑ 15	Ceramic knobs	❑ 2 pr.	Brass butt hinges		

drawers. Follow the manufacturer's instructions for installation of the glides. Before or after assembly, rabbets need to be cut in all sides and tops and bottoms to receive the ¼" backs. The face frames may be assembled using any method you prefer.

Desk Top

The desk top is made by gluing and screwing two pieces of ¾" plywood together, then covering the plywood with laminate and edging with matching ¾" X 1½" solid oak.

Before you secure the two pieces of plywood together you must rout out an opening for the insert. Generally, a 12" X 12" opening is adequate for most mounted equipment, but be sure to check the tools you plan to use. This opening is only cut in the top piece of plywood, with the solid bottom plywood layer supporting the insert. Glue the laminate to the top before making this cut.

To make the cut-out matching inserts you'll need a router, router guide bushings, a ¼"panel router bit or a ¼" carbide bit, and a ¼" collar that can be secured to the guide bushing.

It's critical that this collar diameter is the same as the router bit.

Make a routing pattern jig from ¼" x 3" material at the size you've determined is proper for your insert needs. The jig should be large enough to assure that clamping will not interfere with the routing. ***(Photo 4).***

Make the router frame perfectly square. This frame is used to make the cut-out in the desk top and the inserts that fit into it. A good fit is essential.

Clamp your router frame in position on the laminated top. Install your router bit, guide bushing and the collar securely to your router. Cut the opening with care. Now remove the collar and cut as many inserts as you need from a single sheet of laminated ¾" plywood, using the same pattern frame and bit. Removing the collar moves your ¼" bit closer to the frame, making the insert fit the cut-out perfectly.

Two tips for cutting the inserts: Place several strips of double-sided carpet tape to a piece of scrap plywood and then place your work on top of the tape. This will prevent the insert from bouncing around once it has been cut free, thus ruining your finished edge. Also, hug the pattern frame as you cut the insert to ensure a good fit.

I made three inserts, one for a loading press, one for a fly tying vise and one as a filler to level out the desk top when not using the other inserts.

If you have fitting problems with the inserts, they can

Photo 2. *A two-sided square frame worktable makes gluing the raised panel sections easier and more accurate. Notice the wax paper used to keep the side panel from being glued to the frame.*

Photo 3. *The base cabinets are glued-up after all dadoes and grooves are cut. Note that the base cabinets' bottoms are set up from the bottom 3" using a dado on the inside panel and base support on the outside panel assembly. All other cabinet carcasses will have the bottom flush to the sides lower edge.*

Photo 4. *A routing jig is used to cut the drop-in bases for the top. This process is perfomed after the laminate has been glued in place, but before the two thicknesses of the top have been glued together.*

Desk Drawer Details

There are three sets of drawers in this project. One set of three is hidden behind a door in the right hand base cabinet (I). Another two sets of four are in the middle section (II).

All use the same basic construction, but also have some important differences. The base cabinet drawers use metal drawer slides, while the middle section drawers ride on shelf-like drawer dividers built into the cabinets *(see PullOut Plans™)*.

Starting with the base cabinet drawers, cut out pieces ***W-FF*** from the materials list. Note that all three drawers are different sizes. On all six side pieces *(**Z-BB**)* cut a ¾" x ⅜" deep dado ¼" in from the back edge to receive the drawer back.

Next cut matching dovetail tails on the front edge of the sides and pins on both ends of the drawer fronts *(**W-Y**)*.

For the drawer bottom dado you will need to use care to stop the dado from running all the way through the dovetailed end of the sides. Otherwise the dado will show on the front. The dado is ⅜" deep and is run ⅜" up from the bottom edge. Mill the same stopped dado in the back of the drawer front, again without running through.

Another ¼" x ⅜"dado is then cut vertically on the back side of the drawer fronts. It stops 1½" down from the top. This dado is centered on the pieces and will receive the drawer dividers.

The next step is to cut out the 1" x 4" notches in the top edges of the drawer fronts to be used as finger pulls.

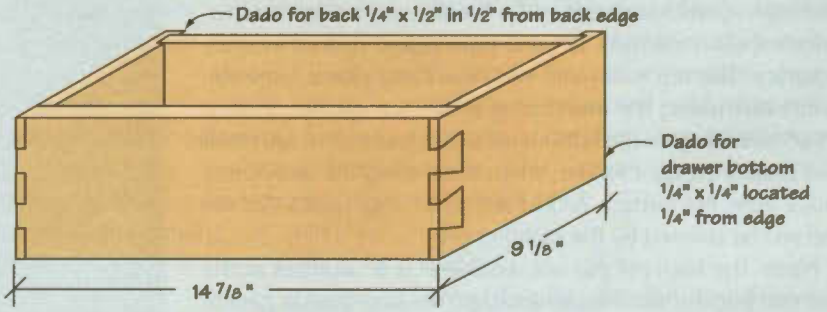
Finish sanding all the flat surfaces prior to assembly will prove to be a lot easier than trying to do so after assembly is complete. Don't break any of the edges until after assembly.

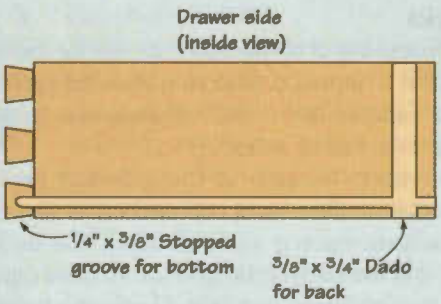
Assemble the sides, front and back using glue and clamps. Use a couple of finish nails or pin nails to secure the back in the dadoes.

Before the glue dries, slide the divider piece in from the bottom, then slide the ¼" bottom into place. Check for square and tack the bottom into place on the bottom edge of the drawer back.

The middle section drawers use the same construction technique, but do not have the handle notch, center divider or metal drawer slides.

Construct the middle section drawers using pieces ***Q-AA*** on the materials list.





be sanded or shimmed as necessary to improve the fit. Now glue and screw the two top pieces of plywood together, forming a 1½" thick desk top. Drill a 2" hole in the center of the bottom of the cut out to let you push out the insert from below. If you need to add more stability to any mounted tool add two ¼" hanger bolts to the insert and drill matching holes. Washers and wing nuts can be easily tightened from the knee hole space below.

Middle Section

The two drawer cabinets of the middle section have removable drawers with dividers and through dovetail fronts ***(see Desk Drawer Details).*** There is a right and a left hand cabinet with an arm brace for support that is attached later to the desk top. The arm brace projects through the case-front face frame and is important for stabilizing the upper units.

As on the base cabinets, a ⅜" x ¾" rabbet is cut in the upper and lower edges of the side panels to receive the top and bottom. Shelf supports ***(N, O and P)*** will form the grooves into which the shelves will slide ***(see PullOut Plans™).*** The sides and top also require rabbets for the ¼" backs.

Top Cabinet

The top cabinet has no shelves in the two end compartments. Where shelves are used, left and right paired dadoes increase accuracy. The top is covered with matching plastic laminate. When assembling the front facing of the top cabinet, there is a 1⅛" overhang on the bottom rail which forms a smooth shelf and shades the light fixture. When assembling the face frame, index from the bottom rail, as any small imperfection at the top will be covered by the molding ***(P).***

Note: The back rail ***(G)*** will require ¾" x 3" notches at the top rear edge of each upright except the two outside panels. Use finish nails in the outside panels, then putty.

Backs

The backs are of ¼" plywood, except for the knee hole space which is ¾" plywood. Matching plywood backs should be used in all exposed areas, and less expensive fir plywood can be used for the other areas.

The backs for each of the individual cabinets are lightly tacked on at the time of construction so they can be removed to facilitate staining and varnishing. The backs for the knee hole and the back of the desk are installed during final assembly. The rabbets to receive the backs can be cut before finishing using a bearing equipped rabbeting router bit.

Each cabinet should be finished before final assembly. The desk top is attached to the two base cabinets with screws. The two middle section drawer cabinets are attached to the top cabinet with screws before mounting the unit on the desk top, again using screws. Two additional screws secure each arm of the middle section to the desk top in recessed holes covered with matching wood plugs.

The light, light switch and power outlet are optional features that are very nice to have.

When the Sportsman's Desk is finally finished and plugged into power it should be secured to wall studs with screws driven through the upper cabinet wall support (G). PW

Ten Construction Tips

1) Cut out and assemble each of the three units one at a time to avoid congestion and confusion.

2) Purchase all of your hardware before construction so you can make any necessary construction modifications well in advance of assembly.

3) Make extra pieces when making stiles, rails and raised panels in case of a mistake. It takes a lot of time and effort to recreate all the set-up steps due to one mistake. This also allows you to choose the best pieces during final assembly.

4) Use stop blocks on your cross cut fence when cutting stiles, rails and mullions to length. You will ensure all the pieces will be identical.

5) Rip the rails to width after you've made the end grain cut to minimize tear out.

6) If you're following the advice of step 1, make a setup block for the pattern/cope cutter and the raised panel cutter so you can quickly adjust cutter height and make all cuts the same as you progress from one cabinet to the next.

7) Stain and varnish the raised panels before assembly to make finishing easier. This seals all edges, minimizing expansion and contraction due to changes in humidity.

8) The drawer dividers are set in blind dadoes cut in from the bottom edge of the drawer front and drawer back. Glue the drawer front, back and sides together. Then slide the divider in place from the bottom and insert the bottom panel. Nail the bottom in place.

9) Make all dry assemblies on a large flat surface to check all fits. Mark off areas to be glued with masking tape to insure proper alignment while avoiding getting glue on the raised panels.

10) For ease of assembly, drill the holes for the barrel hinges before you glue up the face frame for the top cabinet.

Calendar

If your group is hosting an event and you would like other woodworkers to hear about it, please send all pertinent information (date, location, description and fees) at least four months before the opening date to: Calendar, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, Ohio 45207.

Arkansas

White River Artisans School. Year-round courses are available. Class selection includes forged toolmaking, wood-strip canoe making, bamboo fly-rod making and more. Call (501)435-2600.

California

The 28th Annual Santa Clara Valley Carvers Show, April 8–9. The event will be held at the Prospect High School. Sponsored by Chapter 1 of the California Carvers Guild. For more information call (415)948-9869.

The 1995 Woodworking, Machinery and Furniture Supply Fair, August 4–7. Held at the Anaheim Convention Center, Anaheim, Calif. The theme of this year's show is "Expand Your Marketing World." For complete information, call (310)477-8521.

American Association of Woodturners 9th National Symposium. July 6-8. Held at The University of California, Davis, Davis, Calif. The event will host approximately 500 lathe turners, collectors, teachers and lovers of the craft from around the world. Includes demonstrations, panel discussions, an auction and trade show. For more information call (612) 484-9094.

The Woodworkers' Place. Classes, offered year-round focus on building furniture. No experience is necessary; conducted Saturdays and Sundays. Private instruction also available. For more information, call (818)952-3177.

Northern California Woodworking Show. April 21, 22 & 23. Alameda County Fairgrounds, Pleasanton, Calif. Featuring machinery, power and hand tools, supplies, demonstrations, and seminars. For more information call (800)826-8257.

Southern California Woodworking Show. April 28, 29 & 30. Long Beach Convention Center, Long Beach, Calif. Featuring machinery, power and hand tools, supplies, demonstrations, and seminars. For more information call (800)826-8257.

Colorado

Colorado Woodworking Show. May 5, 6 & 7. National Western Complex, Denver, Colorado. Featuring machinery, power and hand tools, supplies, demonstrations, and seminars. For more information call (800)826-8257.

Illinois

Illinois Valley Woodland Expo: The Pleasure, Profit and Products of Good Woodland Stewardship, August 26, 8 a.m.–8 p.m. Held at the Marshall-Putnam County Fairgrounds. Sponsored by Prairie Rivers Resource Conservation and Development, a non-profit organization. This show includes demonstrations, exhibits, wood/natural crafts marketplace, seminars and more. For complete information, call (309)364-3979.

Chicagoland Woodworking Show. April 7, 8 & 9. Odeum, Villa Park, Ill. Featuring machinery, power and hand tools, supplies, demonstrations, and seminars. For more information call (800)826-8257.

Kentucky

Woodturning and Joinery Instruction. Classes are offered year-round. Topics include woodturing and joinery. For complete information, call (606)986-8083.

Maine

Center for Furniture Craftsmanship. Ongoing classes. Call or write for a detailed brochure and detailed registration information: The Center for Furniture Craftsmanship, 125 W. Meadow Rd., Rockland, 04841. (207)594-5611.

Massachusetts

Classes. Beginning April 3. One Cottage Street School of Fine Woodworking, Easthampton, Mass. Eleven classes and 13 one-day seminars are being offered during the Spring. They include beginning through intermediate woodworking and specialty classes. For more information call (413)527-8480.

Minnesota

Wood Carving School. Offered year-round, these woodcarving classes include Introduction to Wood Carving and Whittling Angels and Hearts. For more information, call (612)927-7491.

New York

Constantine's Woodworking Classes. Classes are offered year-round. Bronx, New York. Topics range from router basics to furniture refinishing, from wood inlay to spindle turning. For information, call (718)792-2100.

19th Annual American Crafts Festival. July 1, 2, 8 & 9. Lincoln Center for the Performing Arts, New York City. Admission is free with program offering displays from America's finest craft-artists from 44 states. There will be more than 300 displays including traditional furniture and home furnishings. For more information, call (201)746-0091.

Pennsylvania

Traditional Windsor Chair Making. Classes are offered year-round. Earlville, Pa. Private instruction available. Topics include woodturning and sharpening techniques for beginners to advanced levels. For more information, call (215)689-4717.

Texas

Woodshop Inc., Woodworking School. A full range of classes (offered year-round) are available. For complete information, call: (214)466-3689.

North Texas Woodworking Show. May 12, 13 & 14. Tarrant County Convention Center, Fort Worth, Texas. Featuring machinery, power and hand tools, supplies, demonstrations and seminars. For more information call (800)826-8257.

Houston Woodworking Show. May 19, 20 & 21. Astroarena, Houston, TX. Featuring machinery, power and hand tools, supplies, demonstrations, and seminars. For more information call (800)826-8257.

Trenching, Excavating & Ploughing

Hand tools make quick work of precise wood removal.

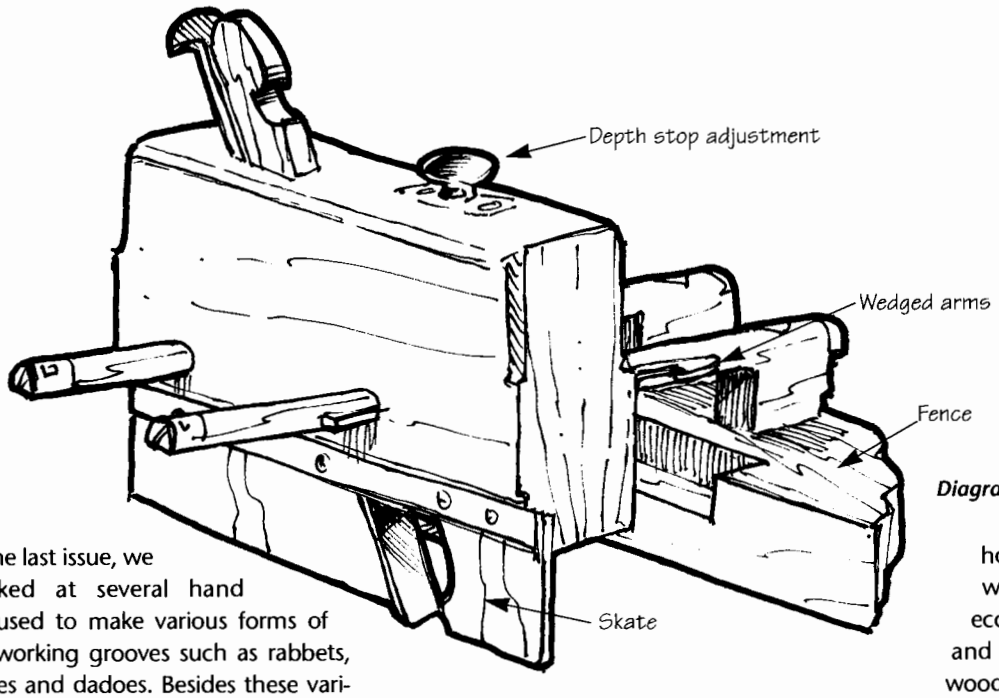


Diagram 1. Simple Plough Plane

In the last issue, we looked at several hand tools used to make various forms of woodworking grooves such as rabbets, grooves and dadoes. Besides these various rabbet planes, fillisters and dado planes, there are several other hand tools, similarly classed as "antiques" but still easily found, that also can be used to form many of the grooves and profiles needed in contemporary woodworking.

Because many of these operations are fundamental to all kinds of woodwork, it's not surprising that they are among the first for which power tools were developed to replace hand tools. It's also not surprising that these power tools should have appropriated the names of the earlier hand tools. Accordingly, the word "router," for example, now usually refers to the common electric tool used for a variety of relief work, whereas the original router must be distinguished by an extra qualification, such as "hand-router."

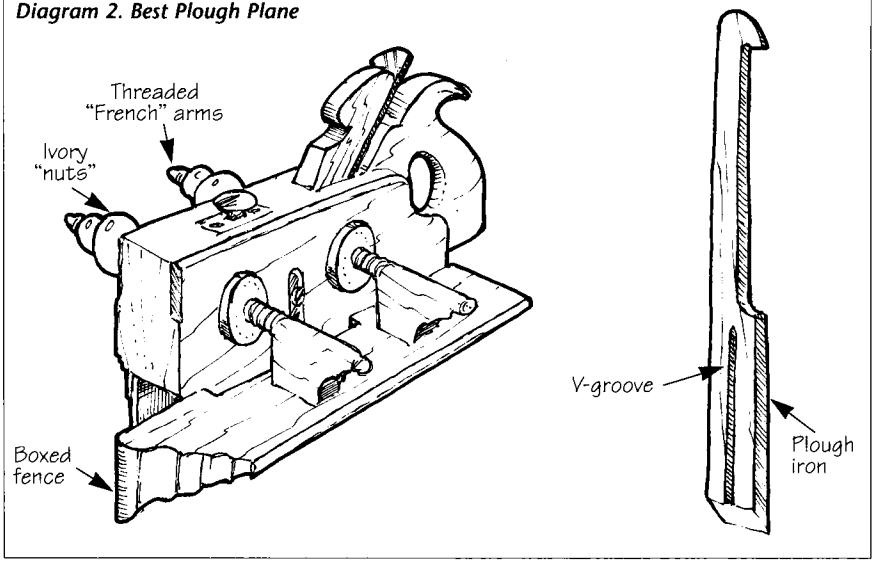
But something else happened when power tools took on the names of the hand tools they were designed to replace. Although many of the functions of the hand tools were indeed sped up and made easier by their powered replacements, not everything that the hand tool had been used for could be accomplished by the power tool. At first this made little difference to the average woodworker who used the power tool for those operations which most benefited from the capabilities of the new tool, and other operations continued to be taken care of with the hand tool.

Inevitably, though, most workers chose the faster, easier tools, gradually abandoning many of the techniques that could only be undertaken with the hand tools. Furthermore, new uses were developed for each power tool; and new methods of work were discovered that were unique to it and could not be duplicated by the hand tool, even if for some reason one wanted to take the longer route.

This adaptive process is fine so long as the end result justifies the means. But when it results in a diminishment of the quality of the end product, we should examine more carefully exactly what we hope to achieve by woodworking. It makes perfect economic sense to simplify and speed up the finish woodwork in house building, for example, by using the tablesaw and router to produce large amounts of square baseboard and plain trim. The use of old-fashioned, time-consuming hand tools to produce the more sophisticated mouldings and finer woodwork found in many turn-of-the-century buildings is cost prohibitive. However, the woodworking enthusiast working in the home shop is not necessarily under the same economic constraints as the house builder. His or her impetus is often the joy of woodworking for its own sake, combined with the desire to produce something that reflects the best that can be achieved in this satisfying medium. For these people, it is a shame to limit the range of what can be accomplished by an overemphasis on speed and efficiency. Rediscovering some of the original routers, ploughs ***(diagram 1)***, beaders, and other specialized hand tools pushed out of the shop by their powered, modern descendants can make possible designs and techniques otherwise impractical and difficult to achieve.

Graham Blackburn *is a contributing editor to* Popular Woodworking *and does his writing and woodworking in Inverness, California.*

Diagram 2. Best Plough Plane



The Infinite Groove

Even in today's standardized world a variety of adapters are often needed when interchanging parts between tools. In the past there was almost no standardization at all; it was far more usual for each tool to be a unique entity—except in one outstanding example: the plough. Many manufacturers produced these tools—adjustable wooden grooving planes—in a wonderful variety of shapes, sizes and patterns. Some were extremely simple, the parts being secured by plain wooden wedges; others were marvels of the toolmaker's art, sporting ivory knobs, threaded brass adjusters and boxed wear strips ***(diagram 2)***. But all shared the ability to accept and use irons of any manufacturer.

The irons, or blades, for ploughs were commonly made in sets of six widths, and often sold separately from the plough itself. Although few sets were precisely identical in measurement or graduation, all shared a common design that included a V-groove cut in the back of the iron. This groove indexes the iron in relation to the front edge of a matching piece of metal known as the skate ***(diagram 1)*** screwed to the sole of the plane. No matter how wide or narrow the iron, it's always centered nicely in the plough's throat. This feature allows you to collect many more than six different widths, all of which can be used with the same tool to produce an equal number of grooves.

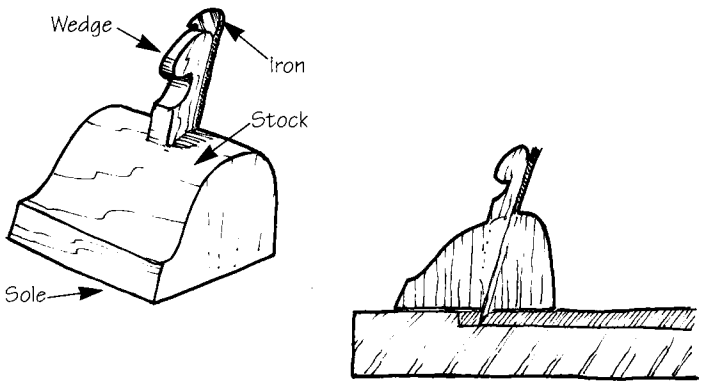
At the same time, this marvel of standardization also makes possible the forming of an infinite number of groove sizes with no more than a single iron! Even the simplest plough is fitted with a fence, allowing the groove to be formed at varying distances from the edge of the workpiece. The fact that any plough iron will work in any plough allows the user to insert whatever iron is available and, after forming the initial groove, increase its width by adjusting the fence, cutting and resetting as many times as necessary. Of course, you can't cut a groove narrower than the narrowest iron available, but possessing a tool that can be adjusted to form an infinite number of widths is very handy.

A rare form of plough was also developed to form grooves in curved surfaces. There are other ways to do this, but it should be noted that by reshaping a plough iron to a profile other than straight and square makes possible the formation of a wide variety of internal mouldings in all kinds of stock.

The Original Router

The plough is used typically to remove wood at a specified distance from (and usually parallel to) the edge of the workpiece. Although it is possible for the material removed to be wider than it is

Diagram 3. Old Woman's Tooth



How Old Woman's Tooth can make a stopped groove.

Diagram 4. Small Metal Router Plane

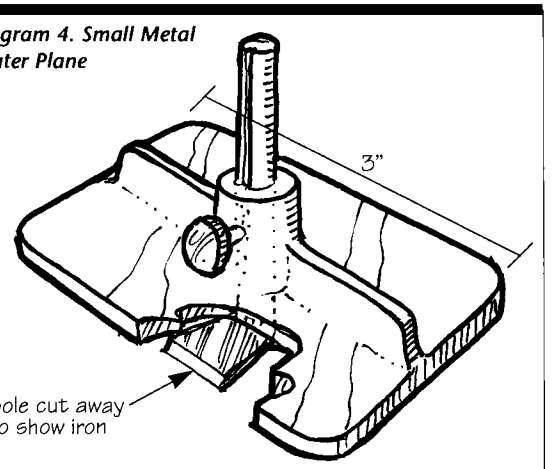
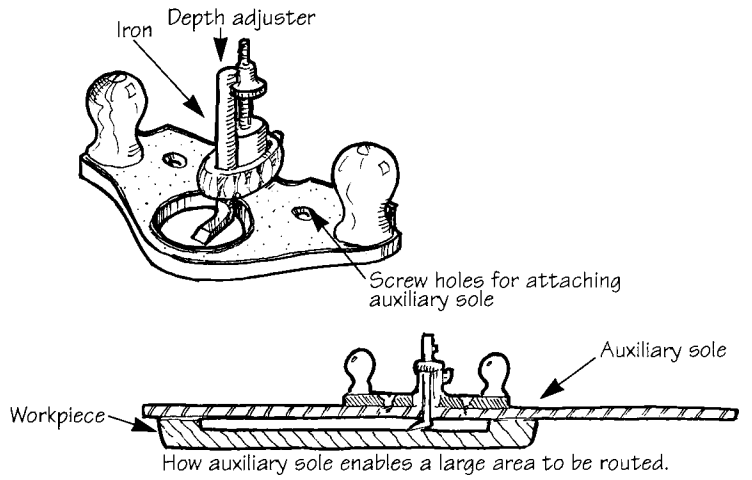


Diagram 5. Standard Closed Throat Router Plane



deep, the form of the removed area is generally that of a groove. The router (and here we are referring to the original hand tool) was designed to remove, or rout out, material from the surface of the workpiece with no special regard for the form or location of the edge. This means that although it is often fitted with a fence to help it maintain a fixed relationship with the edge of the workpiece, the router can also be used freely to remove wood anywhere, and by no means necessarily in the form of a groove.

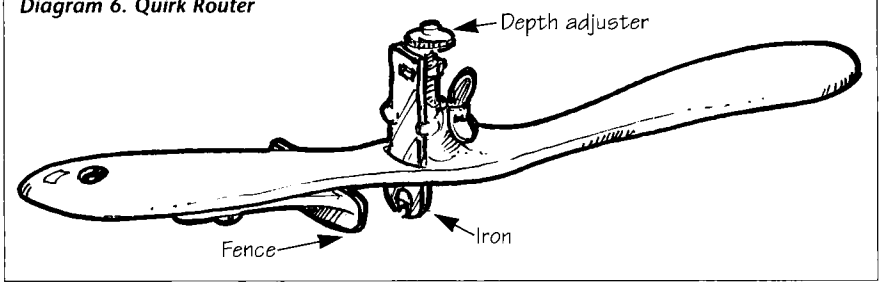
The oldest form of router is commonly believed to be a plane-like tool that was given the picturesque name—in the politically incorrect days of the sixteenth and seventeenth centuries—of "an old woman's tooth" ***(diagram 3)***. It consisted of a flat-bottomed chunk of wood, with a chisel-like blade inserted through the center, so it projected through the base. The "old woman's tooth" could be worked in a groove (no narrower than the width of the iron), and was especially useful for working the ends of blind or stopped grooves otherwise inaccessible (by virtue of its skate) to the plough plane's iron. It was also the ideal tool for removing a larger depression in the surface of a workpiece, such as a wide mortise. The iron could be progressively lowered as the material was removed, and the base of the tool resting on the surrounding area kept the worked depression perfectly level.

This original function has remained so useful that modern-day descendants of the old woman's tooth are still manufactured in the form of various metal router-planes ***(Diagram 4)***. The small models, made by Stanley, Record and various musical instrument toolmakers, are particularly useful for delicate inlay work such as stringing and banding.

These little tools are often easier to use than the router attachments that can be used in conjunction with the miniature electric tools such as the Dremel Moto-Tool. Since these small power tools are often used on the surface of laboriously prepared stock, such as routing out the narrow grooves needed for delicate inlay work, the level of anxiety that accompanies their use can be quite nerve-wracking. This can be avoided completely with the use of the hand tool over whose use perfect control is always assured.

Larger models of metal router planes are also made ***(diagram 5)***. These are essentially sophisticated versions of the old woman's tooth with provision for vernier adjustment of the cutting edge's depth. They also feature a selection of irons with differently shaped cutting edges that permit the tool to be used in corners or to produce bull-nosed stopped grooves; and straight and curved fences which allow the tool to be used as a more versatile plough. In some models, the iron can be rotated so that the tool can be used in extreme bullnose situations, cutting right into a stopped corner. Almost all have soles bored to accept screws that can be used to attach extra wooden soles. A wooden sole is preferred by many woodworkers. Being shop made, a wooden sole can be made wider (or longer) than the original sole. This effectively increases the area of the depression that the router can form by bridging edges that are farther apart.

Diagram 6. Quirk Router

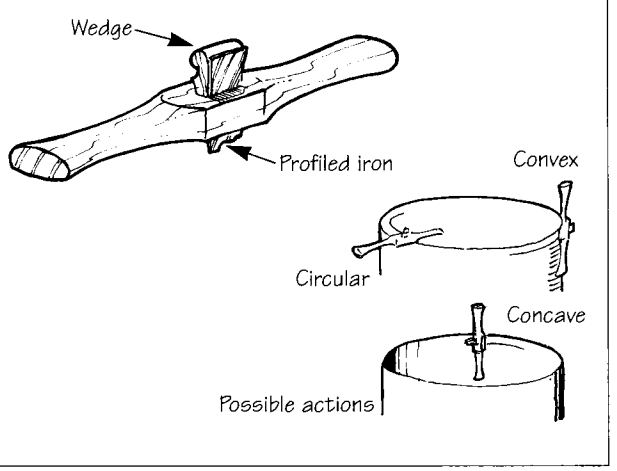


Compound Quirks

In its pre-electric heyday, the hand router existed in many other forms. The following list gives some idea of the specialization that existed and the many different uses to which this versatile tool had been adapted, few of which are directly duplicable by the modern electric router: beading router, carving router, circular router, coachbuilder's router, corner router, grooving router, side router, moulding router, pistol router, reeding router, quirk router, rabbetting router, sash router and stringing router. Almost every branch of the various woodworking trades had its own specialized form of router.

Of all these, the metal quirk routers

Diagram 7. Shopmade Moulding Router



(diagram 6), produced by firms such as Preston around the turn of the century and still available from many old tool dealers, are among the most useful. An electric router is somewhat limited in the operations it can perform by its flat base. This generally restricts its use to flat work surfaces. A router table or shaper makes certain curved work possible but generally restricts work to a single axis of curvature, and even then fairly complicated jigging may be necessary to work with safety.

The quirk router, designed primarily to produce a quirk—a narrow grooved element in a moulding profile—can be used to form grooves on a work surface of almost any shape: convex, concave, single or compound curves. Think, for example, of forming a bead around the edge of a circular lid—and a matching profile on the *inside* of the container. An electric router can be made, with the use of a curved fence, to cut such a bead on the outside of the circumference, but it is more difficult to cut the same profile on the top surface. An electric router's bit is also incapable of cutting any form of undercut profile; the quirk router (or a similar tool fitted with the appropriately shaped cutter) has no such limitations.

The secret lies in the quirk router's narrow curved sole and its selection of straight, convex and concave fences. This design is shared by other router-type tools, some of which are also known collectively as hand beaders. While the manufactured metal varieties are easy to use because of their fences and cutting edge adjustments, older wooden versions and even shop made models work equally well. It's no harder to make your own individually shaped cutting edge for one of these routers than it is to file an edge for a scratch stock *(diagram 7)*. The result is a greater choice of design opportunities and techniques otherwise possible only with more expensive machinery such as lathes and shapers. PW

Book Reviews by Hugh Foster

The Business of Woodwork, *by William H. Norlin, 320 pages, hardcover, $75, available from The Business of Woodwork, P.O. Box 36, Westminster, CO 80030-0036; (303)254-9464.*

To be worth $75, a book must contain lots of good information—this one does. I only wish I had encountered this volume when I was younger. But even now I believe there's something for every level and age of woodworker.

Here's the book's first of many lessons about correlating woodworking with earning a living: What's the multiplier for converting square feet of finished project into board feet (or square feet of sheet material)? I used to use a multiplier of 1.2, and always came up short on payday. Norlin explains why 1.69 make more sense, and why it's fair to the customer. He reminds us that we only use about 59% of a total shipment. In large quantities, board footage is sold plus or minus 5%. You've most likely lost 5% before the timber has been unloaded from the truck. You'll be lucky to consistently get 8½" of useful material from rough 10" stock by the time you plane it. You'll regularly lose material from the ends because the timbers aren't square and/or have checked ends from the drying process.

Labor costs are another item on which we sell ourselves short. Plant overhead and administrative costs mean we must multiply an employee's salary (including taxes and benefits) by 2.052. Thus, in Norlin's example, a $13/hour employee's benefits typically cost 30% ($3.90), resulting in a direct labor cost of $16.90. Applying the factor gets us to $34.68. Divide that by .85 (allowing for 15% profit), and you should charge $40.80 for labor. And don't forget to include set-up and clean-up time in the billing. Norlin's plan will change the way my shop runs. It may mean I'll lose some work, but without following his precepts at least to some degree, I am in effect doing the projects for free. Being busy isn't *that* great.

Norlin reminds us that after constructing our bid, we have to make a professional presentation. After the bid has been accepted or rejected, we should find out by how much we were beaten or by how much we beat our nearest competitor. Norlin is convinced that if we're bidding 10% or more below our competition, we're giving away our work.

He also provides a great collection of charts and forms, suggesting that we use them as patterns for computer-generated forms. (You could just copy them.) Use them. If nothing else, they'll force you to make an educated bid. Norlin also gives 15 reasons for establishing time-line charts for monitoring progress and a project's rhythm.

There are also sections about completing and delivering work, dealing with people and accounting, machinery purchase and depreciation (it's very useful) and how to buy or sell an existing woodworking business.

I know that I'll be spending more time with Norlin's book. I'm sure that I've barely scratched the surface of what I can learn from it. It's expensive, but it might be a bargain even at twice its price. PW

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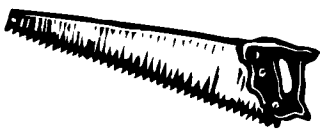

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A/M 95

Black Locust

A rugged material ready for outdoor abuse.

By Ken Textor

Black locust is strong, very hard and extremely heavy, despite its rapid growth.

Black locust is the relief pitcher of American hardwoods: Tough, versatile, long-lasting and generally without the glory or notoriety other wood species get. But for woodworkers who know about it, black locust can quickly become the most valuable player in the woodworking game.

General Description

Black locust (*robinia pseudoacacia*) should be more appreciated than it is. A distant relative of tropical hardwoods like Honduras rosewood (PW #78) and exotic North American hardwoods like mesquite (PW #73), black locust is also known as post locust, yellow locust, ship's locust or trunnel wood. In lumber yards a slightly different, somewhat less desirable species called honey locust is sometimes mixed in with black locust. But for the most part, if you ask for black locust, that's what you'll get.

Environmentally, black locust is also a big winner. The tree is indigenous to the Appalachians from Pennsylvania southward to Georgia and west to Indiana, Arkansas and Oklahoma. It has also been planted as far north as Maine and Nova Scotia as well as the Prairie states of Kansas and Nebraska. Indeed, it was once farmed in plantations because the wood was so valued as fence posts. The tree itself grows quickly and regenerates itself from seeds or roots rapidly, sometimes growing as much as four feet per year. Its growth patterns usually favor a relatively long, straight trunk on which there is little branching for the first 15 to 20 feet. Black locust trees attain a height of 40 to 100 feet with an average trunk diameter of one to three feet. The tree is known for its ability to rapidly fill recently cleared land, preferably in well drained, rich, loamy soils. It is a relatively short-lived tree, however, and is sometimes subject to insect attacks.

The wood of black locust is very hard, very heavy, tremendously strong and generally straight-grained. The heartwood ranges in color from yellow and yellow-green to medium brown. What little sapwood there is in black locust lumber is usually a dirty cream color. These colors do darken after exposure to sunlight, turning various shades of brown. When first cut, black locust's yellow color and grain sometimes leads woodworkers to mistake it for Osage orange (PW #79). The grain patterns in black locust are almost identical to Osage, being a handsome, interlocked tweedy look. But Osage is a considerably brighter yellow color when first cut. Moreover, Osage is not likely to be as straight-grained as black locust. To certify beyond a doubt that you're dealing with black locust, put the wood under a so-called "black light". In a darkened room, this ultraviolet light will make black locust glow an iridescent yellow. It has no effect on Osage orange. Also, shavings of Osage orange dropped in hot water will turn the liquid yellow, while Black locust will not.

Once it is properly kiln or air dried, shrinkage in black locust is very modest for a North American hardwood, on about a par with mesquite. This superior stability combines with the wood's hardness and shock resistance to produce a material that competes favorably with many high-grade tropical hardwoods. Moreover, black locust is highly resistant to decay. Reports of black locust fence

***Ken Textor** is an active freelance writer who works with wood in Arrowsic Island, Maine, and is a contributing editor in* Popular Woodworking.

A perfect material for outdoor use, black locust has been used as railroad ties and mine timbers. The author turned a set of tent stakes (left) that will last a lifetime.

posts lasting up to 150 years are fairly common. Its steam-bending properties are also good, due primarily to the tough interlocked grain that resists splitting. Its only shortcoming might be its tendency to check. It behaves like most oaks (PW# 58 & 59) in this respect: If the ends of boards are properly treated during storage, the checking problem is minimized.

Because of its remarkable durability and strength, black locust has been traditionally used in such applications as mine timbers, railroad ties, tent stakes, tent poles, fence posts and wooden dowels called trunnels (short for "tree nails"), which were used to fasten together parts of wooden ships in the 19th century. It was also favored for electrical insulator pins, crating, rough construction, fuel and tool handles. Indeed, any outdoor applications—lawn furniture, garden cribbing, flower boxes, picnic tables—would be an excellent use of this wood.

Working Properties

Black locust is easy to work in some respects, not so easy in others. In the power planer, that tough interlocked grain doesn't always yield the smoothest surface and may require some in-depth sanding afterward. Moreover, that same grain makes hand planing difficult at best. Only the sharpest hand plane blades should be used on black locust.

Elsewhere, power tools have mixed results. Ripping and routing operations are problem-free if you move the wood along briskly. Like black cherry, black locust does have a tendency to burn if left resting up against the cutter blades too long. Cross-cutting operations leave a slight ragged edge on the "down" side of the cut. This can be eliminated with scoring before the cut, or by using some heavy grit sandpaper on the offending edge after the cut. Boring and drilling is problem free, and lathe work is only a problem in that the finished piece will require more sanding than hard maple (PW #60). The modest amount of dust that you get from working black locust has no distinct odor other than a brief, slightly sour wood smell. Allergic reactions are minimal.

Fastenings in black locust hold exceptionally well. Plain old black iron nails in particular have amazing holding power if driven while the wood is green. However, they are difficult to drive in dried wood, generally requiring pilot holes. Screws are fine in dried wood, but also require properly sized pilot holes. Of course using the wood itself as a fastener is a good idea, particularly with the ends wedged for added holding power. All glues worked well on black locust.

Finishing

There isn't much history of finishes used on black locust, primarily because it was rarely used in applications where finishes were required. In my own trials, I rapidly came to the conclusion that if you don't have to finish black locust, don't. Part of the difficulty lies in the wood's somewhat open grain, which must be filled if you are to get a smooth surface. This requires extra steps, much like finishing oak. In exterior uses, a wood as durable as black locust doesn't need added protection.

You may be tempted to use stains on black locust. Although the wood's color can vary, it's pretty easy to get planks with uniform color, which lends itself to staining. If you use stains and/or clear finishes, be certain to take into account the wood's natural tendency to darken. This process is slower than in yellow poplar (PW #83), and not quite as pronounced. Of course, this darkening makes a non-yellowing clear finish essential.

All paints require a surfacing coat and a modest amount of sanding between coats to get a professional finish. Oil-based and water-based paints require about the same amount of effort. Finishing oils (tungs, linseed, etc.) should be avoided because open grain will trap dirt in the open pores.

Availability

For a wood so easy to grow and cut, the availability of black locust lumber is unaccountably spotty. Even in its native habitat, only the most complete hardwood lumber yards carry it. The price ranges from $1.50 to $3 a board foot on the retail market, progressively higher as you get outside its native habitat.

The most common sizes into which black locust is cut are 4/4, 8/4 and 12/4. Those big dimensional timbers they once used as mine timbers are no longer available on the retail market, but planks up to 12 feet long and 10 inches wide are usually available.

If you mail-order this wood, take into account its substantial weight, about 50 to 55 pounds per cubic foot of kiln-dried lumber. For shippers who charge by weight as well as size, this can double the cost of shipping compared to more common hardwoods.

Try using black locust in your next outdoor woodworking project. Any well-constructed piece from black locust will be around for many, many baseball seasons to come, making it the Nolan Ryan of your woodworking projects. PW

would become fogged in dullness? Even the simplest woodworking enhances life.

On the other hand, there exist woodcrafters who have invented their way through woodworking problems, sometimes brilliantly, who then become victims of another trap— thinking *their* way is the only way. In turn they seek to impose their way on others. Often the result is dogma tending to restrict another's searching and discovery, out of fear of being judged out of step. The woodlords degrade another's inventions in a manner that kills native inventiveness.

Parents and teachers inadvertently do this. Read woodcraft magazines, or attend lectures and demonstrations of shop technique, and eventually you'll encounter the dogmatic attitude. Beware! Listen and learn, but don't let anyone tread on your inherent capacity for self-teaching.

Detail of tall clock by Bryan Mills.

How does self-teaching and self learning happen? You observe and listen to that inner image that's telling you what you want to build. You draw plans. You consult the best books. You talk to trusted artisans (if available) who will not tramp on your idea. You practice. You experiment. You willfully wade through self doubt. You learn from the pesky mistakes. Gradually, ways and means emerge from your experience. You grasp them, trust them, use them. You are in the process of teaching yourself. You have meshed with a grand natural process available to everyone.

Something more emerges too. It's invisible but powerful. You feel it inside. You may not ever put it in words, but it's there: self-assurance, satisfaction in life (meaning), and the most amazing thing, a constant flow of creative ideas.

You have tasted the simple life, bountiful like an old summer garden. PW

Tricks of the Trade (cont.)

Continued from p.10

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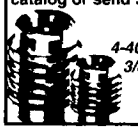

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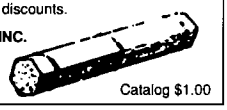

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Submit your caption(s) for this issue's cartoon on a postcard to *Popular Woodworking,* Cartoon Caption #12, 1507 Dana Ave., Cincinnati, OH 45207. The entry deadline is May 1, 1995. Entries will be judged by the editorial staff. A winner and two runners-up will be chosen and announced in the August/September issue.

The winner will receive the new Skil 8" Drill Press, model 3380, including a 5 speed, ¼ HP induction motor (620-3100 rpm), adjustable depth stop, ½" chuck with 2" spindle travel and 7" chuck to table clearance—10" to the base. Also included is a chuck key holder and a 20 bit storage compartment. The warranty lasts two years.

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

"I've taken off from work before, but this is ridiculous!"

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"I thought you said we were going to go hang siding, not hang gliding!"
And Eric J. Hogeland of Lincoln, Nebraska, for:
"I know I've been called a fly-by-night carpenter, but this is ridiculous!"

by Bryan Mills

Self-Teaching and the Joys of Discovery

Preserving the process of invention in your weekend woodworking shop.

A potential customer examined a delicate inlay of an urn and flower I'd done on a table leg.

"How did you learn to do that?" he asked.

"I taught myself," I replied proudly.

I wasn't bragging. I had responded in awe and disbelief realizing that, without any instruction, my skill had evolved until it could be done efficiently. Certainly, vocational necessity had required an up-grading of skill to stay in the market and to pay the mortgage. But, underneath these raw facts of life lies a rich pool of satisfaction that I was able to teach myself. Doing so breeds self-confidence and assurance, and ignites the will to press on in spite of life's absurdities. Would that everyone could find such richness of spirit.

But, I worry, has structured education, specialization, programmed clubs and packaged tours all but smothered the possibility for self-teaching and self-actualization, and thus shut down the resultant joys possible?

I wonder about this in the shop whenever a discovery is made. Forget whether or not it's original, forget its magnitude. So someone else made the discovery long ago, or invented the technique years before so that in the trade it's common knowledge. When you've made a personal discovery or have devised a tool to solve a problem, you've engaged in self-teaching. And the satisfaction you reap is genuine,...a pure joy...pure like genuine maple syrup. Let no one tramp on it. Savor it!

For the woodcrafter many ways exist to do a job. When a craftsman devises his own way, it's often discovered later that someone else has already found that method, or devised a better one. That's not defeatist. The significant thing is that a person has thought through a problem to a solution. This living out of the invention process has a value all its own. The human being is supremely equipped for the invention process. Moreover, in its natural form its exercise feeds the soul as vitamins strengthen the bones. In a mechanized society the individual's invention process faces extinction. In a weekend woodworking shop it can be preserved and exercised.

Learning produces a very satisfying experience—however learned, group or self. How painful it is when a person comes to the conclusion that learning can only occur through a teacher, or some certified course of instruction, thus killing the individualistic potential for self-teaching.

I picture the learning potential in an individual as a delicate flower. It's possible for parents, teachers, siblings and peers to stamp on the flower before the morning sun can cause it to open and reveal its beauty. Recently a study has shown that peers in our cities discourage *too much* achievement. How sad.

Woodcraft provides the opportunity for a person, regardless of age, to escape the dullness that the lack of self-teaching creates. Woodcraft constantly confronts the craftsperson with problems to solve, regardless of how neat and complete are the plans from a magazine. To progress, whether amateur or pro, one must experiment, practice, learn from mistakes, invent, take risks and eventually discover. The positive, absolutely invaluable element in this experience is that in the act of self-teaching from one's own imagination and experimentation, primitive confidence emerges. This intangible product produces ideas that influence a life direction and endow meaning. Without woodcraft how many lives

Continued on p. 76.

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