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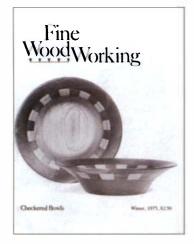
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Half-mortise locks, p. 88

On the Cover: Fine Woodworking is 20 years old this fall. But after 115 issues, the fundamental themes of the magazine haven't changed much. For more, see "Letters" on p. 4. Photo: Boyd Hagen

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20 years of sharing ideas—With any luck, something wonderful happens to a craftsman working alone at his bench. Skill, materials, tools and imagination are combined in an object of utility and beauty, something that may not have been foreseen. This is the creative process that *Fine Woodworking* began exploring 20 years ago this fall.

In 1975, detailed information about the tools and techniques used in high-quality woodworking could be found in textbooks, vocational schools or apprenticeships—but not in magazines. It's no wonder that readers took to it right away. They found themselves peering over the shoulders of skilled crafts-

men who could teach them how to cut a dovetail, sharpen a chisel or apply a coat of shellac. It was an apprenticeship that arrived in the mail.

Issue #1 carried articles on checkered bowls (the cover story, above), carving, library ladders, marquetry, essential tools, French polishing, bench stones, birch plywood and making a serving tray. With the exception of two advertisements, it was all black and white. Illustrations were simple, not too surprising for a magazine that was essentially put together at the kitchen table. Including the covers, the first issue ran 54 pages. Since then, we've published articles about everything from power tools to bookcases: the plain, the extraordinary, sometimes even the weird. Thousands of you have shared your experiences, your skills and your insights in these pages. The magazine is still about the process of making things well, and we have no plans to become anything different.

Fine Woodworking was, and is, written mostly by its readers, the craftsmen doing the work. Some of our authors, like Tage Frid and Bruce Hoadley, have been with the magazine since the first issue. Others have been happy to write a single article and go back to what they were doing.

What they do isn't easy. Authors must steal time from their jobs to work with the magazine. And putting words to paper may be an unfamiliar, even intimidating, experience. A good measure of patience and humor helps, but the authenticity of what they have to share is what gives *Fine Woodworking* its value. Our collaboration with these craftsmen has made the magazine possible, and with it those opportunities for creativity we hope you, too, have had.

-Scott Gibson, editor

Apron with a dangerous pocket—A photo in your October issue shows Kelly Mehler bending over his tablesaw wearing an apron with a swing pocket (*FWW* #114, p. 64). Because these pockets aren't attached at the bottom, they swing away from your body as you lean over. Whatever you've put in your pocket stays put.

You would not work on any power machinery with a necktie, nor should you use this type of apron. I once bent over the tablesaw with a similar apron and the pocket got caught in the blade.

I was *very* lucky. There was no damage to me because the apron strap broke—I didn't have any open heart surgery. Since then, though, I have either cut the pocket off and thrown it away or I have sewn the bottom edge of the pocket to the apron.

—E. Barta, St. Petersburg, Fla.

Footnote on pneumatic-nailer safety—

I read your article on pneumatic fasteners (FWW #114, pp. 42-47) and wholeheartedly agree with their usefulness, even in my hobby woodshop. I would be lost without my brad nailer.

I would like to add one item concerning nail-gun safety. The male quick-disconnect fitting can have a check valve built into it that will trap enough air to drive a nail or two even after the hose is disconnected from the gun. When you buy your quick-disconnect fitting, don't get the type with a check valve. If you do, drill or punch a hole in the check valve to let the air escape. —Ronald Mayfield, Morris, Ill.

On buying Taiwanese tools—I would not be too concerned with Jet's and Grizzly's opinions of Robert Vaughan's ar-

Fine WoodWorking

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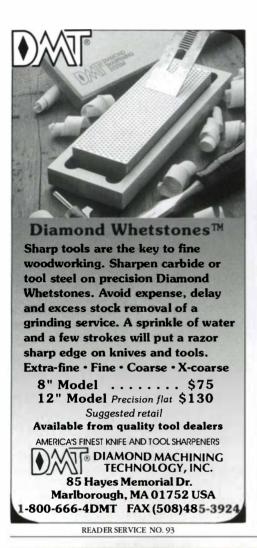
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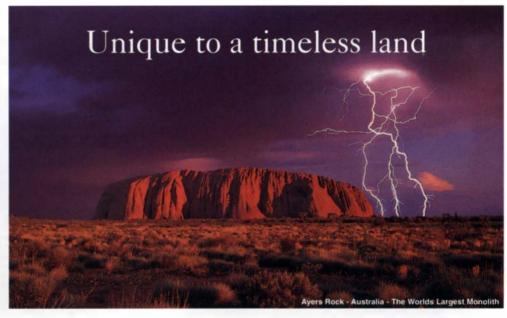


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Writing an article

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ticle "Choosing a Tablesaw" (FWW #112, pp. 74-77). Mr. Vaughan's comments concerning the quality of Taiwanese tools are dead-on. Having purchased Taiwanese power tools from both Jet and Grizzly, I can attest that they are not of the quality one should expect, and their shortcomings affect the basic functions of the machines.

One glaring example of what I am saying involves a Jet 1336 metal lathe. Its slowest speed was 50% higher than advertised. In the case of Grizzly, the 6-in. jointer I bought would not joint a straight edge, which as far as I can determine is the basic function of a jointer. True, Grizzly corrected the problem (the two tables were not parallel), but I had to return the jointer to the plant to get the work done. Such an error should never happen.

Taiwanese imports are not a particularly bad way to acquire, at reasonable prices, machines of considerable capacity. Just don't expect them to perform as well as American or Japanese equipment. They don't. —Don Garlow, Sacramento, Calif.

I read the letter in the August issue from Robert Skummer (Jet Equipment's president and CEO) and just about laughed out loud. I'm sorry that he believes he and his company have been slighted, but because it took me five months to get my Jet tablesaw in running order, I find it hard to commiserate with him.

I could forgive that the base wouldn't assemble without rocking (that never did get resolved), that the miter gauge didn't fit the slots (but a Delta gauge did) and that the drawing for the motor's connections were indecipherable (or even wrong).

But the fact that the trunnions were so poorly manufactured that the blade couldn't be brought into square with the miter slots cried of inexcusably lame quality. This problem, too, was resolved (requiring custom grinding at a local shop). But after five months of haggling with Jet, I could no longer enjoy owning this blasted tool. I can only hope that other Jet Equipment buyers don't have the same lackluster technical support that I had. I suspect that the 97% fill rate on parts that

Mr. Skummer refers to has to do with the fact that Jet rarely parts with its parts.

-Peter Ottem, Sacramento, Calif.

About three years ago, I bought the low-budget Delta lathe. The motor and pulleys are a bit loud, and the available accessories are pricey. But it didn't break my budget, and it is fine for making chair parts and toys. I feel that I got a good deal.

I recently got a good look at the Taiwanese imitation of this product. It was junk. I will continue to value Robert Vaughan's machinery reviews, and I ask that you not print letters from indignant executives.

-Chris Bogardus, Lexington, Ky.

Yesterday, I received my August issue of *Fine Woodworking*. Conspicuously missing was the Grizzly Imports, Inc. advertisement. It became evident as to why the advertisement was missing after looking through the letters.

Mr. Vaughan's article left much to be desired. I surely wouldn't hesitate buying a Taiwanese import from Grizzly because of anything anyone said about mail-order companies. To stay in business as long as it has, it must have a good product and be able to furnish service. I am planning to purchase a Grizzly tablesaw. I now have a Grizzly shaper, planer, bandsaw, edge sander and sundry other items. I am very happy with all of them.

Being a retired builder and a former shop teacher, I appreciate Grizzly's quality and price. It is affordable for me. Were I setting up a cabinet shop and in need of a shaper, I would get four or five Grizzlys and leave them set up rather than have one shaper for \$3,000 that had to be reset for each operation. Keep up the good work. —Jay A. Harris, Plymouth, Mich.

Tung oil isn't the only finish—John Kinne asked how to repair a marred lacquer finish on a jewelry box (*FWW* #113, p. 28), and the answer from Tom Wisshack is to refinish the whole thing with tung oil! His first reason is erroneous: because it would require "a complete furniture touch-

up kit and fairly extensive knowledge." His second reason is pompous: "Personally, I don't like lacquer...it doesn't seem to fit the wood."

What kind of an answer is that? Should I strip the lacquer from my guitar and replace it with tung oil?

-Robert P. Deason, Deerhorn Valley, Calif.

Good tools make good work—I read with interest your article on buying the best—well done! (*FWW* #113, pp. 64-67). There is one aspect of owning good tools, however, that I think you have omitted, and it is best summed up by my father.

Let me explain that here at Magikraft Studios we design and make magician's illusions and that "DeKolta" mentioned below was an old-time (1847) inventor and performer. What follows is from Dad's notebooks under the heading "tools."

"Tools are more than just fancy equipment—they are mental also. It is said that 'a bad workman blames his tools,' indicating that one can do good work with any tools. This is not entirely true. A job can be done with bad tools. DeKolta is supposed to have used an old axe, a knife, a file, and some other crude tools, and he built illusions that worked. But his apparatus was as crude as his tools. If one owns fine tools there is a pride of possession and one automatically puts more care and craftsmanship into the work done by them. The work must be worthy of the tools. As I said tools are a mental attitude, so use the best you can afford."

I think the same is true of the upkeep of tools. You may spend some time honing that lathe chisel just so, but as you touch it to the wood and that single shaving of wood spirals into the air—well, it inspires you to do your best, don't you think?

Thank you for your fine magazine, keep up the good work.

-Martin Lewis, Huntington Beach, Calif.

I own a number of Bridge City tools, and I am very pleased with the quality of the tools and the very intense personal service that stands behind them. Your article could



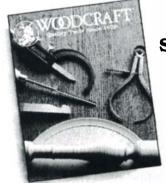
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leave one with the impression that Bridge City only produces tools that replicate less-expensive, yet very functional, layout tools available in various markets. Bridge City has developed some tools that are incomparable in their function.

I tell people I am a woodworker. My wife tells people I collect nice tools, so I confess to buying some tools for their beauty as well as their function. My experience, though, with Bridge City is that beauty and function go hand in hand. Woodworkers leaf through tool catalogs every month. They might as well call Bridge City and drool through some really nice stuff.

> -Ralph McCluggage, Stone Mountain, Ga.

First, I'm sure the Lie-Nielsen low-angle jack plane is far superior to the No. 5 Union it was put up against. The problem with comparing the two is that they're not at all the same plane. The angle and thickness of the blade have everything to do with the results.

But that wasn't my main problem with this article. I really don't think Mr. Gibson understands the true value of a Bridge City tool and that goes beyond its superior quality. It's the warranty. For \$5, Bridge City Tools will repair or replace any of its tools, regardless of how the damage occurred or how extensive it is. If you knock a \$25 Sorby out of square once, it's worthless. And if you buy a second one, now your investment is equal to that of the Bridge City tool. Throughout a lifetime, the Bridge City tool is a bargain.

-Erik Aasen, Seattle Wash.

Don't forget luck-Regarding General Finishes' water-based finish (FWW #113,

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pp. 94, 96), Jim Chiavelli stated that his shop was around 70° and humidity was below 35% when he applied it. In Iowa, don't I wish.

My shop was heated to 72°, the daytime outside temperature was 65° and the humidity 75% when I used the finish. The piece was an oak storage bench (both solid wood and plywood). Three coats of the stain were applied by hand and wiped dry. None of the coats dried enough to sand in less than three days.

Next I sprayed on a coat of finish, probably too heavy. The humidity was still more than 70%, but high temperatures were by then more than 90°. A week later, the finish was still not sandable and had become cloudy. I described my situation to General Finishes, but no advice was given that would help me avoid the same problems again. I was told to sand it off. I also was told that I had bad luck. Six weeks later, with the temperature above 80° and the humidity below 65%, the system works as advertised.

My conclusions are to take seriously General Finishes' warning not to use the finish when the humidity is above 70% and the temperature below 60° and to use light coats. Yes, you will need the recommended three coats. And don't forget that their technical advice includes luck.

-Charles C. Green, West Des Moines, Ia.

Spray article was off base—I think Chris Minick totally missed the point in his comparison of spray systems (FWW #113, pp. 58-61). He failed to mention a number of things that are critical in the evaluation.

The first one is cost. There are many three-stage turbines for high-volume, low-pressure (HVLP) spraying available for \$500-\$700, much less than "more than \$1,000." Conversion HVLP guns are \$300-\$500 and require a 5-7-hp air compressor. Not many home or small shops have a need for that much air. You must work very slowly so that you don't get ahead of the compressor. Add another \$750 for a new compressor.

He concludes that the conversion HVLP gun produces a better-quality spray, but he has never tried a three-stage turbine, which produces higher pressure, more air and comes with better guns. I think that a valid comparison would be with systems of the same total cost. Don't forget how slow HVLP is. For anyone used to highpressure spraying, the decrease in speed can be maddening.

-Larry Cirotski, Tigard, Ore.

Removing pitch the inexpensive way—While running a couple hundred feet of old fir through my tablesaw in 90° plus temperatures, I ran into enough resin pockets to really foul up my favorite Forrest blade. After soaking it in mineral spirits in an old Frisbee (maximum submersion, minimum spirits), I sprayed it with Brake Clean, a solvent sold at autoparts stores. It costs approximately \$3.99 a can and certainly does the job. Pitch removers advertised in wood-supply catalogs are far more expensive.

-Dave Robinson, Ann Arbor, Mich.

Try a folding rule, it's easier—Either I'm missing something important or a lot of people must be making a big problem out of what seems to me rather simple: taking measurements inside a cabinet ("Methods of Work," FWW #113, p. 16). For more than 30 years, I've used a simple, 6-ft. folding carpenter's rule, which includes a small brass insert in one end for making inside measurements. It's so cheap and convenient, I'm surprised that Gary Westmoreland would bother to construct a piece of wood, insert a screw and then adjust the screw to obtain a proper inside measurement.

Concerning the same column and its paint-storage idea, I've been using clearplastic food containers with screw tops (pint and quart size jars) for years to store latex paint. They aren't free, as are the wine bottles suggested by Dave Robinson, but they have wide mouths, permitting a brush to be dipped into the jar.

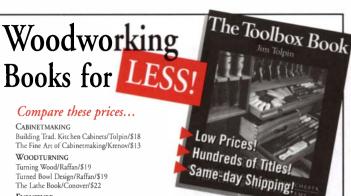
The jars look like canning jars, though not as sturdy, and cost about \$2 at the grocery store. When I finish, I wipe any paint from the mouth of the jar and exhale into the jar to reduce the amount of oxygen above the paint before screwing on the lid. I've yet to have a skim form on top of my paint, and I have left jars untouched for several months.

-James E. Vint, Redondo Beach, Calif.

To kill bugs, use moth flakes instead of heat-John Arno's suggestion for killing insects by heating the wood in an oven seems like too much brute force to me (FWW #113, p. 26), especially if one is treating an artifact such as a wooden molding plane. Before giving up on fumigation chambers, reader David Foos should contact some of the larger museums in his area.

In 1990, I inherited a fine Chippendale chest of drawers that was infested after a century in an unheated building. This chest measures 35 in. by 40 in. by 22 in. overall, yet it fit easily into the fumigation chamber of a major eastern museum. You might expect that they would use some deadly poison gas, but actually, carbon dioxide under slight pressure for one week was sufficient. They only charged me for the gas they used, but in view of the value of the piece I gave them a donation.

For a small object, a tightly sealed plastic



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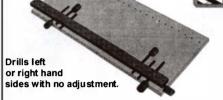
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bag containing some moth flakes (paradichlorobenzene) is the way to go. Inasmuch as the plastic is probably not 100% gas tight, I leave the object wrapped up for one month. Moth flakes eventually evaporate, leaving no residue. An infestation of wood worms should not be ignored because they may spread to other nearby objects. Often when infested lumber is planed, numerous channels just under the surface are revealed, even though the worms may be long gone. It pays to be skeptical about salvaging such material.

-Lewis C. Cooper, Chester, N.J.

Files really can be a threat to hands—

Mario Rodriguez says he does not believe that anyone ever jammed the tang of a file through the palm of his hand (*FWW* #113, p. 50). If he means literally vertically through the center of his hand, that may be. But as a young woodworker, I jammed the tang of a file into the fleshy part of my hand at the base of the thumb when filing without a handle. It was a deep penetration and not difficult to accomplish.

The natural way to hold a file without a handle results in the tang pressing against this fleshy part of the hand. When filing, if the end of the file hits something that suddenly stops its movement, the tang goes

right into the hand. I learned my lesson well and never repeated that practice.

-Howard C. Lawrence, Cherry Hill, N.J.

A screw called by any other name is still a screw—Regarding John Wagner's article on joint strength (*FWW* #111, pp. 58-61), the poor performance of lag "bolts" is no doubt a result of using lag *screws*. Had lag bolts been used, the resulting joint would have been so strong his equipment would not have been able to break it! Lag bolts are found at your local hardware store next to Unicorn horns and hen's teeth. Screws are tightened or released by torquing the head. Bolts are tightened or released by torquing a nut.

-Donald J. Haarmann, Flushing, N.Y.

Cabinet was not of Florentine style-

Your article on Tomas Braverman (*FWW* #113, pp. 82-85) presents his work in a well-illustrated way. The one area that I question was the description of a 16-ft.long cabinet as being of Florentine style. I thought the design was not Florentine. My father, who is a carver, agreed. Either the caption is in error, or we must assume that style information in your articles is very loosely addressed.

-Joe Baiamonte, Brooklyn, N.Y.

Getting the correct bevel—There appears to be an error in a formula for calculating saw settings for compound angles (FWW #113, p. 18). The formula for tilt angle is correct as it appears, but the formula for bevel angle as written gives an incorrect angle. Instead, the formula should read: bevel angle = tan⁻¹ (sin miter/tan tilt), using the miter angle calculated in the first formula.

It should be noted that these angles are usable on the radial-arm saw as well. The miter angle is set on the arm, and the bevel set on the motor.

-Donald Blodgett Jr., Nashua, N.H.

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-Scott Gibson, editor

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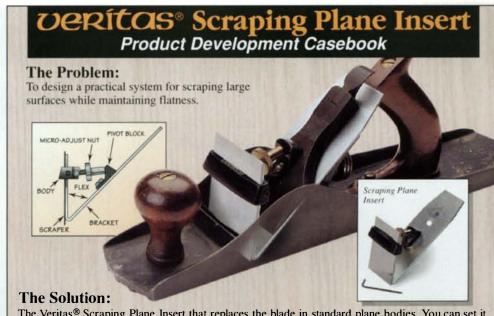


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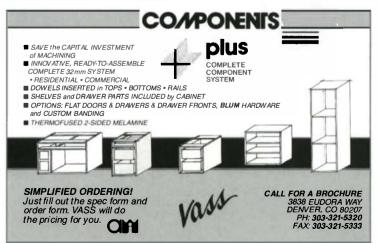
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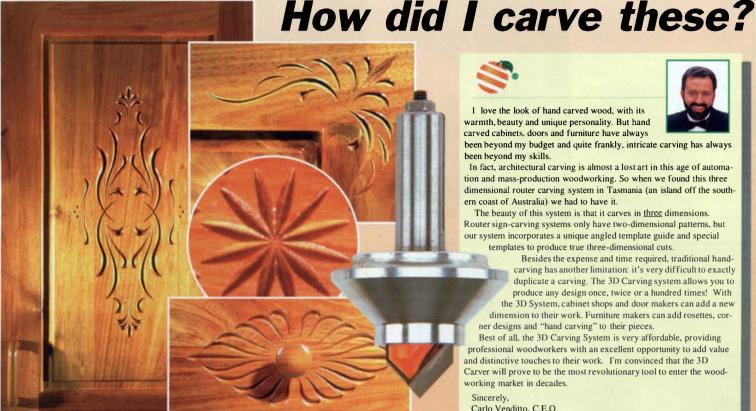
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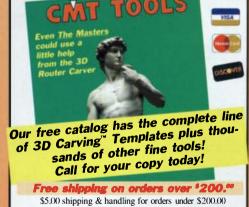
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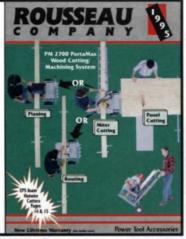
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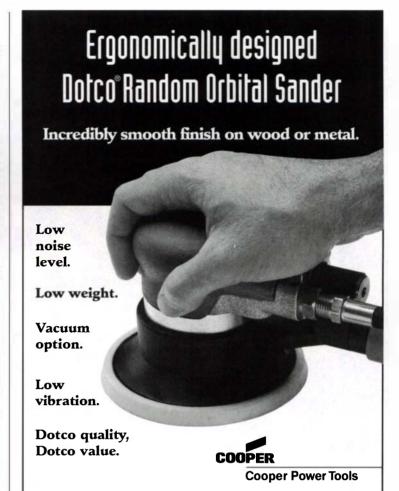
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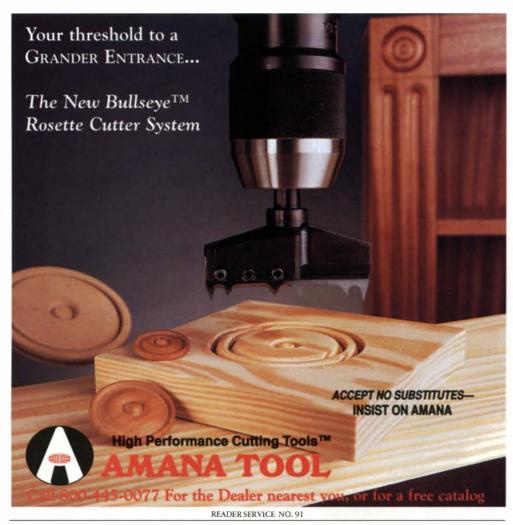
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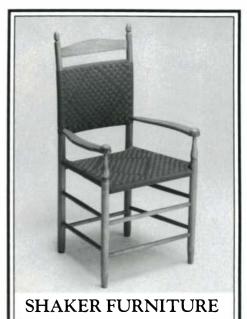


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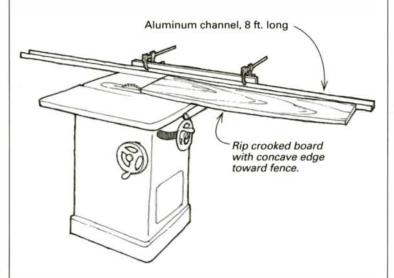
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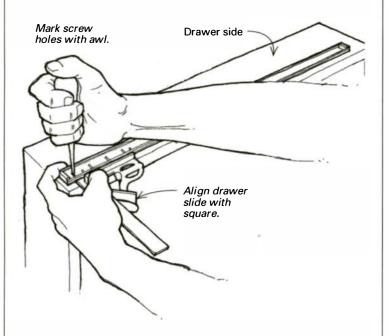
Extension fence helps straighten crooked stock



I put off building one of those carriage fixtures for straightening crooked-edged boards for several years. The fixtures require expensive hold-down clamps, and they reduce the possible depth of cut by holding the workpiece off the saw table. The real problem was that the length of the regular rip fence is too short.

Then I noticed an 8-ft.-long piece of aluminum channel leaning in the corner of my shop. I clamped the channel to the rip fence, as shown, to produce an auxiliary fence that would guide fairly long stock in a straight line. To use the auxiliary fence, I just put the concave side of the board against the long fence and push it through. It works. —William Mondt, San Diego, Calif.

Aligning drawer slides with a square



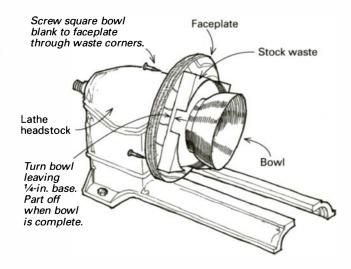
If I have to install a number of side-mounted drawer slides, I take the time to make up an alignment jig from scraps of wood. But if I'm doing only one or two drawers, I use a combination square as a quick-alignment jig.

I set the blade of the square to the distance I want to offset the slide hardware from the bottom edge of the drawer. Then with one hand holding the head of the square tight to the drawer box and the slide tight against the blade, I mark the forwardmost screw center through the attachment hole using an awl. I set a

self-tapping screw in the hole made by the awl, slide the square to the back of the slide, and mark and set a screw there.

-Jim Tolpin, Port Townsend, Wash.

Quick bowl mounting



Here's a quick, simple way to attach a bowl blank to the lathe. The method requires a faceplate larger than the finished bowl.

Start by screwing the square bowl blank to a faceplate in the corners using the shortest screws that will attach the blank. I use ³/₄-in.-long screws for all but the largest bowls. If your faceplate is too small, then enlarge it by attaching a ³/₄-in. plywood disc. Now turn the bowl inside and out, being careful not to hit the screws in the waste corners. Leave the last ¹/₄ in. thickness of wood next to the faceplate.

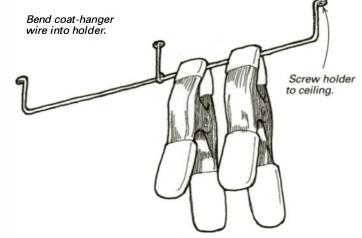
The bowl is now complete except for the bottom. Continue turning at the slowest possible speed, carefully angling a parting tool to release the bowl from the lathe. The bowl will not fly across the shop; it can be picked from the lathe as it is parted off.

-Peter Sibbald, Lyndhurst, Ont., Canada

Quick tip: To fill cracks and defects in wood, pack sanding dust into the voids, and zap the filler with cyanoacrylate glue. After the glue sets, sand the surface flat, and repeat if necessary. Be sure to use safety glasses when using the cyanoacrylate adhesive.

—Dennis W. Hetzner, Canton, Ohio

Coat hanger makes a spring-clamp holder



Here's how to make a convenient hanger for your spring clamps. Form a U-shaped bracket from coat-hanger wire using needle-nosed pliers. Screw the bracket to the ceiling over your

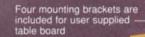


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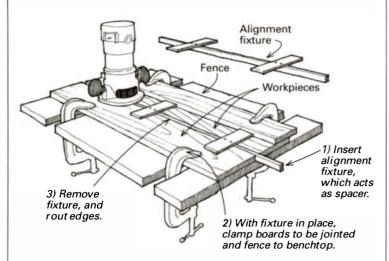
If you've been thinking of investing in a new table saw, think again. For just a fraction of the cost, you can rejuvenate your old clunker with the ULTRA-TS, and end up with a machine that will out-perform the most expensive table saws out there.

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bench. The hanger has two advantages: First, the clamps are located close at hand, and second, the clamping springs aren't in tension when not being used. —*Anthony Guidice, St. Louis, Mo.*

Router setup for edge-jointing



This method provides a quick and accurate setup for jointing the edges of stock with a router. Make a two-piece jig that consists of an alignment fixture and a fence. The fixture sets the proper spacing of the boards. A single pass of the router shaves a little off each board. The best spacing is about 3/32 in. smaller than the router bit. The fixture also sets the location of the fence. This is accomplished by cutting the two cross pieces the same length as the diameter of your router base.

To use the jig, set the two boards to be jointed on the bench with the alignment fixture between them. Slide the fence against the cross pieces of the fixture, and clamp the boards and fence to the bench. Remove the alignment fixture, and make one pass with the router to joint the two boards.

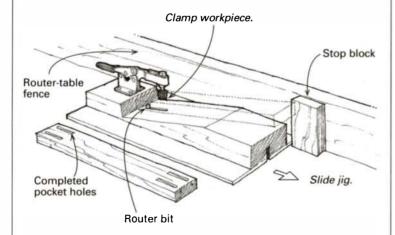
Once the jig is made and tuned, you can joint two boards in less than a minute. The resulting pieces will mate perfectly.

-Jeff Colla, Eden Prairie, Minn.

Quick tip: To prevent bandsaw blades from rusting, store the coiled blades in an airtight cake pan along with a couple of those little moisture-absorbing (desiccant) packs.

-Paul Burri, Ventura, Calif.

Pocket-making jig for a router table

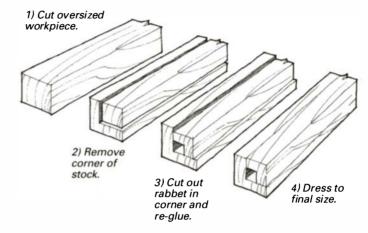


Here's a router-table technique for producing clean, precise pocket holes for joining face-frame members. First, construct a wooden cradle fitted with a lever-operated toggle clamp. The cradle angles the workpiece as pocket holes are milled. To cut the pockets, mount a straight cutting bit in the router, and with the workpiece clamped in the fixture, slide the fixture along the fence on the router table. A stop clamped to the fence prevents the pocket from running out the end of the workpiece.

To complete the pockets, drill screw-shank-sized holes from the end of the board to meet the pockets. Face-frame assembly is simple. Just clamp the stiles and rails together with glue, and drive screws through the pockets.

-Paul K. Murphy, San Jose, Calif.

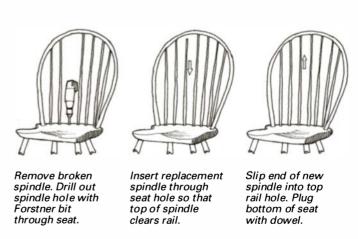
Hiding the wires in wooden light fixtures



I needed to hide electrical wire inside one of four 4-ft. wooden sticks that held a Mission-style light. I wasn't about to attempt drilling a hole that long. So my solution was to cut the stick oversized, rip out one corner of the stick, rout a rabbet in the corner of the removed section and then glue up the two pieces. I then thicknessed the joined stick down to the desired ¾-in. cross section. Now the stick can't be distinguished from its three neighbors, even though a hole runs through it straight as an arrow.

—Saul Isler, Cleveland Heights, Ohio

Replacing a spindle in a chair back



Here's how to replace a spindle in a chair back without having to disassemble the entire back. First remove the broken spindle. Then drill the bottom hole all the way through the seat with a Forstner bit. Slide a new spindle into the hole far enough to allow it to pass under the top rail. Then raise the spindle up into the hole in the top. Plug the hole in the seat bottom from the underside to complete the job.

—Jon Gullett, Washington, Ill.

Quick tip: The innards of a worn-out measuring tape make a great wire-fishing tool. You can use it to pull speaker wires into

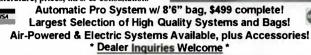
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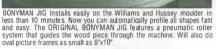
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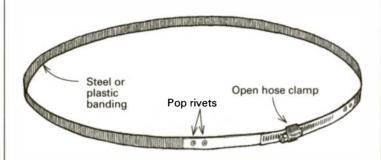
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the back of a cabinet or to pull Romex cable into a stud space for an outlet or switch. Simply push the tape into the space from one opening to another, hook on the wire and pull.

-Craig C. Steele, Carson City, Nev.

Hose clamps to the rescue

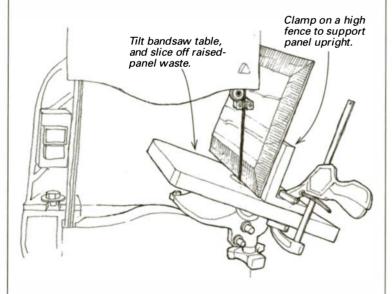


After several mishaps with the bag coming off my dust collector, I made up a new band with a hose clamp, as shown. Start with a 4-in. hose clamp. Cut it in two about midway, and poprivet a length of steel or plastic band (the kind used to secure shipping cartons) between the two ends to lengthen the clamp to whatever size you need. —Ray Namiotka, Pittsburgh, Pa.

Quick tip: Smaller air tools can be operated at remote sites directly from a portable air tank, like the propane tanks used for barbecue grills. You can purchase air tanks ready to use or adapt a propane tank with a \$5 valve kit. Make sure the tank has a safety valve, and monitor the pressure with a gauge when you're charging up the tank.

—Sven Hanson, Albuquerque, N.M.

Removing raised-panel waste on the bandsaw



Although my shaper reluctantly will profile the edge of a raised panel with one pass, I feel that it is safer and more efficient to remove some of the waste stock first. I use my bandsaw, which is safer and faster than the tablesaw. Tilt the table, raise the guide, adjust the fence and have at it.

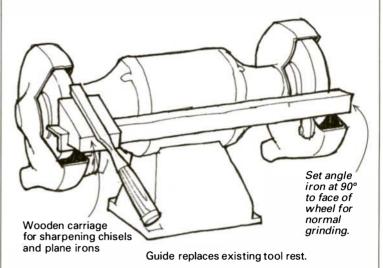
-D. Kenney, Middlesex, Vt.

Reducing slippage with moist paper towels

I discovered that a damp paper towel under a cutting board prevents the board from sliding around on the countertop. This method works equally well for anchoring an oilstone or a sheet

of plate glass to the bench. I do this when I'm honing the sole of a bench plane. —James R. MacMahon, Maitland, Fla.

Sharpening guide for a grinding wheel



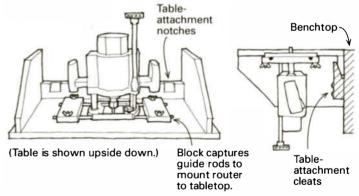
I removed the guides (tool rests) that came with my grinder and replaced them with a single piece of steel angle that spans both wheels. I use this guide for normal grinding. Then I made a sliding wooden carriage that correctly angles chisels and plane irons. This arrangement lets me switch quickly between straight and angled grinding. I use 80-grit, white aluminum-oxide wheels, which run cooler than standard wheels.

-Frank Norman, South Perth, Western Australia

Quick tip: Rub soapstone (welder's chalk) on a clean file to minimize clogging, especially with soft metals.

-Jim Good, Fox, Ark.

Space-saving router table mounts to bench



This router table is quick to set up and hangs on the wall when not in use. A plunge router attaches to the table's underside using the rods provided for the router's guide fence. Nothing need be removed from the router. Once the router has been attached to the table, you can flip it over and slip the table onto wedge-shaped blocks bolted to the front of your workbench. The table is held securely by the blocks. The total time for mounting or dismounting is minimal.

—D.A. Kennedy, Rugby, England

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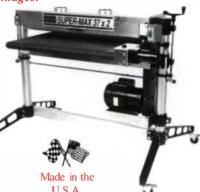
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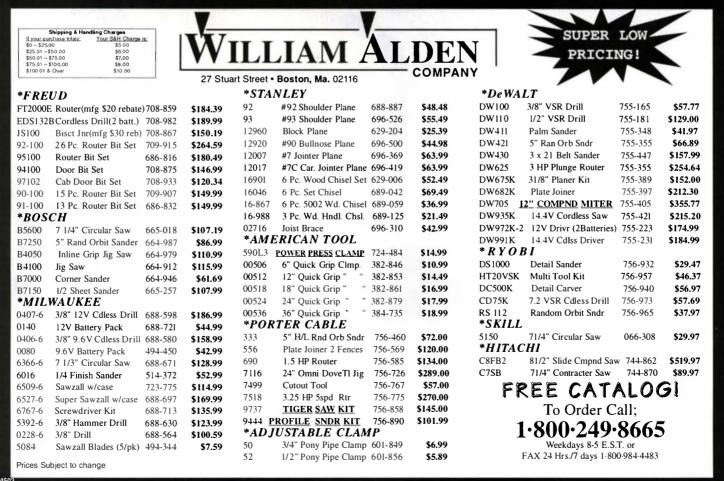
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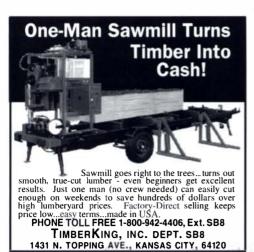
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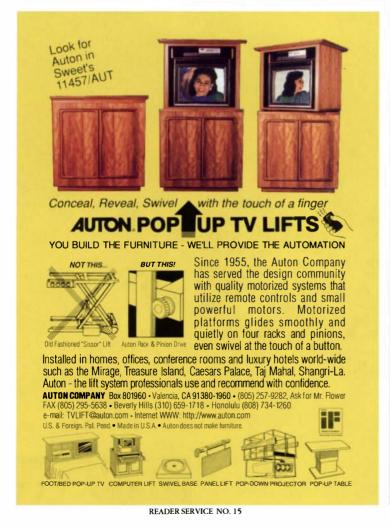
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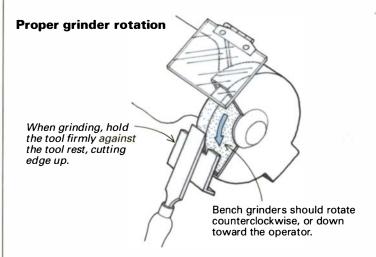
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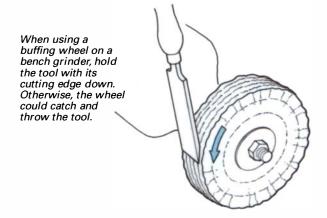
Which way should a bench grinder rotate?

Sharpening instructions usually mention the use of standard shop bench grinders to restore damaged edges on chisels and plane irons. I am curious how most bench grinders are set up for this purpose. I have a Black & Decker dual-wheel grinder, but the rotation is toward me (down, or counterclockwise). Most pictures I have seen of woodworkers sharpening with a grinder show them holding the tool pointing up. This would seem to indicate the grinder is rotating away from them (up, or clockwise). Is my grinder rotating incorrectly? Can it be reversed? Please explain the proper rotation of bench grinders -Craig Mascolo, Paradise Valley, Ariz. for sharpening. Gary Rogowski replies: Grinders are designed to rotate toward the operator, just as yours does, while a tool rest supports the chisel or plane iron at a fixed angle (see the drawing below). Maintaining a proper grinding angle is crucial to sharpening success. With the wheel turning down toward you and into the tool and the tool held firmly on the tool rest, you can obtain a consistent hollow bevel across the end of the tool.



If you reversed your grinder so that it rotated away from you, the wheel (trying to carry the tool around in this rotation) would tend to lift the tool off the tool rest. This would make it difficult for you to do accurate work and could be dangerous if the chisel or plane iron got away from you.

Another way to think about it is to realize your grinder is a cutting tool, like your jointer or tablesaw. Generally, the workpiece is fed into the tool, against the rotation of the cutter, blade or grinding wheel. With the proper guards (or tool rest, in this case) and technique, the work can be done accurately and safely.



One note of extreme caution: A buffing wheel mounted on a grinder presents a serious danger if improperly used. Tools being buffed are held with their cutting edge down (see the drawing above). Cloth buffing wheels are much softer than grinding

wheels. It's easy to catch a tool edge in a buffing wheel if the tool edge is presented in the same way it is to the grinding wheel. Catching the edge of a cutting tool in a buffing wheel almost inevitably results in the tool being thrown violently onto the floor (or into your foot). It is imperative if you use a buffing wheel on a bench grinder that you point your tool down, so the buffing wheel can't catch the edge.

[Gary Rogowski, a frequent contributor to FWW, teaches woodworking and is a professional woodworker in Portland, Ore.]

Source for an inexpensive magnetic starter?

I am building a new cabinet for my Unisaw and would like to incorporate a magnetic starter. I want the machine to start only when the operator momentarily depresses the switch. Delta sells a low-voltage control that serves the same purpose, but it costs \$375. Do you know where I can buy a magnetic starter switch for a reasonable price?

-Paul Glasser, Sherwood, Ore. Robert Vaughan replies: I understand your frustration with trying to find a reasonably priced magnetic starter. After years of looking myself (and years of installing retrofits for cheap starters gone bad), I've pretty much come to the conclusion that a goodquality magnetic starter is worth the asking price. Delta's lowvoltage unit is one of my favorites, and I use it whenever I can because it's so durable and trouble-free. In terms of value, it's as good a buy as any.

[Robert Vaughan is a contributing editor to FWW. He tunes, maintains and restores woodworking machinery in Roanoke, Va.]

Sizing a dust-collection system

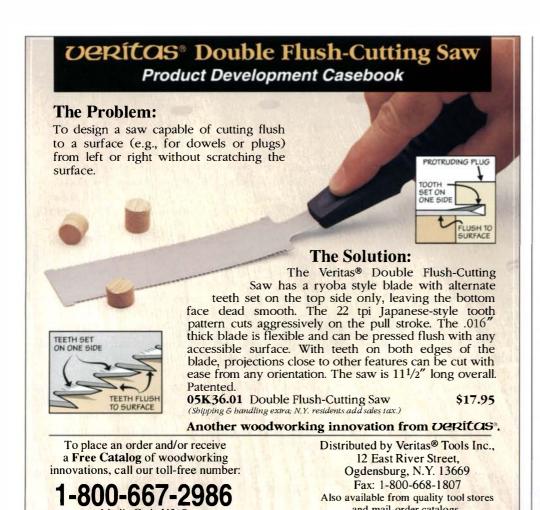
I will be adding a dust-collection system to my shop soon. I'm wondering how powerful a collector I'll need. Specifically, how many cubic feet of air per minute should the collector be able to move with an estimated run of 26 ft. of tubing and a tube diameter of 21/2 in.? -Ted Baca, Evans, Colo.

Sandor Nagyszalanczy replies: Unfortunately, your plan of running 26 ft. of 2½-in. tubing for collecting dust from your shop machinery won't work. You would need to use an extremely high-powered blower (the fan of the central collector) to move the volume of air required to convey the dust generated by a tablesaw, jointer, planer or shaper. Though it's beyond the scope of this column to go into all the factors and formulas needed to properly design a dust-collection system, here's a basic rundown on the relationship of duct diameter to air volume, velocity and friction losses that occur as air travels through a duct.

Dust collectors are rated by the volume of air they can move (measured in cubic feet per minute, or cfm) while overcoming the friction of the air flow in the duct work and in the blower itself (stated as static pressure, or sp, measured in inches of water). Therefore, a collector that is rated to move 1,200 cfm with no friction (0 sp loss) might only manage 100 cfm or so when the friction's up to, say, 8 in. of sp loss.

Now, given the same collector hooked up to two differentdiameter ducts, the air would flow faster through the smaller one. This is because air velocity increases as duct diameter decreases-think of how much faster a stream of water flows as it passes through a narrow garden-hose nozzle. If you want to move a large volume of air through a small-diameter duct, the air would have to travel at a very high speed. In your situation, to move the amount of air required to collect the dust from an average tablesaw (350 cfm is typical), the air would have to travel at around 9,000 feet per minute, or fpm. This is more than double what is normally recommended for woodworking dustcollection systems, which is 3,500 fpm for main ducts and 4,000 fpm for branch ducts.

The reason that the air would have to travel so fast is that it would have to overcome a huge static pressure loss (lots of fric-



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tion). Static-pressure losses increase as the diameter of duct decreases. And sp losses are cumulative over distance: the longer the duct (and the more bends and junctures it has), the greater the friction and, therefore, the higher the sp losses.

The higher the total sp losses in a duct system, the more powerful the collector must be to overcome them. In your original scenario, you'd have .72 in. sp loss per foot. Over 26 ft. of straight duct (no elbows or turns), this would amount to a whopping 18.72 in. of sp loss—enough to choke even a huge collector. By way of comparison, a heavy-duty, 3-hp collector can handle only about 9 in. of sp loss when moving 400 cfm (about what you'd need for a shaper and less than is recommended for a bandsaw).

I recommend you stick with a typical small-shop dust collector and connect it to your machines with large-diameter ductwork. A 5-in. main line with 4-in. branch lines should be about right. These ducts are large enough to carry the volume of air and chips from most shop machines while maintaining recommended air velocities. And for the relatively short 26-ft. run you're planning, I'd guess a 2-hp unit should be able to handle the modest friction losses in the 4-in.- and 5-in.-dia. ducts. For more on how to calculate a successful woodshop dust-collection system, see "Clearing the Air" in The Best of Fine Woodworking: Power Saws and Planers (The Taunton Press). [Sandor Nagyszalanczy is a contributing editor to FWW.]

Are dusts from abrasives harmful?

I have a question about dust. The hazards of various wood dusts are fairly well-documented, but what about the dust from sandpaper itself, created when the grit is separated from its backing? What's the relative toxicity of different kinds of sandpaper? Should we avoid using certain kinds altogether? -Pete Marshall, Crozet, Va.

Chris Minick replies: Depending on sandpaper brand, the "rocks" found on the surface are either flint, garnet, aluminum oxide or silicon carbide. All four of these inert (chemically inactive) mineral products, whether man-made or natural, are considered no more harmful, ingested or inhaled, than any other common dust particles. But asbestos, another equally inert mineral, is known to cause lung cancer in humans. How can one inert mineral be relatively safe while another causes serious illness? Particle shape, not chemical composition, is the reason. The mineral grains used on sandpaper are approximately spherical in shape; asbestos particles are needle-like fibrous crystals. This seemingly insignificant difference accounts for the major difference in toxicity of these minerals.

Once inhaled, asbestos fibers stick into the tissue lining on the inside of our lungs. Occasionally, an asbestos fiber penetrates the wall of an individual lung cell. That's when the real trouble starts. Because asbestos fibers are inert, the pierced cell can not break down the fiber or eliminate it from the body. So to protect itself from further irritation, the cell surrounds this fiber with a material similar to scar tissue. This scar tissue can serve as a nucleus for lung cancer.

Spherical, inert mineral sandpaper particles do not cause the same reaction because these ball-like particles simply lay on the cell surface, without penetrating the cell wall. Normal body cleansing processes eliminate these particles from the lungs fairly rapidly. Still, it is better to avoid breathing grit or sanding dust if possible. I always wear a good dust mask when I'm sanding, and you should, too.

[Chris Minick is a contributing editor to FWW and a finishing chemist and woodworker in Stillwater, Minn.]

Dealing with specks in a finish

I find that I always have to rub down my final finish to get rid of small specks in the surface, whether I've used varnish, lac-

quer or enamel paint. Having to do this as a last step is a lot of work, and though I can restore a satiny gloss to a piece, I can never get back the original high gloss.

I see a lot of finished furniture, even antique pieces, with a high gloss that is perfectly smooth to both sight and touch. I think there must be something very simple that I'm overlooking. I always sand my project down to #600 wet-or-dry sandpaper and wipe with a tack cloth to make sure it is dust free. I have used many different types of brushes and always stirred the finish properly. Would thinning down the varnish or enamel help prevent air bubbles?

-Jack Hall, Newport Beach, Calif. Chris Minick replies: Nibs and specks in a brushed-on finish usually can be traced to one of three sources—bubbles in the finish, a dirty brush or dust in the shop.

Thinning the finish combined with the proper brush technique will eliminate most bubble problems. I've found most brush-on finishes are too thick right from the can, so I thin my brushing finishes to the consistency of whole milk before application (about 13 seconds with a Zahn #3 viscosity cup).

Proper brush technique is important, too. A slip-slap back and forth stroke is okay for house painting, but it can be disastrous on fine furniture. Instead, flow the finish onto your project with long, even strokes similar to the technique used for shellac.

A surprising number of specks in the finish film can be traced to a dirty brush. When a brush is used to apply finish, a small amount of finish works its way up the bristles and accumulates just below the ferrule. This area of the brush is difficult to clean completely, so the likelihood of residual dried finish in this area is high.

The next time the brush is used, dry finish flakes off and falls onto the wet finish film. Wetting your brush with thinner before sticking it into the finish will minimize this problem. Incidentally, new brushes often contain all sorts of junk and should be thoroughly cleaned before use. (For more on brush technique, thinning finishes and cleaning brushes, see the article "Brushing on a Finish" in *FWW* #98, pp. 54-56.)

Dust can be a real problem for woodworkers, like me, who don't have a separate finishing room. I've found the best time to do my finishing is late at night. I vacuum and blow down the shop and then eat supper. After two hours or so, I go back to the shop and start finishing. This quiet time allows the airborne dust to settle and cuts down on the specking problem.

I have a makeshift room for finishing (more of a tent than a room) made from heavy plastic sheeting. The plastic sheeting runs from the floor to the ceiling and makes a booth about 6 ft. square. This area keeps the dust and bugs out of my finish and doesn't work too badly as a spray booth for waterborne finishes, either. I use a 20-in. fan for ventilation when I spray. The excess air escapes through a false wall at the back of the booth. When I'm not using it, I roll up the finishing booth and store it against the ceiling with elastic cords.

If I were a betting man, I'd wager that most of those smooth high-gloss finishes you admire so much have been rubbed out. Rubbing out, or "finishing the finish," is a necessary part of highquality furniture finishing and should not be viewed as just an extra step to get rid of the specks. Specks and nibs are a part of finishing. We all get them, and just like you, we all have to rub them out.

Lacquer-adhesion problem

I recently finished building two Queen Anne style end tables. I wanted the tabletops to be durable and have a deep shine, so I sprayed lacquer for a topcoat. The tabletop has a thumbnail edge with a ridge about 1/8 in. high. About a day after spraying the lacquer, cracks and bubbles began to form in the area of the ridge. Beneath the lacquer, I had used a mineral-based stain on

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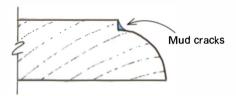
the bare wood, followed by a coat of acrylic lacquer sealer.

I stripped off the finish and sanded back to bare wood. Then I stained the tables again and sealed them with shellac before applying the lacquer sealer and topcoat. The result was the same. Can you help? I have not experienced this problem with lacquer on raw wood or with an alkyd-based stain. I find it hard to believe that cured, mineral-based stain is incompatible with lacquer. Even so, shouldn't the shellac have isolated it? -Michael O. Goodnow, Stevensville, Md.

Chris Minick replies: I suspect your finishing problem is not caused by incompatible materials but rather by an excessively thick coat of lacquer on the routed edges of your table.

When lacquer dries, two thermodynamically opposed forces are created in the film. First, surface tension gradients are formed in the still-wet lacquer as the film starts to dry. The effect of these gradients is to pull wet lacquer to the outside edge of the table, which results in excess finish along the edge. In the furniture business this phenomenon is known as picture framing or fat edge and is most pronounced on 90° edges. Slightly easing the sharp edges all but eliminates this problem.

Lacquer-adhesion problem



Second, lacquer films dry from the top down and shrink as they dry. With excessively heavy coats, the surface dries first and then starts to shrink. Because the lacquer below is still wet, the shrinking film moves across the wet lacquer, and stress cracks are formed (see the drawing above). These cracks, known as mud cracks, widen as the film continues to dry (surface tension gradients play a part in mud cracking, too). I think what you have on the edge of your table are classic mud cracks.

A simple solution for both problems exists. Next time, thin your nitrocellulose lacquer to between 12% and 14% solids, and spray thin coats no more than three to five mils thick. Thin coats dry very rapidly, minimizing surface tension effects and eliminating mud cracking. Multiple thin coats are always better than one or two thick ones. Experience has taught me that it is easier to spray on a few extra coats than it is to sand down a thick cracked one.

Value of King's Arrow pine

Recently, I learned that I am to receive some King's Arrow pine from my father's trust. It is old-growth clear pine. I have never seen the wood, though I did grow up with some beautiful furniture made from it. The wood has been stored for more than 20 years. I don't know how much I will be receiving, but in total, there's about 40,000 bd. ft., 11/8 in. thick, 30 in. to 45 in. wide and 15 ft. to 25 ft. long. Can you give me some idea of what the wood is worth?

-Tina Weeks, Colfax, Wash. Jon Arno replies: The historical significance of King's Arrow pine dates from Colonial times. Agents of the king of England were sent into the New England forests with orders to mark all exceptionally large and straight pine trees suitable as masts for

the British navy.

The mark they used was an arrow formed by three strikes of a hatchet. The Colonists were then forbidden to cut these trees. As with the Stamp Act and heavy duties on tea, this practice did little to endear the king to his Colonial subjects.

It's impossible for me to tell, based on the information you've provided, whether your pine was actually cut from ancient trees that bore this mark or whether the term is being used simply to denote exceptionally nice, old-growth wood. If it was, in fact, cut from marked trees, it may have some collector's value over and above the worth of the wood as a commodity.

The species in question is undoubtedly Eastern white pine, Pinus strobus, and the large-quantity mill price for select white pine is currently running about \$2,800 per thousand board feet. Lower grades are much cheaper: #3 Common currently sells for about \$650 per thousand. Regardless of the grade, however, boards 30 in. to 45 in. wide certainly would be worth a healthy premium to the right buyer.

[Jon Arno is a wood technologist and consultant in Troy, Mich.]

Re-hardening tools that won't stay sharp

My carving tools have turned blue from regrinding. I must have destroyed their hardness because they neither take nor hold an edge like they used to. Is there any way I can easily reharden these tools? -Steve Hamrell, Park City, Mont. Ray Larsen replies: You have, indeed, taken the hardness out of your carving tools. If your tools are made of high-carbon steel, as most are, correcting the problem is a relatively simple, three-step process:

- 1) Annealing. Heat each tool slowly and thoroughly to about 1,450°F (a bright cherry red), and then bury it in a large container of sand. A propane torch works fine. This will allow the tool to cool slowly. If the tool's edge can be readily filed when it has cooled, then it has been properly annealed.
- 2) Hardening. After restoring the cutting edge to its original shape, reheat the tool to 1,450°F, and then quench it by plunging the tool edge first into a container of soft water. Agitate until it's cool. Run a new smooth file over the edge. If the file skates over the edge without catching, the tool has been properly hardened. This tool is too hard to use, though. So it must be tempered first.
- 3) Tempering. Heating and quenching the tool blackens the tip. so polish it with a piece of fine-grit wet-or-dry sandpaper as soon as you've checked for hardness with the file. Heat the tool slowly with a propane torch, keeping the flame well back of the edge. When the edge turns a soft yellow, quench again in soft water.

Heat-treating carving tools in this manner takes practice, so don't be discouraged if you have some failures. Remember, learning the art of heat treating can pay big dividends.

For more detailed information, get a hold of a used copy of Hardening and Tempering Engineers' Tools by George Gentry, Argus Books Ltd. (the book is out of print). It's a good, basic book on the subject.

[Ray Larsen is a blacksmith in Hanover, Mass. He also teaches workshops, such as Toolmaking for Woodworkers.]

Protecting and restoring teak outdoors

The teak furniture in our screened porch here in the mountains of North Carolina is exposed to periodic rain and dampness and is becoming quite discolored. I've used teak cleaner and teak oil to try to restore the natural finish, but it is becoming more and more discolored with a blackish tone and a rough finish. How do I remove the discoloration and retain the beautiful, natural look of the teak?

-Perry B. Wydman, Sapphire, N.C.

I want to place two teak benches on each side of my walk, but I've been told that paint will not adhere to teak's oily surface. What should I do? -W.L. Lee, Anderson, S.C. Aimé Fraser replies: Teak earned its reputation as a superior outdoor wood largely because of its success aboard warships



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during the age of sail. The most conspicuous use of teak, then as now, has been for decks, because it wears well and provides a natural non-skid surface. When left unfinished, it weathered to a beautiful silvery-gray. Of course, each morning the decks of those warships were scrubbed by hundreds of sailors on their knees using Bible-sized blocks of sandstone. The decks were then flooded with clean seawater to rinse away the residue and left to dry in the sun.

In the modern world, teak rarely gets the same treatment. Put the teak in the shade, where mildew thrives, add air pollution and acid rain, and you can see why teak never quite achieves that lovely silvery-gray color.

Thankfully, modern chemistry has come up with a number of solutions for the problem of ugly teak. The most commonly used solution is a two-part teak cleaner, sold under many brand names. Widely available at marine stores, these products use hydrochloric acid to eat away the top layer of wood. You help it along by scrubbing. Then the acid is neutralized with an equally strong alkali, followed by more scrubbing.

It's important not to scrub with the grain. Teak's grain is made up of very hard and very soft fibers, and vigorous back-andforth scrubbing will leave a washboard effect that only can be removed by much coarse-grit sanding. Use medium-grit Scotch-Brite pads, and scrub in a circular motion.

It's critical when using these products to follow the directions closely, especially the parts about safety and rinsing the teak thoroughly to neutralize the chemicals. If you don't rinse well, you'll have adhesion problems with any subsequent finishes.

If the stains are bad, you might do the two-step process twice. In cases of deep and extreme blackening, I use a powerful twopart wood bleach and am very careful about neutralizing.

After all the effort required to clean and brighten teak, most people want to apply some kind of finish to preserve the fruit of their efforts. What you don't want to use on outdoor teak is linseed oil, lemon oil or mineral oil. They aren't compatible with the oils in teak; they simply sit on the surface of the wood. In a matter of weeks (days, in some climates), they become black

Tung oil is most compatible with teak. You can buy marine teak oil containing tung oil, or you can use pure tung oil, cut about 30% with mineral spirits. Expect to oil your teak with this mixture about once a month when it's outside; otherwise you'll be right back where you started.

Another way of protecting teak is to varnish it with any highquality spar varnish or paint it with an oil-based paint (though to a sailor and boatbuilder like me, that seems irreverent). Whatever you use, it's vital to wipe down the surface with acetone, and then follow up with a tack cloth before applying the finish. This removes the layer of surface oil and improves adhesion.

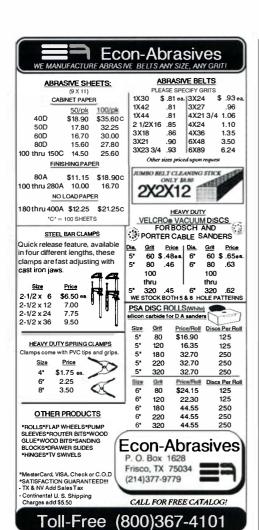
For either the varnish or the paint, the first coat should be 50% finish and 50% thinner (the thinner you use will vary with the type of varnish or paint you use). The second should be 70:30, and each coat thereafter thinned only to brushing consistency. Aboard yachts, it's usual to apply at least an initial eight coats of varnish (sanding to 320-grit between coats) and then two more coats each spring and fall.

[Aimé Fraser is an assistant editor of FWW. She's been building and maintaining boats for 20 years.]

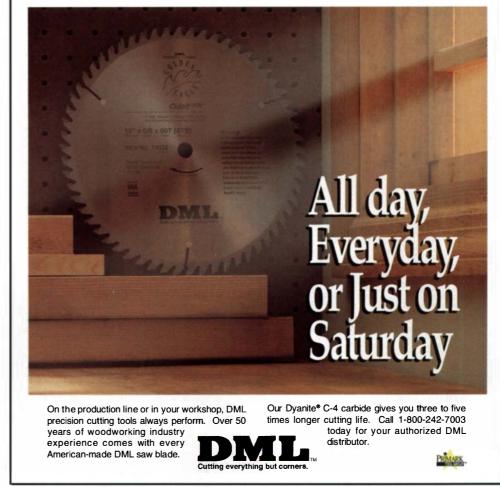
Have a question you'd like us to consider for the column? Send it to Questions & Answers, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.



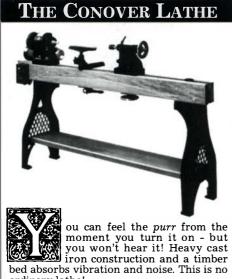




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EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit w/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger	\$225 \$155 \$184 \$189
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt.	\$225 \$155 \$184 \$189 \$195
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt.	\$225 \$155 \$184 \$189 \$195
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools	\$225 \$155 \$184 \$189 \$195 \$225
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. UET Equipment & Tools JWTS-10JF 10" Table Saw	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw	\$225 \$155 \$184 \$189 \$195 \$225 SALE \$569 \$569 \$489
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$569
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$489 \$429
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$569 \$489 \$429 \$229 \$ALE
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EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw w/Brake 1604A 1-3/4 HP Router	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$569 \$429 \$429 \$229 \$ALE \$120 \$134 \$134
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit W/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw WB7ake 1604A 1-3/4 HP Router 1613FVS 2 HP Plunge Router	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$489 \$429 \$429 \$229 \$ALE \$120 \$134 \$134 \$139 \$194
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw 1657 7-1/4" Circular Saw w/Brake 1604A 1-3/4 HP Router 1613EVS 2 HP Plunge Router 1613EVS 3-1/4 HP Plunge Router 1615EVS 3-1/4 HP Plunge Router	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$569 \$489 \$429 \$229 \$229 \$ALE \$130 \$134 \$139 \$194 \$285 \$94
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit w/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw 1657 7-1/4" Circular Saw w/Brake 1604A 1-3/4 HP Router 1613EVS 2 HP Plunge Router 1613EVS 3-1/4 HP Plunge Router 1615EVS 3-1/4 HP Plunge Router	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$569 \$489 \$429 \$229 \$229 \$ALE \$130 \$134 \$139 \$194 \$285 \$94
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit W/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw w/Brake 1604A 1-3/4 HP Router 1613EVS 2 HP Plunge Router 1613EVS 3-1/4 HP Plunge Router 1608 Laminate Trimmer 1608 Underscribe Laminate Trimmer 1609KX Deluxe Installer's Kit	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$489 \$429 \$229 \$344 \$134 \$134 \$134 \$134 \$285 \$94 \$145 \$120
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit W/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw BOSCH 1655 7-1/4" Circular Saw w/Brake 1604A 1-3/4 HP Router 1613EVS 2 HP Plunge Router 1613EVS 2 HP Plunge Router 1615EVS 3-1/4 HP Plunge Router 1608 Laminate Trimmer 1608 Underscribe Laminate Trimmet 1608 Underscribe Laminate Trimmet 1609KX Deluxe Installer's Kit 1584VS VS Jig Saw with Clic 1587VS VS Top Handle Jig Saw w/Cli 1370DEVS 6" Random Orbit Sander	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$489 \$429 \$229 \$ALE \$120 \$134 \$134 \$139 \$194 \$285 \$914 \$145 \$145 \$149 \$149 \$149
EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit W/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw BOSCH 1655 7-1/4" Circular Saw w/Brake 1604A 1-3/4 HP Router 1613EVS 2 HP Plunge Router 1613EVS 2 HP Plunge Router 1615EVS 3-1/4 HP Plunge Router 1608 Laminate Trimmer 1608 Underscribe Laminate Trimmet 1608 Underscribe Laminate Trimmet 1609KX Deluxe Installer's Kit 1584VS VS Jig Saw with Clic 1587VS VS Top Handle Jig Saw w/Cli 1370DEVS 6" Random Orbit Sander	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$489 \$429 \$229 \$229 \$ALE \$120 \$134 \$134 \$134 \$139 \$194 \$285 \$145 \$229 \$149 \$145 \$229 \$149 \$145 \$145 \$145 \$145 \$145 \$145 \$145 \$145
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EY6207EQK 12V 1/2" Drill Kit EY6181CRKW 9.6V Compact Drill Kit W/2 Batt. EY6100CRKW 12V Drill Kit w/2 Batt. EY6100CQKW 12V Drill Kit with 15 min. charger EY6100EQK 12V Drill Kit EY6100EQK 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit EY6100EQKW 12V Drill Kit W/2 Batt. JET Equipment & Tools JWTS-10JF 10" Table Saw WBS14CS 14" Band Saw JJ6CS 6" Jointer JDP17MF Drill Press DC650 Dust Collector BOSCH 1655 7-1/4 Circular Saw 1657 7-1/4" Circular Saw w/Brake 1604A 1-3/4 HP Router 1613EVS 2 HP Plunge Router 1613EVS 2 HP Plunge Router 1613EVS 2 HP Plunge Router 1618EVS 3-1/4 HP Plunge Router 1608L Underscribe Laminate Trimmer 1608U Underscribe Laminate Trimmer 1609KX Deluxe Installer's Kit 1584VS VS Jig Saw with Clic 1587VS VS Top Handle Jig Saw w/Cli 1370DEVS 6" Random Orbit Sander 1273DVS 4x24 Belt Sander 1273DVS 4x24 Belt Sander 1003VSR 3/8" Drill 3054VSRK 12V 3/8" Cordless Drill Kit	\$225 \$155 \$184 \$189 \$195 \$225 \$ALE \$569 \$489 \$429 \$229 \$229 \$ALE \$120 \$134 \$134 \$139 \$194 \$285 \$149 \$285 \$149 \$228 \$149 \$228 \$149 \$145 \$229 \$145 \$229 \$147 \$228 \$149 \$149 \$149 \$149 \$149 \$149 \$149 \$149
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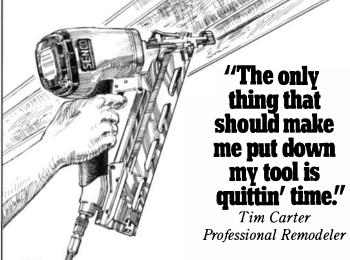
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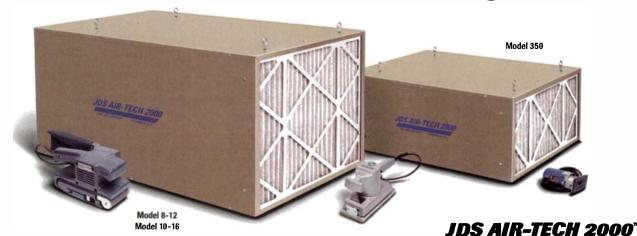
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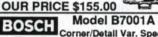
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Waterborne Finishes: Friendlier Than Ever

Simple shop tests help rate a new generation of clearcoatings

by Chris A. Minick



Finishes that use water as a carrier—Waterborne finishes go by many names, such as lacquer, acrylic, urethane and conversion-varnish. But they all use water as a delivery medium. The waterborne finishes compared in this article (with their test panels below left) include both hardwarestore and commercial-grade varieties.



cigarette advertising campaign gained fame, if not fortune, by telling women, "You've come a long way, baby." The ads are in bad taste. But that corny slogan would be perfect for describing products I'm sure advertising copywriters didn't have in mind—waterborne wood finishes.

Almost universally, the latest wave of clear, waterborne finishes (see the photo above) shows a dramatic improvement over those of just five years ago. Gone are the poor-performing, hard-to-use coatings

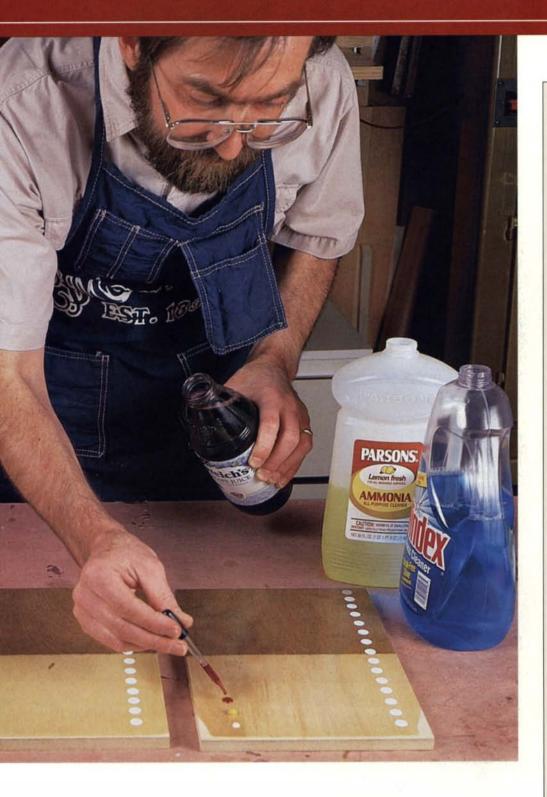
that looked more like plastic wrap than furniture finish. They've been replaced by friendlier finishes, some of which out-perform nitrocellulose lacquer.

Waterborne finishes are not toxic to the environment. They meet the most recent limits for volatile organic compounds (VOCs) in finishes. The newest waterborne finishes adhere better and raise the grain less than the old formulations did. They are easy to use, dry fast, clean up with water and, generally, level out well. If you have good ventilation, you can set up

a simple finishing area to spray waterborne finishes. You don't need an explosion-proof booth. If you're brushing, keep in mind that the coats dry quicker than solvent-based varnish (see the story on p. 52).

To see how the new field of waterborne finishes has changed, I chose 15 popular brands—eight over-the-counter finishes found at hardware stores and seven professional-grade finishes found at woodworking supply stores.

I picked gloss finishes because they're the most difficult to get right. I couldn't



evaluate every transparent waterborne finish on the market, but if the brand you're using isn't on the chart on pp. 50-51, some simple shop tests will tell you how good your finish is (see the box at right).

Choosing a finish depends on many factors (see *FWW* #104, pp. 85-89). Because different waterborne finishes excel at different things, you can use the results summarized in the chart (or your own test results) to select the right finish. First, though, a brief discussion of the chemistry of waterborne finishes is in order.

Waterborne finishes have complex formulations

By definition, a lacquer always is soluble in its own solvent. That's why even dried nitrocellulose lacquer can be cleaned from a brush with lacquer thinner. It might surprise you that most waterborne finishes are lacquers. They're sold under every finish name under the sun, including acrylic and urethane.

But don't expect to clean up any of these dried waterborne finishes with water. Water is merely a convenient, nonhazardous

Six finish testing methods

There is no magic to testing finishes. For the test panels, I used ½-in. medium-density fiberboard (MDF) veneered with birch. I stained half of each panel with Glidden's walnut, oil-based stain and let the panels dry for a week.

To apply the finish uniformly, I used a draw-down bar (a rod wrapped with #40 wire). I applied a swath of finish on one end of the panel and used the wire-wrapped bar to drag the finish across the panel. (You could make your own bar by spiralwrapping 20-gauge wire around a length of pipe.) I applied three consistent coats of finish, 3 mils thick, allowing each coat to dry four hours. I cured the panels in the shop for 10 days. —*C.M.*



Adhesion

Slice an X on the finish with a razor or sharp knife guided by a straightedge (on the stained side of the panel). Apply a piece of duct tape over the cut area, and rub down well.

After a few minutes, yank off the tape. The finishes that pass will show no delamination. Finishes with marginal adhesion will have ragged edges along the cut. And failed finishes will have chunks missing.

(continued on p. 51)

carrier liquid that transports the resin from the can to the work. Special resin-soluble/water-soluble solvents, usually glycol ether (similar to lacquer retarder), are added to waterborne finishes. These solvents are critical to film formation. They also dissolve the dry film.

Besides solvent, water and resin, a myriad of other chemicals are needed to complete a waterborne finish formulation. Among the most important are surfactants, compounds which are added for stability, proper flow and leveling.

Defoamers minimize bubbles during application, and thickeners maintain proper viscosity. Flatting agents control finish sheen, and mar-aids protect the film from damage while curing. The formulation is a delicate balance of all these parts, plus some other minor ones. Over-thinning a waterborne finish will destroy this balance, resulting in finishing defects.

How waterborne finishes work

Waterborne finishes contain about 30% resin—much more than nitrocellulose lacquer, which has about 12% resin. That's why it's easy to apply too heavy a coat the first time you spray a waterborne finish. It's common to get sags and runs until you get used to spraying these finishes.

Waterborne finishes differ from solvent-based finishes not only in composition but also in the way a film is formed. If you could look into a can of waterborne finish with a powerful microscope, you'd see billions of tiny spheres of resin dispersed in water. Each resin ball contains solvent, which makes the ball sticky, and is surrounded by a protective layer of surfactant. The surfactant layer keeps the sticky balls from becoming one giant agglomeration in the can.

As the finish begins to dry, water evaporates from the emulsion. At the same time, the viscosity of the finish increases, and the resin balls start to bunch together, much like golf balls packed in a bucket. When enough water has evaporated, capillary action within the film deforms the balls into stacked, overlapping discs, called platelets. Residual solvents, called tail solvents, weld the discs together to form a continuous film.

The tail solvents also allow successive coats to burn into one another. The solvents gradually evaporate to complete the curing. One exception is Kemvar W made by Sherwin Williams. Because it is a conversion varnish, it's possible to get "witness lines" between coats if the directions aren't followed. Witness lines result when successive layers of finish don't melt into

Manufacturer	Product	Adhesion over oil stain	Stain Resistance (22 max.)	Heat resistance (200°F)	
Amity Gloss (800) 733-1776		Fail	22	ОК	
Behlen (518) 843-1380	Water-based urethane	Pass	17	Slight print	
Behr (714) 545-7101	#630 polyurethane	Fail	22	ОК	
Carver Tripp (508) 679-5938	Safe & Simple	Fail 22		ОК	
Crystalac (615) 727-6425	CL90	Marginal	arginal 14 S		
Deft (714) 474-0400	Safe & Easy	Marginal	Marginal 20		
Fabulon (716) 873-6000	Crystal	Marginal	16	ОК	
Eclectic Products (800) 288-4667	Famowood Super Lac	Pass	19	ОК	
General Finishes (800) 783-6050	EF poly- acrylic blend	Pass	16	ок	
Hydrocote (800) 229-4937	Equal	Marginal	6	Fail	
McCloskey Heirloom (800) 845-9061		Marginal	17	ОК	
Minwax Polycrylic (201) 391-0253		Fail	15	Slight print	
M.L. Campbell Ultrastar (716) 873-6000		Marginal	20	ОК	
Sherwin Williams Kemvar W (216) 566-2000		Pass	20	ОК	
Wood-Kote Liquid plastic (503) 285-8371		Pass	22	ОК	
Two benchmark fini	ishes				
Solvent-based		Pass	21	Fail	

Nitrocellulose lacquer and polyurethane varnish are considered the solvent-based standards in the finishing industry. Because you may be more familiar with these two finishes than you are with waterborne finishes, we've included them here as a point of reference.

Pass

each other and are rubbed out unevenly.

nitrocellulose lacquer

polyurethane varnish

Solvent-based

Comparing waterborne finishes

The whole film-forming process is known as coalescence. The makers of waterborne finishes often have "polymerized" written on the can because it's a sexy chemical term that attracts consumers. Some cans of waterborne finish also have "catalyzed" on the label, which means that a chemical (catalyst) is added to trigger the polymerization process. Finish polymerization, in theory, means that billions of tiny molecules link into one big one.

Testing the finishes and interpreting the results

22

OK

I'm a sucker for new finishes. But experience has taught me that the worst way to select a new finish is by reading manufacturer's advertisements or what's listed on the label. Most of the product literature reads something like "Our finish is great on everything." The only way to tell whether those assertions are true is to test the finish. That's how this article was born. Half the waterborne finishes I tested are

	Solvent resistance (30 max.)	Sanding	Appearance	Best applicator	Remarks / Dry time
	3	Moderate	Fair	Spray	Good color/ 2 hours
88315	1	Difficult	Fair	Spray or brush	Very thin/ 2 hours
	10	Difficult	Poor	Brush	Looks plastic-coated/ 3-4 hours
	16	Moderate	Poor	Brush or spray	Blue tint/ 45 minutes
	2	Easy	Very good	Spray	Lacks color/ 30 minutes
	8	Very difficult	Very poor	Brush	Severe fish-eyes / 1 hour
-	2	Moderate	Fair	Brush	Low gloss/ 1 hour
	9	Easy	Excellent	Spray	Looks like nitro- cellulose / 30 minutes
	8	Easy	Very good	Brush or spray	Easy to brush/ 2 hours
	0	Easy	Excellent	Spray	Cold water destroyed film/30 minutes
	12	Difficult	Fair	Brush	Good color/ 1-2 hours
	16	Moderate	Good	Brush	Lacks color/ 2 hours
	6	Moderate	Good	Spray	Rubs out nicely/ 45 minutes
100	30	Moderate	Very good	Spray	Off-gasses formal- dehyde / 45 minutes
	18	Difficult	Poor	Brush	Poor leveling/ 2-4 hours
	9	Moderate	Excellent	Spray	Industry standard
	27	Difficult	Very good	Brush	Very durable, but looks yellow

The areas on the chart in this color indicate professional-grade finishes designed for spraying. Unshaded areas indicate over-the-counter, hardware-store finishes designed for brushing. There are three finishes that are recommended for both spraying and brushing.

recommended for spray application. The other half are suitable as general-purpose, brush-on finishes.

Adhesion is the most important consideration—Many projects are stained, so it's critical that a waterborne finish adhere to oil-based stain (see the photo at right on p. 49). After all, the main job of a finish is protection. If a finish doesn't stick, the rest of its attributes are meaningless. I avoid any finish that fails in adhesion. If a finish

adheres marginally, I would seal stained areas with fresh, de-waxed shellac before I used that particular topcoat.

Resistance to stains, solvents and heat depends on the project—Not all finishes are appropriate for all projects. Tabletop finishes should provide good resistance to food stains and should be washable with standard cleaners. I used a stain-resistance test to determine how well each waterborne finish withstood 11 com-



Stain resistance

Place one drop of the following household products on the panel: milk, mustard, grape juice, lemon juice, olive oil, Windex, Fantastik, Spic and Span pine cleaner, ammonia, black shoe polish and hot water (140°F). After one hour, wash the panel with water, and inspect the finish. If a patch shows no stain or damage, it receives two points; if it has slight dulling, it gets one point; if it has severe damage or a stain, it gets no points. Add up the points (22 is the maximum).



Heat resistance

Heat several large flat-head bolts in boiling water. Set a bolt (about 200°F) on each panel, and allow them to cool to room temperature. Then remove the bolts.

Rate the finish "okay," if a bolt shows no sign of damage. If the bolt leaves a slight impression or sticks to the finish, the finish fails the test.

(continued on p. 53)

Solving waterborne finish problems

Although it's true that waterborne finishes are easy to use, they are not problemfree. However, by knowing a few corrective tricks, you can overcome most of their shortcomings.

When you first apply a waterborne finish, don't be alarmed if the finish looks milky. As it dries, and the water evaporates, a clear film of finish will form.

Reducing bubbles and micro-bubbles: Bubbles are the most common drawback to using waterborne finishes. Bubbles are caused by the surfactants (compounds added for stability, flow and leveling). Manufacturers try to counteract the bubbles by mixing in defoamers, but the defoamers deactivate over time. The older the finish, the more bubbles. To control bubbles in old (one year or more) cans of finish, I add a small amount of solvent (no more than 11/2 oz. per gallon). I use lacquer thinner, mineral spirits or even



Watch the humidity-Applying waterborne finishes in high humidity and low temperatures can interfere with proper film formation. That was the case with this finish.

milk. (Fats in milk are chemically similar to defoamers.)

Another bubble problem, micro-bubbles, is particular to certain fast-drying waterborne finishes designed for spray application. Micro-bubbles form when high-pressure air from a spray gun is forced into the liquid finish. This trapped air forms tiny voids in the film. Micro-bubbles are not so noticeable in a dull or semigloss finish, but they show up as a white haze in high-gloss finishes. To eliminate micro-bubbles, reduce the atomization pressure. Lowering the pressure can cause another problem-orange peel (poor leveling). Eliminating both micro-bubbles and orange peel is

a balancing act. Sometimes, I add a waterborne finish retarder (in a pinch, you can use a 50:50 mix of lacquer retarder and water) to minimize micro-bubbles

Applying level, blemishfree coats: When brushing on a waterborne finish, use long, even strokes, as you would with shellac. Keep the brush angle at about 30°. Avoid backand-forth motions-they're more suited for house painting. Use a long-bristled, tapered-and-tipped nylon brush or a good foam applicator. Work quickly as you brush, and maintain a wet edge. This should reduce sanding.

In preparation for a waterborne finish, don't use a tack cloth. It contains an oily substance that will cause fish-eyes (so will some stearate-coated sandpapers). I wipe down my projects beforehand and between sanding stages with a cloth dampened with mineral spirits. If you're spraying, make sure you have a de-oiler. Also, don't use steel wool between coats. Small metal shards left by the steel wool will rust and ruin your finish.

Eliminating grain raising: Grain raising, though still a problem with waterborne finishes, is not as bad as it once

was. One way to get around the problem is to wet the wood and then knock down the fibers with sandpaper before you finish. But there is an easier way. Waterborne-finish manufacturers have introduced non-grain-raising (NGR) sealers. Apply a thin sealer coat, let it dry and then scuffsand the surface. Nearly all the finishes in this article have accompanying sealers.

I almost always use a sealer with waterborne finishes. Compared to nitrocellulose lacquer, waterborne finishes usually are colorless and without depth. Sealing (I like super-blond shellac) before you apply the waterborne finish can dramatically improve the appearance. Tinting with NGR stain is another option.

Watching the temperature and humidity: The ideal application condition for most waterbornes is around 70°F and 50% relative humidity (RH). Temperatures below 50°F and/or humidity above 85% RH can severely compromise film integrity (see the photo above). In fact, either condition can prevent the finish from forming a film at all. Heating or dehumidifying your shop will cure both problems. Or you can wait for a -C.M.better day.

mon chemicals (see the top photo on p. 51). The higher the number, the better the stain resistance. Finishes with a rating of 15 or higher should stand up well to everyday use. If you have a house full of teen-agers, you may want to use a finish with a higher rating.

Heat resistance also is important for dining-table finishes. While it's probably not a good idea to take a hot casserole dish from the oven and place it on the table, it happens all the time. Heat-damaged finishes are very hard to repair. A simple test using a hot bolt (see the bottom photo on p. 51) can save you a lot of work later on.

The solvent-resistance test (see the top right photo on the facing page) is tedious. But it's worth checking out a finish's solvent resistance ahead of time. This is especially true for dressing tables or bar tops because perfume, nail-polish remover and drinks with alcohol in them contain sol-

vents that can damage a finish. This test is standard in the kitchen cabinet industry.

How it sands and looks may or may not be a concern—Sanding is an important step toward getting a nice finish. But I don't like to sand. Who does? If a finish is hard to sand (meaning that globs of finish accumulate on the sandpaper), I usually get frustrated, stop sanding and hope that the next coat will cover up the problem. It rarely does. That's why I select finishes that sand as painlessly as possible. It's rather tricky for a finish to be both durable (not brittle) and have the right feel (friction) for sanding. A good finish is neither too soft nor too hard.

Grading the look of a finish is subjective. I'm a nitrocellulose lacquer fan. As far as appearance goes, no finish can match it. I can't help but compare any finish to nitrocellulose lacquer, and the waterborne finishes were no exception (see the bottom photos on the facing page). Appearance rankings on the chart, as well as those for sandability, relate more to my preferences than to hard data or measurements. Take them with a grain of salt.

The good, the bad and the ugly

I've tested a lot of waterborne finishes in the last 15 years, and most have been pretty mediocre. I expected the same kind of results from this round of tests, too. What I found was quite different. The latest waterborne finishes have some real winners and a few big losers.

The real surprise was Hydrocote Equal. Although it was one of the best-looking finishes, it tested last overall. I even ran the tests twice to confirm my initial results. And then I used the same procedures to compare this finish to an acrylic floor polish made by Johnson Wax. The floor polish

Strikes against them-No finish was perfect, but some of them had serious faults (from left): Amity (poor adhesion), Carver Tripp (poor appearance), Deft (excessive fish-eye), Wood-Kote (poor leveling) and Hydrocote (poor stain and solvent resistance).



Author's favorites-Based on the tests, Minick liked three finishes (from the left): Sherwin Williams (most protective), General Finishes (best brush-on). and Wood-Tex, which is now sold as Famowood Super Lac (best to spray, best looking and best value). Sherwin Williams is shown with its catalyst.



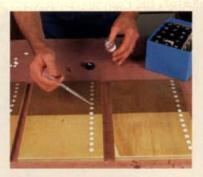
scored higher. Hydrocote does make another more expensive, more durable waterborne finish called Resisthane. This finish performed much better than the Equal. The waterborne finishes made by Amity, Carver Tripp, Deft and Wood-Kote had their share of problems, too (see the top photo). They may or may not be appropriate for your next finishing project.

But three finishes really impressed me (see the bottom photo). Kemvar W had the highest gross score. For sheer protection value, this finish is practically bulletproof. In terms of formulation, it's quite different from the others in the field because it has two parts. It's actually a spray-on, acid-catalyzed, waterborne conversion varnish designed as a kitchen-cabinet finish.

A word of caution, though. Kemvar W releases small amounts of formaldehyde gas as it dries. This finish should only be sprayed in a booth that has good intake and exhaust air flow. And it's a good idea to wear gloves and protective clothing. I also use a carbon-filter respirator.

General Finishes' EF polyurethane and acrylic blend applies easily, has excellent leveling properties, good vertical cling and looks great—a pleasant surprise in a brush-on finish. Of all the finishes, I was most impressed with Eclectic Product's Famowood Super Lac (previously available as Wood-Tex Super Lac; the manufacturer assures me that the finish in the can remains the same). This finish's color is virtually indistinguishable from nitrocellulose lacquer. It rubs out beautifully, has decent resistance properties and, best of all, has a depth not usually associated with waterborne finishes.

Chris Minick is a finishing chemist and a contributing editor to Fine Woodworking. He works wood in Stillwater, Minn.



Solvent resistance

Apply three solvents to the panels. I blended water, ethyl alcohol (ethanol) and methyl ethyl ketone (MEK) in 15 different ratios, starting with a 50:50 mix of water and ethanol and ending with 100% MEK. Space 15 dots of bond paper on the panels. Place a drop of each solution on the dots, and dry two hours. Remove the dots. A spot with no damage receives two points; slight damage or dulling of the finish gets one point; dots that stick to the finish get no points. Add up the points (30 is the maximum).



Sandability

Wrap a 3/4-in.-wide strip of 400-grit sandpaper around a piece of scrap. Abrade a spot of the panel. Easy-to-sand finishes form a powder and do not load the paper. Difficult-to-sand coatings require force and gum up the paper. Moderate-to-sand finishes fall in between.



Lacquer



Waterborne

Appearance

Compare the finishes to nitrocellulose lacquer. Note the clarity, depth, color and luster. I rated finishes "excellent" and "very good" if they looked threedimensional and warm (amber). I used "good" and "fair" for finishes that lacked color or appeared cloudy or blue. I rated ugly finishes "poor."

Blanket Chest Provides Simple, Stylish Storage

Large finger joints make quick, solid construction

by Gary Rogowski

have a sweater that's almost as old as I am. I've worn it through sun and storm, through good times and bad. Its wool now holds more memories than warmth, but I can't throw it away. Where to store it and the other sweaters and blankets I have accumulated over the years had started to become a problem. I felt like the world was shrinking, and I needed more storage space.

A blanket chest seemed like the best solution. I

kept the design simple so that the piece would be adaptable. I wanted a piece of furniture that would look equally at home in many rooms and with many other styles of furniture.

The construction is simple as well. It's a plank chest with screwed and plugged finger joints. The top is a large panel with breadboard ends, butt hinged to the chest. I wanted a plain, opengrained wood to complement the design, so I decided to use elm. The wood is fairly rare these days because Dutch elm disease has eliminated so many trees, but I found enough nice boards for this chest. For the bottom panel, I chose aromatic cedar, confident it would keep the moths from finishing off my old sweater.



I rough milled the stock to within ½6 in. of its final thickness and matched boards for color and grain. I edge-jointed the boards and dry-clamped them to make sure my joints closed up tight. Because I was using four or five boards per panel, biscuits helped keep my boards aligned during glue-up. After the glue had set up a bit and the squeeze-out had gotten rubbery, I scraped it off.





Finger-jointed blanket chest 34 in. 34 in. 1934 in. Wenge plugs cover 2½-in. #5 screws.





Rabbet the bottom panel to fit a 3/8-in. by 3/8-in. groove on the

sides of the chest. Stop groove short of ends on long sides.

Handsome storage, great joinery practice. These large finger joints look great and help make the blanket chest a manageable, not-too-fussy project. Wenge plugs, feet and handle contrast well with the elm.

of chest sides.

The panels still needed to be flattened. So I planed and scraped one side of each flat and took the panels to a local shop where I could run them through a wide-belt sander. Then I cut all my pieces to width and length. I was surprised at how much the elm fuzzed when cut, especially when crosscut. To minimize tearout on the final crosscuts, I applied masking tape where the cuts would be.

All fingers

are 4 in. wide.

With the boards at finished size, I scraped the surfaces of all the panels to a nice luster. Then, with a sanding block cut from a small piece of blue-foam building insulation, I lightly hand-sanded the boards with 180-grit sandpaper. I sanded before cutting the joints, so I wouldn't risk rounding over any surfaces near a joint. That finger could result in a sloppy fit.

Joining the carcase

Large finger joints look solid, and they make the piece relatively straightforward to build. There are just four steps to this process: rough bandsawing, template routing, squaring up corners and fitting joints (see the photos on p. 56).

Template simplifies joinery—I started by making patterns from ¼-in. medium-density fiberboard (MDF), which I used to lay out the panels. Later, I used these same patterns as templates for routing. I cut the MDF pieces to the width of the chest's sides. Then I marked out even divisions, so I had three fingers on one template and two on the other, each 4 in. wide. Once the templates fit each other snugly, I laid them on my panels and pencil-marked the joints. I also marked each of the panels for face side and, to prevent confusion, numbered each corner.

Drilling for screws and plugs—Glued finger joints are plenty strong, but a little insurance doesn't hurt. I decided to screw the fingers together and then plug the screw holes. After squaring up the corners of the finger joints, but before fitting them, I drilled two ¼-in. holes in each finger for plugs. I pared the holes square and drilled holes all the way through for the screws.

Once all the finger joints were fitted and the carcase dryclamped, I started the screws into the finger joints to mark the end grain for drilling. Then I disassembled the carcase and drilled into

Drawing: Jim Richey

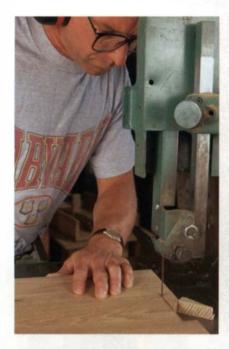
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CHEST SIDES ARE TEMPLATE ROUTED

Lay out the finger joints with a template. This eliminates the potential for measurement errors and speeds layout.



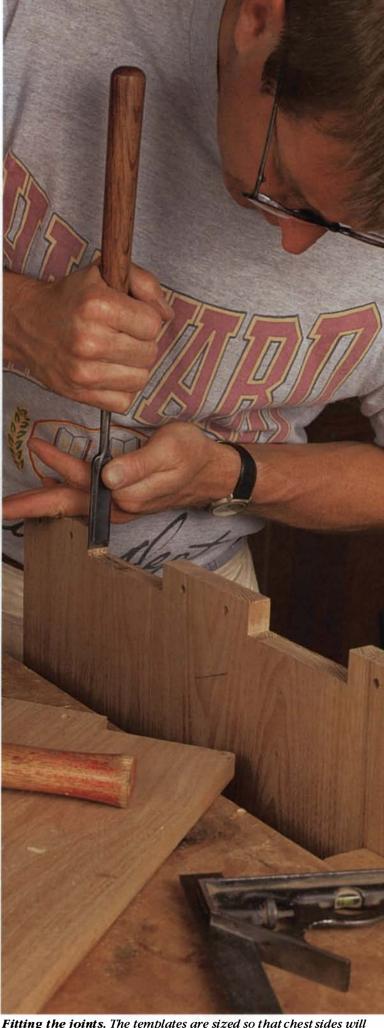
Bandsaw takes out most of the waste. The author removes all but the last ½16 in. of waste between the fingers.



Template routing ensures consistent results. With a bearing-guided bit and a template, the author produces joints of con-sistent width and depth. After completing a pass at half-depth, he makes a second pass with the bearing rest-ing on the routed por-tion of the finger joint.







Fitting the joints. The templates are sized so that chest sides will barely go together. This allows for some final fitting.

the end grain with a \%4-in. bit—about the right diameter for the shank of the 2\%4-in.-long #5 screws I was using.

Growing the sides, rabbeting the bottom—I routed a groove near the bottom of the chest for the bottom panel. The groove runs all the way across on the ends but is stopped on the sides. I also routed a rabbet around the bottom panel, so it would fit in the grooves. Then I finished the insides of the four side panels with a couple of coats of shellac, taking care not to let it drip into the joints. I left the bottom unfinished to let the cedar breathe.

Glue-up—With all these surfaces, the glue-up was tricky, so I wanted to simplify things as much as possible. I attached clamping blocks over each finger with double-faced tape and applied a light coat of glue to the end-grain surfaces to seal the pores. I pulled out all the clamps I would need, set them in a convenient place and opened their jaws. Then I quickly swabbed glue onto all the edge-grain surfaces of the finger joints, joined a side and two ends, slid in the bottom panel, attached the other side and clamped up. I checked the inside diagonals of the chest right away to make sure it was square. I cleaned up the glue squeeze-out with a chisel once it had become a little rubbery.

Screwing and plugging the fingers—After the glue had set up, I drove the screws into the fingers. The wenge plugs were cut just a 1/44 in. or so larger than the 1/4-in. plug holes. To make the plugs, I rough-milled the stock on the bandsaw and then, using a push stick and fingerboard, carefully cut it square on the tablesaw. I crosscut the plugs to length—about 3/48 in. long—and handplaned them to size using a bench hook. Then I used a stationary belt sander to put a slight taper on just the bottom third of the plugs. This made it easier to drive them home (see the top photo at right). I chamfered the tops of the plugs with a chisel, paring toward the center (see the photo at right).

Making the top

Breadboard ends are essential to keep a panel the size of this top flat. I decided that the best solution would be to use three discrete tenons with a stub tongue across the entire width of the top (for more on breadboard ends, see *FWW* #110, pp. 78-81). Once I was happy with the fit of the ends, I glued only the center tenon in place so that the panel can move with fluctuations in humidity.

Installing the hinges

For aesthetic and practical reasons, I chose butt hinges for this chest. I left the top oversized until the hinges were installed; then I marked the overhang and cut it to its finished size. The back edge of the panel sits flush to the back of the chest, and its edges overhang the chest equally on both sides, a bit less in front.

Marking and mortising the carcase—The chest was mortised for the hinges first. I clamped a batten on the inside of the chest, level with the top edge to give the router base more stability. I set the router bit to cut slightly less than half the diameter of the hinge pin. This makes the back edge of the top sit slightly above the back edge of the chest and helps the front sit flat.

After routing the bulk of each mortise, I cleaned and squared the corners with a paring chisel. I used a steel screw to cut the threads and then drove in the brass screws that came with the hinges.

Marking and mortising the top—With the hinges attached to the chest, I brought the top next to the chest for marking the mortises in the top. Then I routed and pared them out, just as I did with



Slightly tapered plugs seat easily. Wenge plugs are cut to length, planed to fit and then tapered so that they'll enter the squared screw holes easily. A dot of glue holds them in place.



Plugs are easy to chamfer. Chamfering all 40 plugs took less than an hour. Plastic laminate protects the chest when the author levers his chisel to pare the inner faces of the plugs.



Clean styling and simple construction make this chest a versatile piece of furniture and a relatively quick project to build.

the chest. To check the fit of the top to the chest, I put one screw into each leaf of the top panel, which allowed me to adjust the hinges if necessary. Once I'd positioned the top on the chest just right, I marked the overhang, took the top off the chest and trimmed the top to size. Then I sanded it and refastened the hinges, adding the other two screws in each hinge leaf on the top.

Later I added a brass lid stay to keep the top from flopping open and pulling out the hinges. Several coats of shellac finished off the chest nicely, giving me a beautiful home for my old sweater.

Gary Rogowski teaches woodworking and is a professional furnituremaker in Portland, Ore.



Japanese Chisels

With proper preparation, these tools take and hold a superior edge

by William Tandy Young

Thave a passion for chisels.

But when I first encountered Japanese chisels, I wasn't interested in them, despite the rave reviews. They were expensive and upkeep were expensive and upkeep seemed too bothersome. Because of the western and Japanese both Western and Japanese.

both Western and Japanese seemed too bothersome. Bechisels, and I wouldn't want to sides, how superior could they be without either. By adding be to my Western chisels? Japanese chisels to your tool I eventually gave in to my kit, you can bring hand-tool curiosity about Japanese chisperformance to a new level. els and tried a few of them (see the photo on the facing One word of warning, though: If you choose unsuitable page). For once, the tool hype Japanese chisels or you preis true: The laminated steel blade of a Japanese chisel pare them poorly, you will takes and holds an astounding be disappointed. edge. The distinctive hollow in

the back of the chisel reduces

its surface area, which makes it

easy to flatten the tool quickly

Japanese chisels are com-

pact and hefty. They're ideal

for striking with a hammer,

and they allow you to keep

your hands close to the work.

and precisely.

Shop-worthy chisels

Though Japan is famous for high-quality goods, it also produces lots of cheap, inferior merchandise—chisels included. I have a few low-quality Japanese chisels that are brittle and unpleasant to work with. I wouldn't recommend them to

HANDLE PREPARATION



Remove the factory coating from blade and handle. Soak new chisels in lacquer thinner.



Hammer the hoop squarely on the handle using a slightly larger hoop as a driving ring.





Carefully mushroom the end—Using a household iron, the author steams the handle butt. With glancing hammer blows, he peens the end as he rotates the chisel.

Completed handle butt—After peening, the end of the handle should be a neat, shallow dome that feels comfortable in your palm.

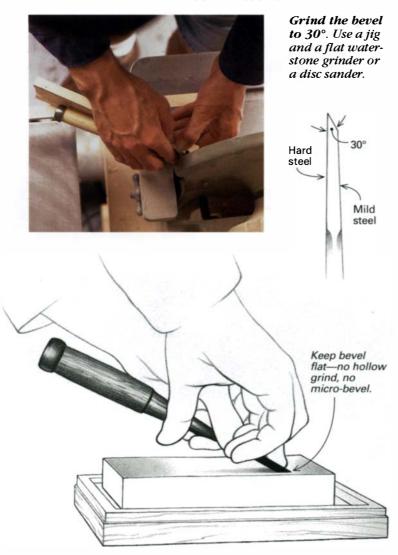
anyone at any skill level. Even if you're just starting out, try to get decent chisels so that you'll always enjoy using them, no matter how experienced you become.

Quality can be a hard thing to figure, though. From rare and exotic to common and cheap, Japanese tool quality is wide-ranging. It's hard to keep track of all the various names, steels, forging methods and toolmakers' reputations.

Japanese wholesalers and exporters add to the confusion by routinely changing the brand names of tools. The same Japanese chisel might be sold under several different labels in the West. That's why it's best to buy Japanese chisels from knowledgeable specialty dealers (see the sources box on p. 61). Get their help in matching a good-quality tool to your skill level and the type of work you do. Large Western

Photos: Alec Waters November/December 1995 59

GRIND AND HONE THE BEVEL



Once the bevel is re-established, hone the bevel on progressively finer waterstones. Keep pressure more toward the tip where the harder steel of the blade is.

tool retailers that sell Japanese tools as a sideline may not know much about them.

You also can ask woodworkers experienced with Japanese chisels for their suggestions. The ones I talked with steered me away from both the cheap chisels and the most expensive ones. They suggested basic, professional-grade chisels, made of durable, good-quality steel and plain oak handles, and common blade shapes. These everyday chisels, called oire-nomi, are great all-purpose tools, excelling at everything from musical-instrument making to timber-frame carpentry. They stand up to rugged use better than many of the more precious Japanese chisels that have ebony handles and ink-patterned, handhammered blades.

The first time that I ordered some *oire-nomi* chisels (expect to pay from \$15 to more than \$25 apiece for decent ones), there was a handwritten note at the bottom of the invoice that said, "These are simple, but tough." I knew I had bought the right ones.

Getting a Japanese chisel ready for use

Like many hand tools, Japanese chisels usually aren't ready to use right out of the package. Before I began tuning up my chisels for the first time, I sifted through all the advice that I had read or heard and then worked out the methods that follow. They may not be tradi-

tional, but these methods will help you get the best performance from your chisels.

Remove the coating—The first thing to do with new Japanese chisels is strip off the thick, protective coating. Soak the chisels in a container of lacquer thinner for a half hour or so (see the top left photo on p. 59). Remove each chisel, and slip the metal hoop off the top of the handle. Wipe the residue from the hoops and tools with thinner and a rag. Use a respirator and gloves, and exhaust the fumes while you do this.

Seat the handle hoop—After the coating has been stripped off, the hoops need to be driven onto the handles to seat them firmly in place. Japanese chisels usually are struck with a steel hammer for chopping cuts. A well-seated hoop prevents the chisel handle from splitting under such pounding. If any of the hoops have ridges or burrs on the inside that would prevent them from seating properly, file them smooth first.

The handles and hoops are paired in graduated sizes to correspond with blade widths. If you start with your smallest chisel, you can use the hoop from one of the larger chisels as a driving ring to seat the smaller hoop. You could also use a piece of pipe or an electrical coupling. With the tip of the blade pushed into a scrap block on the benchtop, hammer the hoops onto the handles (see the top right photo on p. 59). Seat the hoops so the handle protrudes about 1/16 in. If a hoop won't seat down on the handle that far, pull it off, and sand or scrape the handle slightly. If a hoop seats too far down the handle, carefully sand the excess handle end.

Peen over the butt—Once the hoops are seated, I secure them by peening over the handle ends. This can be tedious, but the tool handles will be

more durable and pleasant to grip. The end grain of each handle has to be softened so that you can hammer it into a dome. Dab the handle end lightly with water (don't submerge the hoop), and then touch it on a heated, inverted clothes iron for a few seconds. The heat and steam will soften the fibers.

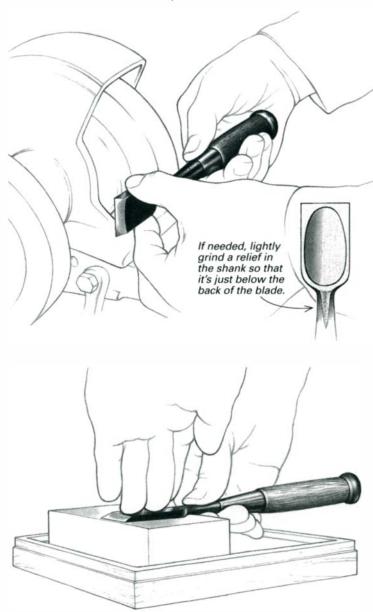
Jam the blade back into your wood scrap on the benchtop, and then start mushrooming the handle end evenly with light blows of a framing hammer (see the center photo on p. 59). Rotate the chisel as you go, and try to draw the wood from the center of the handle out to the edge with each stroke. Reheat the end of the handle often so that you can shape it neatly into a dome (see the bottom photo on p. 59) without mashing it into a pulpy mess. Let the peenedover ends dry out, and then give the handles two or three coats of Waterlox or Behlen's Salad Bowl oil.

Reshape the bevel—Most Japanese chisels have a bevel angle that's too low for kilndried hardwoods (about 25°). Re-establish the angle to about 30° (see the photo on the facing page). The exact bevel angle depends on the chisel and the kind of work that you do. The best guide is to raise the bevel angle until the edge no longer nicks or crumbles as you work.

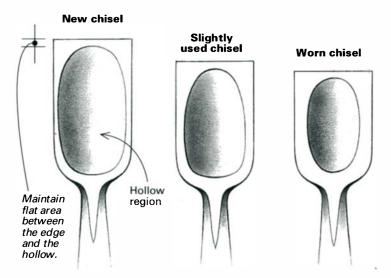
When you are changing the bevel angle, remember that Japanese chisels work best when the bevel is kept full and flat. Don't hollow grind the bevel, hone a micro-bevel or use other typical Western toolsharpening methods. The Japanese chisel blade is a sophisticated sandwich of hard and mild steel. The hard, delicate edge steel on the back of the blade needs the full support of the mild steel behind it for durability.

Hone the edge—After shaping the bevel, hone it on water-

RELIEVE THE SHANK, AND FLATTEN THE BACK



Flatten the back on waterstones, working the blade at a right angle to the length of the stone. Start with coarse stones (220 or 400), and then follow with finer ones (700 and higher).



The back of a Japanese chisel should be flattened initially and redressed periodically. Each time the back is flattened, the thickness of the blade is reduced, so the hollow shrinks and never reaches the cutting edge.

stones. I don't use a honing jig because some blade shapes aren't suitable for jigs. Instead, I use a two-hand grip (see the drawing on the facing page). With practice, it's not that hard to keep the ample bevel of a thick Japanese chisel blade riding flat on a sharpening stone. It's also not tedious because Japanese waterstones cut fast. I begin with a fairly coarse stone and quickly proceed through progressively finer grits. While honing, focus pressure toward the tip of the blade. (Waterstones abrade the mild steel at the rear of the bevel faster than the hard steel at the tip.)

Dress the blade back—You have to flatten the back of a Japanese chisel blade before you use it. And you should redress the back from time to time to maintain a cutting edge. Before flattening, check the back of the shaft above the blade. It should be flush with the back or slightly shy of it.

The shaft often is left proud by the maker. This hinders the accurate flattening of the blade back and restricts the range of the chisel. If the back of the shaft is proud, relieve it until it is barely shy of the blade back (see the top drawing at left). You can use a power waterstone wheel, a bench grinder or a 1-in.-wide belt sander, but don't touch the blade area itself. Relieving the shank slightly will not weaken the tool.

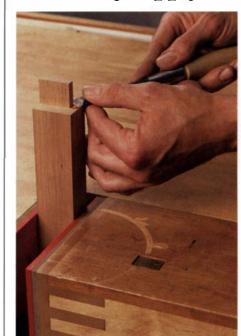
Hone the back of the blade until it's flat, starting with a coarse waterstone (220 or 400), followed by finer stones (see the center drawing at left). Rub the back on stones until the blade has an even, polished appearance overall.

Make sure that the hollow is encircled by a continuous rim of honed steel. This is critical at the tip of the blade, where repeated sharpening or bevel re-shaping can cause the back of the cutting edge to recede into the hollow area. If this happens, hone vigorously, beginning with your coarsest stone, until you re-establish a complete, flat rim of steel around the hollow (see the bottom drawing).

Once both sides of the blade are honed and brightly polished, lightly oil the blade with camellia oil or mineral oil.

William Tandy Young is a furnituremaker and conservator in Stow, Mass.

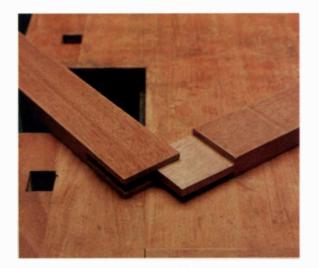
Sources of supply



Aqua Sharpening Stone and Tool, Inc., 819 Stannage Ave., Albany, CA 94706; (510) 525-8948

Hida Tool and Hardware, 1333 San Pablo Ave., Berkeley, CA 94702; (510) 524-3700

The Japan Woodworker, 1731 Clement Ave., Alameda, CA 94501; (800) 537-7820



The Slip Joint

This basic joint of the trade goes together fast and is designed to last

by Frank Klausz

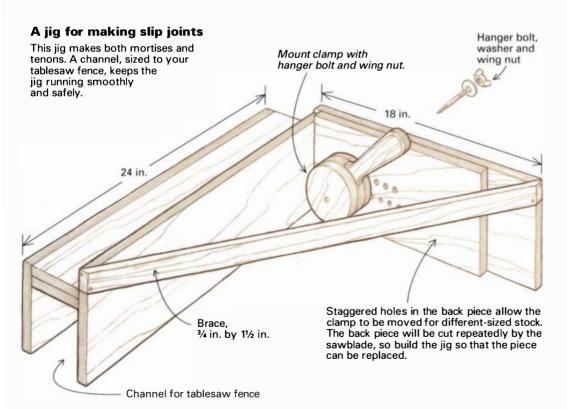
nome years ago, I went to see a show at the Metropolitan Museum in New York that featured artifacts from the tomb of the Egyptian king Tutankhamen. On display was a chair built around 1350 B.C., on which I could see a slip joint. There are reasons this joint has been in use for so long. Also called an open mortise and tenon, the slip joint is hard to beat for ease of assembly. And because of the large gluing area where the pieces meet, a slip joint holds up to a lot of stress.

I build and repair furniture for a living, so I'm interested in not only doing a job well but also doing it efficiently. Unless an architect or designer has supplied me with very detailed drawings, it is often up to me to decide what joinery to use for a given job. The slip joint is one of my favorites. A doweled butt joint may go together faster, but it's not nearly as strong.

Where to use it? If I have a cabinet that calls for simple frameand-panel doors, where rails and stiles are square-edged and the doors are inset, I don't have to think twice about which joint to use. For overlay doors, where the edges will show, I'd still use a slip joint, although I'd ask the clients first whether they had any objections to seeing end grain on the outside of the stile.

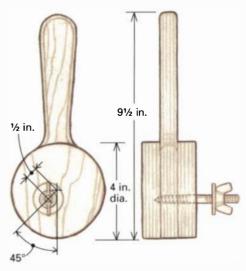
When I make a chair, I use this joint for the slip seat that gets upholstered and secured within the chair rails (see the photo above), because it's the best and most appropriate joint for the job. I don't do a lot of millwork, but if I were making window sash, I'd use a slip joint for the stiles and rails, even if the inside edges were shaped to a cope-and-stick profile.

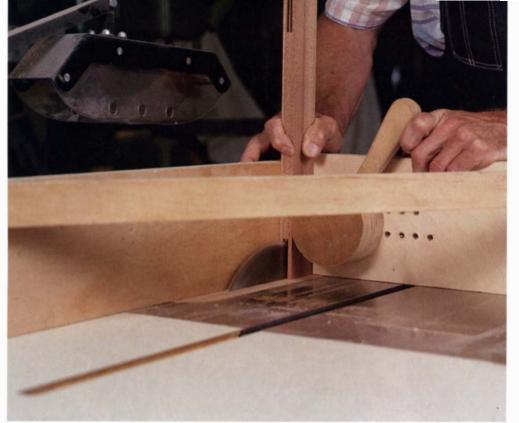
What I really like about the slip joint is how fast it is to cut and assemble. I use a jig that I designed several years ago for use on my tablesaw (see the drawing below). If you don't have a tablesaw, you can cut this joint by hand or with a bandsaw, as I'll explain later. With either of these methods, take your time. If you use a bandsaw, make sure that the blade doesn't wander.



Quick clamp

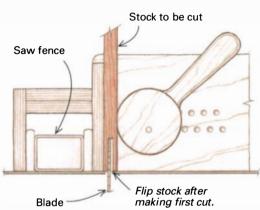
The eccentric clamp holds any thickness of stock tightly. The offset hole makes the clamp act as a cam.





MORTISE

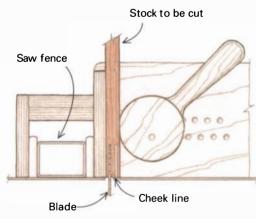
Cut the mortise first. With the clamp, secure the piece of stock to be cut firmly into the back corner of the jig. Make the first cut. Remove the stock, flip it around, reclamp it and make the next cut. Depending on the size of your slip joint, two passes are usually enough to complete the mortise. The one shown at left took three passes at two fence settings.





TENON

Change the setting from mortise to tenon. Use the mortised piece to reset the fence for the tenon cuts. Set the blade to cut on the other side of the cheek line. Always use scraps to test this fit. Once the fence is set, cut one side of the tenon, flip the piece in the jig and cut the other. Cut off the waste at the shoulder line later, using a miter gauge and a stop block.



Cutting mortises on the tablesaw—Whether you build a jig similar to mine or use a system of your own, start with the mortise when cutting this joint on the tablesaw. The beauty of this system is that you don't have to spend any time marking all the pieces with a gauge or pencil. The setup for the mortise is done by eye, and the tenon cuts are taken directly from the mortise.

When I was an apprentice, I learned to determine the thickness ratios of the mortise and tenon by dividing the stock into thirds. So a board ¾ in. thick would have a tenon ¼ in. thick, give or take. You can estimate the mortise dimensions without having to measure them. All that matters is that the pieces fit together well when you're done. I always make sure to keep some scrap pieces of wood on hand for setting up and testing the joints before I use the stock I've milled for the job. Test pieces should be of the same thickness and width as the stock you'll use later.

I make the first setup by cranking the sawblade up to the width of the stile. I place the jig over the top of the saw fence, which serves as a guide track, and clamp in a piece of scrap. I adjust the saw fence so that it's cutting into the middle third of the thickness of the wood. Then I push the piece through, flip it in the jig and push it through again. The first mortise is done. With the mahogany frame shown in the photos, my first setup left me with a sliver of waste between the first and second passes. I decided to leave it like that—making the tenon a little fat of one-third—and to make a second fence adjustment later to clean out the mortise (see the top photo on p. 63). Once I'm satisfied with the setup on the test piece, I can go ahead and cut all the mortises.

One important point: Keep your saw table free of debris that would prevent the wood from riding flat on the table. Also, be sure to clamp the wood firmly in the back of the jig. Losing track of either of these details will cause the mortises to be cut too shallow and out of square.

Cutting the tenons—After cutting all the mortises, I turn off the saw, leaving the last mortised piece clamped in the jig. I loosen the fence and tap it lightly toward the blade by the amount of the blade thickness (½ in. for most saws), as shown in the bottom photo on p. 63. With this setup, the cheek line of the mortise is cut on the inside of the sawblade, closest to the fence; the cheek line of the tenon is cut on the outside of the blade. Once the jig is at the new setting, I remove the workpiece and clamp in a fresh piece of scrap for a test tenon. I run the piece through the saw, turn it around and run it through again (see the top photo).

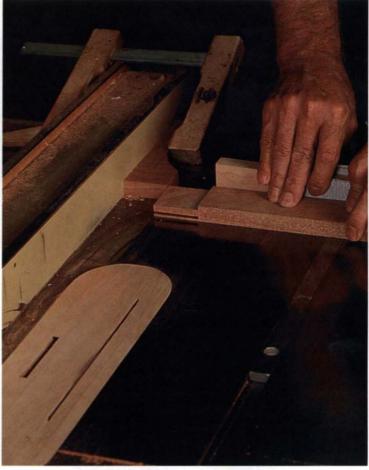
At this stage, I usually chop off the waste around the tenon, without marking it, to see if the tenon fits snugly into the mortise. (A handsaw or bandsaw works well.) I once asked my grandfather how tight this joint should be. He said, "If you need a mallet to force it, it is too tight and will split, but if you can use your hat instead of a mallet, it is too loose."

After these cuts have been made, the waste on either side of the tenon must be removed. I do that with the stock flat on the table. I remove the jig and dial the sawblade down to the right height to trim off the waste. I always clamp a stop block against the fence to serve as an index for trimming the cheeks to the exact shoulder line. The stop block also prevents the waste from being pinched between the fence and the blade. The miter gauge works well for this operation (see the photo at right). Getting this setup tuned correctly may take a few tries with scrap pieces, but the final trimming goes quickly. One tip—save your cutoff scraps as protective pads for gluing up the frames.

Frank Klausz is a cabinetmaker who makes and restores furniture in Pluckemin, N.J.



Cheek cuts for the tenon—To test the tenon setup, cut the cheeks first. The height of the sawblade off the table does not change. One pass per side is sufficient.



Shoulder cuts for the tenons are best done with a miter gauge. A scrap clamped to the fence acts as a stop. Self-stick aluminum carbide sandpaper on the miter gauge keeps stock from slipping.

Making the slip joint by hand



Mark the shoulder line. All pieces cut by hand must be marked on every side and end.



Mark mortises and tenons at the same setting. Fill in the scribed lines with pencil marks, so the lines are easier to read.

Cutting mortises and tenons by hand is neither as fast nor as accurate as the tablesaw method. But if you don't have the equipment or just prefer the look of handwork, this may be the way for you.

I start by looking over my milled pieces, deciding which will be the show faces and indicating that with a pencil mark. I save some marking time by ganging pieces together when I lay out the joints (see the top photo at left). I pencil in the shoulder line on the edges of four pieces at the same time and transfer those lines all the way around all the pieces. I then set my marking gauge to scribe the cheek lines (see the bottom photo at left). Mortises and tenons are marked with the same gauge setting. I just cut on different sides of the line-inside for mortises, outside for tenons. When I'm shaping this joint by hand, I always start by doing all the sawcuts first.

For the long cuts starting on the end grain, I prefer to use a wide-blade bow-saw (one of several my father made for me years ago when he came from Hungary to visit me). I clamp pieces in the vise in pairs to stiffen them and to make the process go a little faster. Remember to cut along the waste side of the marking-gauge line. I start the bowsaw at about a 45 ° angle to have a better view

of what I'm doing. I cut straight down the marked lines to the shoulder lines drawn in pencil (see the top photo at right).

To finish cutting the tenons at the shoulder line, I use a fine dovetail saw while holding the pieces against a bench stop, as shown in the photo at right. I am very careful to cut precisely to the waste side of each shoulder line. This is important. Otherwise, I may end up with uneven tenon shoulders and a joint that will have to be adjusted later.

After the sawcuts have been made, mortises must be chiseled from both sides. I keep the flat of the chisel true to the marked pencil line as I remove the material. I cut halfway through the first side and then flip the piece over and work in from the other edge. A good size chunk will often pop out in one piece when working the second side. When all the mortises are done, I begin fitting the pieces together. This process takes a while.

Handwork is handwork—it's just not as precise as machined joinery and you're bound to have some adjustments to make. You may have to remove some material from a too-fat tenon or from the inside of one of the mortise cheeks, depending on how the joint fits together. Rasps and paring chisels will perform well for those tasks (see the photo at right). If you cut the tenons too thin and the mortises too wide, you can add shims of veneer (preferably of the same species) as gap fillers when you reach the glue-up stage.

Assembly and glue-up: I use a white PVA glue, applying it with a ¹/₂-in. acid brush. After I've dry-fit and adjusted the frame, I apply the glue evenly on all sides of all pieces. Then I put clamps loosely on

each corner, using the scraps from cutting the tenons to protect the frame pieces. After that, I check the frame for squareness and make sure all the shoulders are tight. Then I tighten the clamps all the way, make a final check for squareness, wipe off any excess glue with a wet rag and put the frame aside to dry. Later, I'll clean up the edges with a plane, working in from the corners to avoid chipout.

I remember once as a young man watching my father work, asking him, "How can you do that so fast?" He replied, "Don't worry. After five or 10 years, you're going to be a good beginner yourself." And now, after 35 years, I'm still learning.

—F.K.



The bowsaw is Klausz's tool of choice for cutting this joint by hand because the long, wide blade tracks well and cuts quickly.



Cut the shoulders with a dovetail saw. For well-fitting joints, make sure that you cut to the same line on all the pieces.



Fine-tune the fit. Rasps and chisels are good choices for removing material from either the tenon or the mortise. Hand-cut frames need many test runs before you can call them done.



Orchard Woods

Jewel-like boards take effort to prepare but are worth the trouble

by Jon Arno

e were driving along a rural road near Traverse City, Mich., four teen-age boys in a new, 1957 Pontiac station wagon, on our way home from a camping trip. Cherry trees peppered the rolling landscape, and along the side of the road were scattered piles of orchard trimmings. Cut to firewood length, the wood was being thrown into the back of a pickup truck by orchard workers. I persuaded my companions to stop, and I negotiated for a dollar's worth of the choicer pieces—a half-dozen 18-in. logs, maybe 8 in. or so in

diameter. So began my love affair with orchard woods.

In the decades since, and over many miles of widely scattered rural roads, I've stumbled upon countless finds of apple, peach, plum, orange, pecan, walnut and other fruit- and nut-bearing species. Most of it was free for the taking. It still amazes me that these beautifully figured and brilliantly colored woods often serve no more enduring a purpose than to warm the back of someone's legs on a cold winter night.

So why don't more woodworkers tap this bountiful source of



beautiful woods? Convenience is probably one of the main reasons. It's a lot easier to go down to the local hardwood lumber dealer and buy bigger, wider boards that have been kiln dried and are ready to work. It requires effort to gather, saw and season orchard woods, and results are far from guaranteed. A simple jig, however, can make it a lot easier to turn logs into boards (see the box on p. 68), and there are a number of tips I've learned over the years that will help minimize loss while the boards are drying (see the story on p. 69).

The benefits of foraging and processing orchard woods are qualitative, not quantitative. Even though the boards you get from any given batch are rarely sufficient for a major piece of furniture, the special character of this wood is precious beyond the time and toil expended. And for many woods, including virtually all of the fruit woods except cherry, gathering and seasoning your own may be the only way to get it.

Many varieties, but most are related

At first blush, the scores of fruits and nuts grown domestically would suggest a great diversity of wood to be foraged. Genetically, however, only three botanical families account for the vast majority of cultivated species. With a few choice but relatively



Not just for tool handles. Orchard woods, like the pear used in the veneered cabinet at left by Dan Grenier, can become the raw materials for handsome furniture.

Bottom photo: David Welter November/December 1995 67

rare exceptions (persimmon, an ebony relative, comes to mind), orchard woods fit neatly into the rue, walnut and rose families.

The rue family, Rutaceae—Although much manipulated by horticulturists over the centuries, all varieties of orange, lemon, lime and grapefruit trace their origins to closely related Southeast Asian members of the rue family. Because trees in this family are small, they produce few timbers of commercial importance. Members of the citrus genus are the only species in this family commonly cultivated in North America.

Despite substantial differences in their fruits, the woods of all varieties of citrus are virtually the same: very fine-textured, strong, hard, elastic, creamy yellow with occasional grayish-tan streaks in the heartwood. In most respects, citrus woods work like maple, and they perform exceptionally well on the lathe.

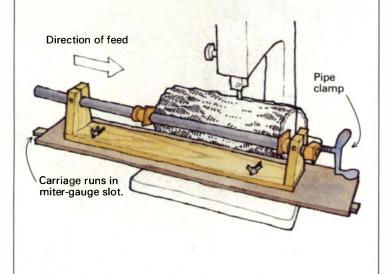
The walnut family, Juglandaceae-Our most plentiful nutproducing species, black walnut, belongs to this family. It needs little introduction to most woodworkers because it produces one of the finest cabinetwoods in the world. But the working characteristics of some of the other species besides walnut vary considerably. Hickory is a member of the walnut family and is one of the hardest of our domestic cabinetwoods. Butternut, which is

Resaw jig for the bandsaw

If you want to do anything with orchard woods besides turn them on a lathe, you first have to turn logs into boards. A well-tuned bandsaw and a sharp blade will take you a long way toward that goal, as will keeping your pieces to a reasonable length-no more than 3 ft. or so. The trick is holding the log in position while you maneuver it

through the blade and keeping the cut straight.

A carriage of some sort is needed. Over the years, a number of them have appeared in the pages of Fine Woodworking. The simplest, and possibly the best, was one that appeared in the "Methods of Work" section of FWW #84. The idea came from Mr. E.G. Lincoln of Parsipanny, N.J.



closely related to walnut, is among the softest.

The walnut family consists of two main groups. The walnut group includes black walnut, English walnut and butternut. These woods all are moderately coarse-textured, semi-ringporous and range in color from light tan to chocolate brown.

The hickory group includes hickory and pecan. The cultivated pecan, C. illinoensis, has a soft, cinnamon-brown color. Hickory is lighter and more yellow than pecan. Both are extremely hard, strong woods.

The rose family, Rosaceae—Orchard woods in the rose family are diffuse-porous and fine-textured. Their figure usually is subtle, but naturally occurring stains are common sometimes resulting in wood as vividly colorful as Gonçalo alves or rosewood.

The rose family consists of two main groups. The apple/pear group includes apple, pear and crab apple. These woods are fine-textured, hard, light in color and usually not figured. Dyed black, pear has been the traditional wood of choice to use as an ebony substitute because of its extremely fine texture.

The cherry/plum group includes cherry, plum, peach, apricot and almond. These woods tend to be darker in color and somewhat softer than apple or pear, often with a pinkish hue and fine amber bands highlighting the annual rings.

Growing trees for fruit alters the wood

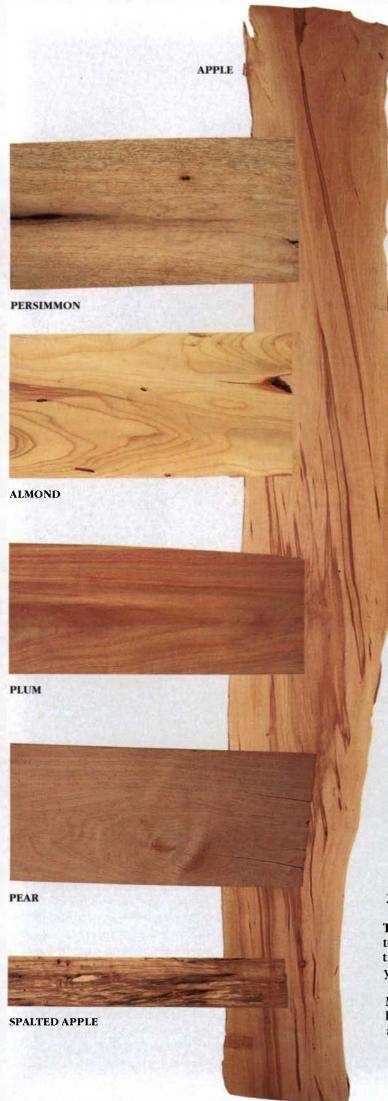
Growing conditions and the way the trees have been manipulated to maximize fruit production strongly affect what the wood looks like and how it acts long after it's cut and dry. For example, most orchard trees are the result of the graft of a scion of a particularly desirable fruit-producing species onto the root stock of a more hearty, disease-resistant variety. The result is a beautifully marbled appearance where the two species meet, with light and dark swirls that neither species produces alone. When English walnut, Juglans regia, is grafted onto the root stock of one of our native walnuts (either black walnut or the northern California walnut, J. hindsii), the result is called claro walnut, a wood that is highly prized for gunstocks. Many varieties of orchard-grown fruit trees, especially apples, are grafted similarly.

Another influence on the wood is the annual pruning most orchard trees receive. Pruning results in an abundance of crotch figure and other intricate patterns of wavy grain as the severed branches heal. Pruning also typically allows pigment-producing fungi to invade the tree. The fungi may spalt the wood or may cause the tree to produce natural antiseptic compounds that polymerize into pigments. Either way, the result can be a kaleidoscope of color. In an apple log, because of the wood's light creamy-tan color, the effect can be particularly stunning.

Beware of reaction wood

Pruning also creates highly unstable tension wood along the upper side of the branch. This reaction wood, capable of as much as 5% longitudinal shrinkage, is trapped by adjacent normal tissue, which hardly shrinks at all in length. As it dries, the reaction wood will either bend or twist the board. Or the surrounding wood tissue will hold the reaction wood in place, which causes the reaction wood to fracture, forming fine crossgrain checks. The telltale signs of reaction wood are streaks or patches of bland, lusterless wood, often with a fuzzy texture. Reaction wood usually is lighter in color than the surrounding heartwood and has a dull-gray or dirty, yellowish cast. \Box

Jon Arno is a woodworker and wood consultant in Troy, Mich.



Tips for drying orchard woods

Processing orchard-grown wood into seasoned lumber requires special care. Here are some basic tips I've gleaned from 30-odd years of trial and error.

Cut the green logs into boards or flitches as soon after harvesting as possible. Don't dry excessively large pieces of wood with the intent of cutting them into more usable sizes later. The thinner you cut the stock initially, the quicker it will dry and the easier it will be for the boards to relieve drying stress without developing serious splits.

Coat the ends of each piece with a heavy sealer to prevent checking. I dilute yellow glue with warm water (about two-parts glue to one-part water) so that the mix will have a brushable consistency. Commercial sealers also are available, but I prefer glue because it seems to bond together any minute end checks that may have formed already. If the checks are ½16 in. or more deep, trim the ends of the boards before coating.

Stack the lumber in a stickered pile using thoroughly seasoned stickers ripped to a uniform thickness. Space the boards in each layer so that air can flow up through the pile as well as horizontally through the gaps between the boards.

Leave the pile uncovered until the boards are dry to the touch (usually about a week to 10 days). This minimizes the risk of blue staining from fungus and is especially important when drying light-colored woods such as apple, pear or one of the citrus species.

Once the boards are surface-dry, cover the pile with a plastic tarp. Weight down the pile with cement blocks, stones or other heavy objects. The weight helps prevent the boards from distorting, and the tarp helps slow the initial drying rate.

Inspect the pile frequently. If beads of moisture are forming on the inside surface of the tarp, lift the edges to allow increased air flow.

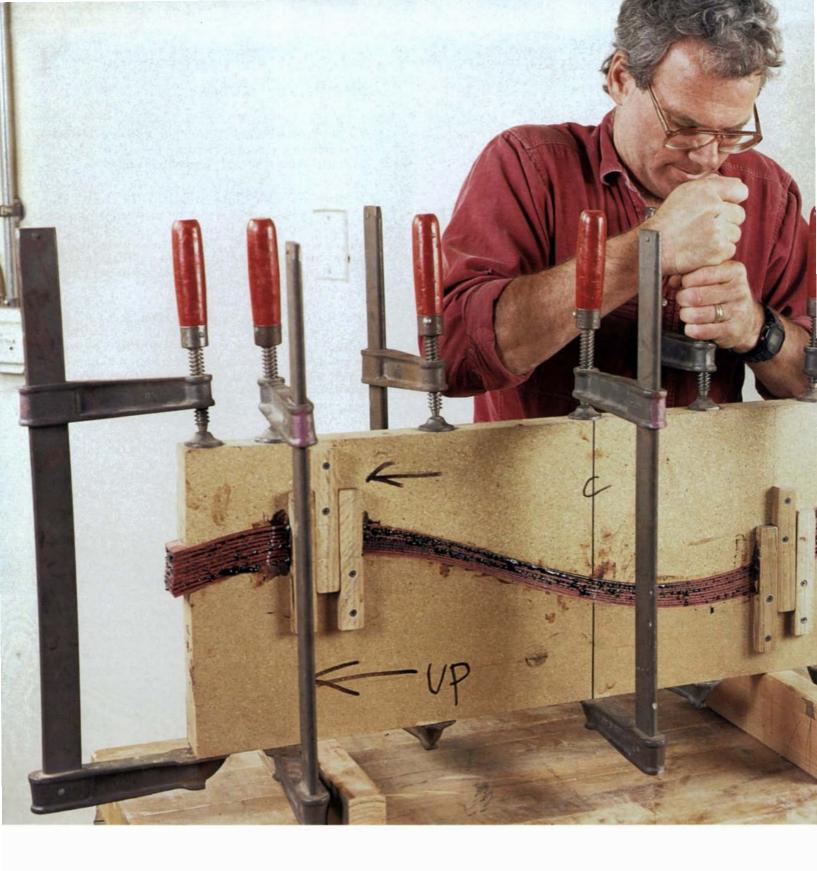
Remove the tarp after several months of drying as long as the pile is otherwise protected from precipitation. In northern climates, where the winter temperatures halt the drying process, it's worth the extra labor to move the lumber inside and then restack it.

Don't rush the process. There is absolutely no chance the wood will become too dry. Stickered lumber that's about 1 in. thick should be left to dry for a year before use. Stock that is 2 in. or thicker may require even more drying time.

Test a sample before use. Rip it down the middle, and attempt to sand this freshly cut surface. If the surface tends to fuzz up or the sawdust sticks together when compressed in the palm of your hand, the moisture content is still too high.

Mentally prepare yourself for a very high loss of stock because of drying problems. Horrendous checks, splits, cup and bow just happen. Having to scrap as much as half of a batch of orchard wood is not that uncommon.

—J.A.



he completed music stand, with its curved legs and pedestal, looked great in the San Diego State University shop where I made it as a student. The stand seemed like a perfect gift for my father, a concert violinist in Corpus Christi, Texas. This was my first bent-lamination project, and I was very pleased with the results and anxious to send it on its way. Little did I know that soon the stand would be back for repairs because I had

made the mistake of using yellow glue for the laminations. Even after the glue was fully cured, it continued to creep with changes in the temperature and humidity; the glue even began squeezing out from between the laminations. The smooth, curved surfaces gave way to a rough, bumpy texture. I ended up refinishing that stand three times before the problem was brought under control.

That was 20 years ago, and despite my

rough start, I'm sold on the possibilities of bent lamination. Curved shapes add movement and life to my furniture designs. But many of the species that I want to use don't steam-bend well, and band-sawing curves from solid stock can result in weak furniture parts.

Bent lamination, which is simply gluing a series of thin plies together over a form, provides strength and allows a greater freedom of wood choice. Many people



Bent Lamination

Accurate forms, thin strips of wood and the right glue vield flowing curves

by John Michael Pierson



Coaxing plies into shape requires a strong form and heavy-duty clamps (left). Bent laminations make furniture, such as this tea cart, graceful, light and strong.

hesitate to try bent lamination because they think that it's too difficult. Nonsense! Making bent shapes is relatively easy.

Parts can be built up with uniformly thick plies. Or for a more dramatic effect, you can taper the plies to develop finished parts of varying thicknesses (see the story on p. 75), as I did on the tea cart in the photo above right. The procedure I'll describe works equally well on tapered plies or plies of uniform thickness.

Choosing wood and ply thickness

Ash, oak and other tough, long-grained woods bend more easily than brittle, short-grained woods like mahogany and purpleheart. But any wood can be bent if you use the proper ply thickness for the desired bend radius. This relationship is about 50:1. So, for example, a 5-in.-radius bend would use plies 1/10 in. thick.

Also, keep in mind the more plies the less springback after the laminate is re-

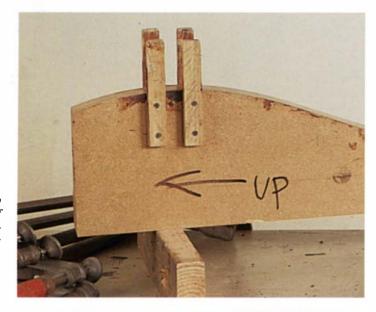
moved from the form. Success depends on the quality of the individual boards. Knots, erratic grain and uneven thickness will give poor results. Stock must be made from clear, straight-grained lumber that's surfaced flat with at least one jointed edge.

Accurate form, accurate bend

The bending form can be a shaped piece of stock to which the plies are clamped, but I generally prefer a mating, two-piece form.



Making a pattern saves time. Identical layers of form stock are made by pattern routing with a flush-trimming bit.



Alignment keys keep the two halves of the form meshed correctly and prevent plies from side slipping.



Wax forms thoroughly, especially around the keys, so they don't stick together. Forms should get two coats of finish first.

It's harder to make, but it captures the laminates and distributes pressure evenly with fewer clamps. This makes glue-up faster and gluelines nearly invisible.

The form must be strong and accurate because thin plies will conform to any bump or irregularity. I build up the forms with layers of medium-density fiberboard (MDF) or particleboard to match the width of bending plies (plus an extra ½2 in. of clearance between the edge of the laminates and the edge of the form). If needed, I'll use a thin plywood shim between layers of MDF to make a final adjustment in the form thickness.

The best way to get identical form pieces is by pattern routing. Bandsaw and carefully shape a full-sized pattern from \(\frac{1}{4} - in. \) MDF. It's much easier to shape a single 1/4-in.-thick pattern accurately than it is to shape a number of ¾-in. or thicker pieces of form stock. Screw this pattern to a piece of MDF or particleboard, and bandsaw the rough shape, staying about 1/16 in. to 1/8 in. away from the pattern. Then, using either a hand-held router or a router mounted in a table, trim the excess stock to match the pattern with a flush-trimming bit (see the top photo at left). Pattern rout as many layers of form material as necessary to build up the needed thickness, and then glue, align and clamp the layers together.

Upright forms let glue cure faster

Feet glued and screwed to the bottom of the form hold it upright and provide clearance for the jaws of the clamps. This upright arrangement promotes air circulation and faster glue curing. Also, it's easier to see what you're doing when you're tightening the clamps.

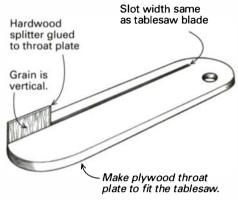
I also add alignment keys to my forms. They are just pieces of hardwood, ½ in. by ½ in. by 8 in., screwed and glued to the sides of the form. The keys (see the center photo at left) speed glue-up dramatically by ensuring the exact location of the mating halves and preventing plies from slipping off the form's side. I line the matching edges of the keys with two layers of masking tape when attaching them to the form. When I remove the tape, there's a slight clearance between keys so they won't bind. A generous chamfer on the inside faces and matching edges of keys allows smooth engagement of the keys when the form halves are brought together.

I finish the forms with two coats of Varathane Diamond finish, a fast-drying, water-based topcoat. Then I apply paste wax (see the photo at left) to all the parts that will come in contact with glue and buff out the wax thoroughly.



Throat plate and splitter for ripping thin plies

A dedicated throat plate for ripping plies minimizes the risk of kickback and ensures good results. Cut the slot with the blade used for ripping the plies. The splitter height should be slightly lower than the thickness of the stock being ripped. the stock being ripped. Locate the splitter close to the back of the blade.





Test a ply by bending it over the form. If the ply bends easily, the thickness is correct.



A stippled roller helps spread the glue with speed and consistency. Apply glue to all but the two faces that will contact the form.



Start clamping in the center, and work out to prevent bubbles between plies.



Use plenty of clamps, and space them so the plies are compressed against the form. To avoid springback, keep the clamps on the form until the glue has completely cured.



Separate the form. Sometimes a rap with a well-placed chisel and mallet is needed to free the cured part.



Grind off glue. A coarsegrit sanding disc and minigrinder quickly remove squeeze-out once the glue has dried.

Consistent plies give best results

When the form is completed, rip the plies with a tablesaw. Start by drawing reference lines on the stock (see the photo at left on p. 73) so that the plies can be reassembled in the original order for grain continuity. Set the fence-to-blade distance at ½ in. This should put you in the ballpark on thickness, but you should cut a test ply to see if it's flexible enough. Bend a test ply by hand (no clamps) in your form to test for flexibility (see the photo at right on p. 73). It should bend easily. If you hear the sound of cracking or see visual fractures, the ply is too thick. Bump the fence over ½2 in., and try again.

Once you're satisfied with the bendability of the test ply, rip the rest of the plies and stack them in their original order. I rip plies less than 2½ in. wide on the tablesaw; for wider plies, I use a bandsaw. Try to keep the board moving without pause, from the beginning to the end of the cut. This minimizes sawmarks on the ply faces. As you feed the board, be sure that the edge stays against the fence. When some discrepancy develops after cutting a number of plies, simply re-joint the edge, and go back to ripping. Assuming your finished lamination will be of uniform thickness, your goal is to produce consistent ply thickness. Sawmarks do not interfere with a good glue-up nearly as much as erratic thicknesses in plies.

Use a throat plate and splitter

Ripping thin stock on the tablesaw is intense business, but there are ways to make it safer. It's absolutely necessary to make a special throat plate that has a slot only as wide as the blade (see the drawing on p. 73). This throat plate prevents a thin ply from being sucked down the wide slot of a standard throat plate, possibly resulting in an accident. A wooden splitter mounted on the outfeed side of the plate adds another level of safety and prevents the flexible ply from bouncing against the blade. The height of the splitter should be slightly less than the stock thickness so that it won't interfere with the push stick.

Use a substantial push stick like the one shown in the photo at left on p. 73. It is important to keep the stock flat on the table. Don't allow the front end to rise up at the beginning of the cut, as is its tendency. Wrap your thumb and index finger around the handle of the push stick, and hook your third and fourth fingers over the top of the tablesaw fence. If the push stick kicks out from underneath your hand, the position of these fingers over the fence may prevent your hand from falling onto

the blade. Be certain to continue pushing the stock completely past the back of the blade before lifting off the push stick. The push stick will pass directly over the blade during the completion of the cut. Do not readjust the position of the push stick during this stage.

Place the push stick against the tablesaw fence, and press down firmly on the stock as the end of the board approaches the blade. Keep it in this position until it clears the back side of the blade. When the stock has been cut down to $2\frac{1}{2}$ in. wide, you can change to a narrower push stick to maintain a good purchase, or you can cut the plies on the waste side of the blade. Sanding the plies after ripping isn't necessary.

Slow-setting glues work best

I usually use Urac 185 urea formaldehyde glue for the plies (Cytec Industries Inc., P.O. Box 32787, Charlotte, NC 28232; 800-243-6874). It has a long pot life (it doesn't harden too quickly after you've mixed it), dries hard, doesn't creep and won't clog sanding discs when you grind it. Plastic resin glue, another form of urea formaldehyde, also will work and is more readily available in small quantities.

Yellow and white woodworking glues don't work as well for laminating. They remain somewhat plastic, even when cured, allowing glueline creep and springback. They also set too quickly, which can be anxiety-producing when clamping takes longer than expected. If the glue skins over before clamp-up, there is a chance of delamination (possibly after the piece is completed and delivered).

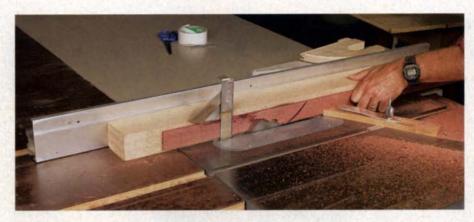
Epoxy works best for oily woods like teak. The glue must be fully cured before unclamping to control springback and to prevent delamination.

How to glue up

Before applying any glue, place the dry lamination stack against the form face, adjust the plies so that the middle of the stack is aligned with the middle of the form, and draw a reference line across plies and onto the form. This reference line will help you see excessive slippage during glueup, which would reduce the usable length of your finished piece.

Using a stippled roller (sold at larger paint stores and used for applying contact cement), apply a thin layer of glue to each face of the plies except the two surfaces that will contact the form (see the top photo on the facing page). Then set the stack against one face of the form. Be careful to align the reference mark on the stack with the matching mark on the form. Clamp

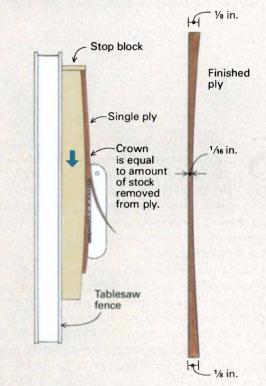
A tapering jig for contoured parts



Tapered bent laminations add another dimension to my furniture designs. To get this effect without bandsawing through plies and disrupting the grain continuity in the finished piece, I taper the ply thickness first. I make a jig similar to a standard tapering jig, except I create a slight crown along the length of the jig equal to the amount of stock that I want to remove (see the drawing at right).

In use, I simply attach the plies, one at a time, to the jig with three patches of double-faced tape and re-rip all the plies for a thinner center section.

Other contoured forms are possible with this approach. For example, with a convex curve, the jig will produce plies with a thicker center section, and a straight taper jig will give uniformly tapered plies. —J.M.P.



across the center. I prefer to use heavy-duty bar clamps to reach the center of the form. Pipe clamps are less satisfactory because their shallow jaws tend to pull the form to one side.

Position and tighten the center clamp first, and then work toward each end. This will prevent trapping a wrinkle in the lamination. There's no magic to spacing the clamps; just use enough to compress the stack uniformly along the entire bend (see the photo on p. 70).

Plies probably will slip and slide around as excess glue is squeezed out. If necessary, release the clamp pressure, readjust the plies and clamp again. Allow the glue to cure thoroughly—this is very important. Prematurely releasing the part from the form will result in springback.

Knock the cured piece free

After the glue is cured, remove the clamps, and tap the bent piece with a mallet to pop it off the form (see the bottom left photo on the facing page). Especially stubborn pieces may require a sharp tap with a chisel between the lamination and the form.

Once free of the form, I clean off the hardened glue with a 24-grit sanding disc in a mini-grinder (see the bottom right photo on the facing page). If you are gluing up duplicate parts, carefully clean off any dried glue residue on the form, reapply paste wax and buff it out. You're now ready for another glue-up.

John Michael Pierson, a professional designer/crafisman and professor of applied design, lives in Lemon Grove, Calif.

Drawing: Matthew Wells November/December 1995 75

Screws for Woodworkers

For best performance, choose the right screw, and install it properly

by Sandor Nagyszalanczy

Crews will never take the place of traditional joinery, but I can't imagine woodworking without them. What other fastening device so small, simple and inexpensive is capable of such extraordinary feats of joinery? Screws help build frames and carcases, mount hardware and trim, and attach tabletops to aprons—all with speed and ease. And even though screwed-together assemblies are strong, they generally can be taken apart if the need arises.

Of the woodworkers that I've visited recently, most use standard tapered wood screws, drywall screws or hardened-steel production screws for everyday tasks. Each type of screw has different characteristics that make it better for some jobs than for others. The drawings on pp. 77-79 show the basic shape of each screw. Depending on the screw and the material that it's being driven into, you'll need to prepare a different kind of pilot hole to get the best fastening performance. I'll tell you more about that later.

Flat-head screws are by far the most common, but there are lots of head types and drive styles to choose from. Each head type is appropriate to a particular application (see the photo on p. 78). The traditional straight drive slot is still used on standard wood screws, but drywall and production screws use Phillips and square recess drives. These drive configurations are more secure, making them much easier to use with power drivers (see the drawings on the facing page).

Standard wood screws—When someone says "wood screw," most of us picture a pointed, tapered-body screw. It's commonly available with either a straight drive slot or a Phillips-drive recess and three head types: flat, round and oval. Standard wood screws have the greatest range of sizes, from a #0 (about ½ in. dia.) by ¼ in. long to a #24 (about ¾ in. dia.) by 5 in. long, which makes them the only choice when you need a very small or very large screw. And these screws are good for everyday fastening tasks as well as for restoration and reproduction work.

These screws require a stepped pilot hole of two diameters one for the threaded part and the other for the thicker, unthread-



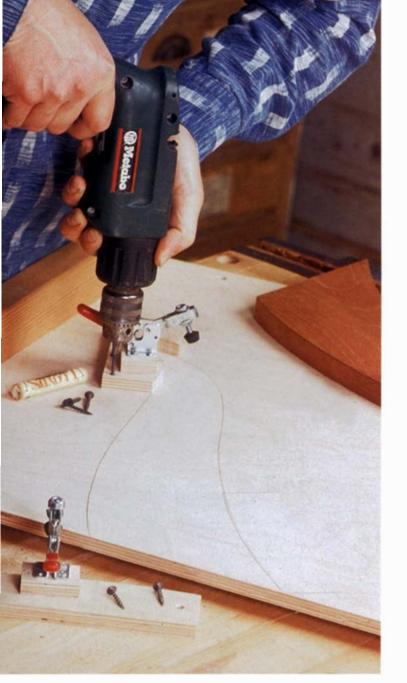
A good selection of screws and a power driver will handle a variety of fastening tasks, but choose the right screw for the job.

ed shank. Pilot holes must be carefully sized to prevent screw breakage (see the chart on p. 78). The thick, shallow threads found on these screws don't bite into wood as aggressively as deeper threads do, so standard screws don't hold as well as the newer hardened-steel production or drywall screws.

Drywall screws—Readily available from most hardware outlets, drywall screws are hardened-steel fasteners used for attaching wallboard to studs. These screws have a Phillips-drive recess in a thin, flat head. The generous radius under the head (called a bugle head) allows the screws to be set below the surface of drywall without tearing the paper. The screws are sold with black-oxide coating or zinc plating to give them a modicum of corrosion resistance. And the sharp points and straight shanks make it easy to drive them into metal studs.

All of this is great for drywallers but not necessarily for woodworkers. Drywall screws are strong. However, they are hardened to the point of being brittle, making them a poor choice for assemblies subjected to a lot of punishment. Drywall screws are

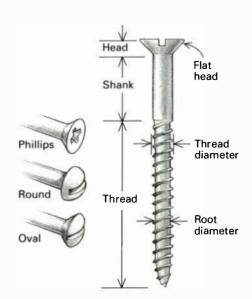
76 Fine Woodworking Photos: author

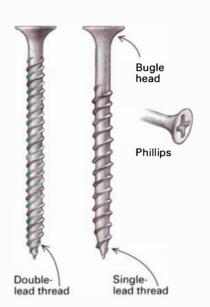


Screws

Standard wood screws

These screws are available in a wide range of sizes, from 1/4 in. to 6 in., and have either a slotted or Phillips drive. Common head styles are flat, round and oval. The thick shallow threads and large-diameter shank require drilling both a shank hole and a pilot hole.





Drywall screws

Drywall screws have a Phillips drive and are made of hardened steel. A pilot hole is not necessary except in the hardest woods. The bugle head is self-seating in soft woods. The double-lead thread pattern (left) provides a tight grip in thin, metal studs. The sharp, single-lead thread (right) works best in wood.

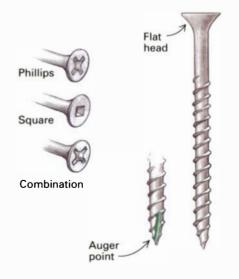
available with shallow, double-lead threads as well as larger single-lead threads (see the center drawing at right). Single-lead threads grip better in wood, double lead in metal.

These shortcomings don't mean that drywall screws have no place in the small woodshop. Because they are inexpensive, I use them for many less-demanding jobs around the shop, such as for jig construction or for cobbling up temporary supports when assembling larger cabinets.

Hardened-steel production screws—Hardened-steel production screws (for example, installation screws, particleboard screws, deck screws) are strong and versatile. They're my fastener of choice for all manner of demanding furniture- and cabinet-assembly tasks. Production screws are made of high-quality steel, heat-treated for strength and greater elasticity to resist head stripping and breaking. The deep, sharp threads wrapped around a straight shank bite more firmly into wood fibers than the thick, shallow threads found on standard wood screws. And production screws are more resistant to pullout—I trust them to

Production screws

Strength and sharp threads make this fastener an excellent choice for wood. A pilot hole is generally not necessary in softwood. The auger-point version drills its own hole in hardwoods. A broad range of sizes in Phillips, square and Phillips-square combination drives are available.



Drawings: Bob La Pointe November/December 1995 77

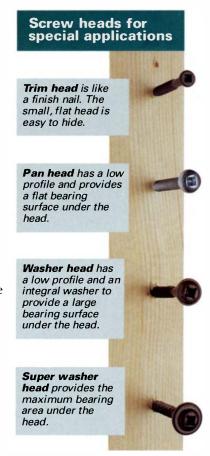
hold, even when they're driven into the end grain of solid hardwoods and the edge of plywood and particleboard panels. These screws are available in a range of sizes from #4 by 3% in. long to #12 by 4 in. long, and they are available with a Phillips-

drive, a square-drive or a combination Phillips/square-drive recess.

Steel screws: a good choice for most jobs

Steel is the most common material used for screws—it's strong and inexpensive. The strength of the high-quality, heat-treated steel of production screws is superior to the mild-steel used in standard wood screws.

Steel screws are plated with different metals to enhance corrosion resistance and to match other hardware. Screws with decorative platings work best indoors. The rust-resistant plating, usually a thin layer of zinc. chips off around the drive slot, so the screw will rust when used outdoors. Although this may not affect the strength of the fastener, it usually results in rust streaks, which discolor the surrounding area.



Screws made of weather-resistant materials, like brass, bronze and stainless steel, can be both decorative and corrosion resistant. In general, these materials are weaker than steel. To prevent the screws from breaking, size the pilot hole correctly: too small and the head may twist off (see the chart below).

Pilot holes: to drill or not to drill

A standard wood screw isn't very good at making its own hole, so you need to drill a stepped pilot hole, correctly sized to the screw. You can use two drills and a countersink, but that method is slow when you have to prepare a lot of holes. Most woodworking suppliers sell special bits that create a pilot hole, shank hole and countersink in one operation. I've used a high-quality taper bit and countersink for years. These bits have adjustable collars to control the depth of the countersink. You can counterbore a hole in the same step by setting this collar farther up on the shank for a deeper cut.

With their thin shanks and sharp threads, drywall and production screws can be driven into softwoods, plywood and some hardwoods without making pilot holes. Some production screws are available with a special self-tapping point that drills its own hole in hardwoods (see the bottom drawing on p. 77). However, in really hard woods, it's best to drill a pilot hole and countersink for a flat-head screw to avoid splitting the wood or snapping the screw.

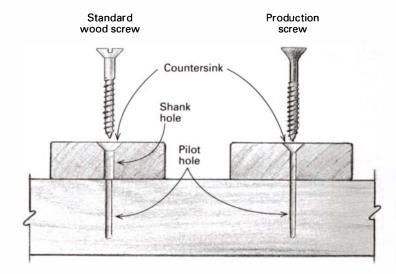
A shank hole lets the screw turn freely—When using drywall screws and production screws, it's tempting to skip drilling a hole for the shank. When fastening two pieces of stock togeth-

er, however, a shank hole allows the screw to turn freely in the first piece, so the screw can pull it tightly against the second piece. A shank hole is necessary for screws that are threaded all the way up to their heads. If the threads are engaged in both pieces, the parts can't be pulled tightly together.

Drilling a separate shank hole isn't always necessary. The shank diameter of a production screw is about the same as the root diameter of the threaded part of the screw (see the drawing below right). If the unthreaded portion of the shank is long enough to extend through the first workpiece, that portion of the screw will turn freely in a shank-diameter pilot hole while the threaded portion bites into the second workpiece.

Another way to avoid drilling a separate shank hole is by clamping parts tightly together before driving a screw. This

Pilot- and shankhole clearance



works well if you're using fully threaded drywall screws. This method also prevents chips and sawdust created by the driven screw from getting between workpieces, which keeps them from pulling tightly together.

To determine the correct pilot-hole diameter for any given screw, I check a chart of standard wood-screw sizes and corresponding shank-hole and pilot-hole diameters for hardwoods and softwoods (see the chart below).

If I'm not sure of the screw size, I measure its root diameter with a dial caliper. The reading I get determines the size of the bit I use for the pilot hole. If I am driving screws into very hard

Recommended drill diameters

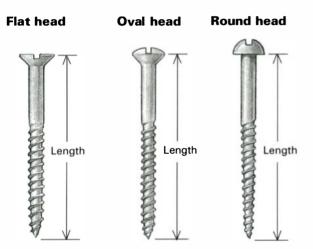
Here are the best drill diameters to the nearest 1/64 in.

Screw gauge	Pilot hole (hardwood)	Pilot hole (softwood)	Shank hole	
#4	5/64	1/16	1/8	
#6	7/64	3/32	9/64	
#8	1/8	7/64	11/64	
#10	9/64	1/8	3/16	
#12	5/32	9/64	7/32	



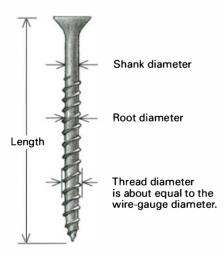
The box label gives the wire-gauge size, length, head type, drive type and material or plating.

Measuring screws



Length is measured from the tip of the thread to the edge of the bearing surface under the head.

Flat-head production screw



Screws are made from wire, the larger the wire gauge the larger the finished screw. Threads on a production screw, unlike those on a standard wood screw, are rolled. This makes the shank diameter and the root diameter about the same.

woods, I add an extra 1/64 in. I increase the size of the pilot hole slightly when using screws made of soft metals, such as bronze. When using soft solid-brass screws, I tap the holes by drilling a slightly undersized pilot hole and driving in a steel screw of the same size and length. I back out the steel screw and drive home the brass screw.

Fit the driver to the screw

A regular straight-slot screwdriver should have a square-edged tip that matches both the width and length of the screw slot. Don't be shy about regrinding the tip; a screwdriver with a twisted or chisel-like point isn't much good. In choosing a Phillips driver, check to see that the tip of the driver goes deeply into the recess without bottoming out.

My all-around favorite is the square driver (see the photo below) because it doesn't slip readily. And the driver holds the screw firmly so it can be set in place with one hand. As far as square drivers go, it's difficult to choose the wrong one—there are only three sizes for the most common-sized wood screws.

Using a powered drill/driver saves a lot of time and wrist fatigue when you have to drive a ton of screws. A drill with an adjustable clutch will improve your screw-setting performance by limiting the amount of driving torque. The clutch prevents broken screws and sets all the heads to the same depth. If you don't own a drill with a clutch, you can fit your old electric drill with a clutch accessory called Optigrip (which is available from several mail-order catalogs).

Good-quality screws are available from woodworking supply companies. McFeely's specializes in screws (P.O. Box 3, Lynchburg, VA 24505-0003; 800-443-7937) and carries an extensive line of hardened-steel production screws. Many brands of hardened-



steel screws are coated with a dry lubricant that makes them easier to drive and less susceptible to breakage. If you drive screws by hand, lubricating the screw will save you lots of effort. If you use a cordless drill/driver, you'll set more screws on a single battery charge if you use a lubricant. There are a number of proprietary screw lubes on the market, but I find that rubbing screws with an old candle works just fine.

Sandor Nagyszalanczy is a contributing editor to Fine Woodworking and author of Fixing and Avoiding Woodworking Mistakes (The Taunton Press, 1995).

Wired for Woodworking

A computer, modem and phone line can be your access to a world of shops

by Brian Holton and William L. Clark III

or Sale: Delta Contractor's Saw, Delta 16½-in. Drill Press, Craftsman 2.75 HP Radial Saw, \$1,000 all three, central New Jersey area, like new, barely used," read the advertisement.

The saw was just what I needed. We settled on a price, and that evening, I loaded my newly found treasures into the truck for the trip back to my shop.

This advertisement didn't appear in any newspaper, and I never spoke to anyone on the phone to make the deal. We used home computers and modems. The posting (com-

puter lingo for message) was made worldwide by a fellow woodworker to thousands, possibly millions, of subscribers to a commercial computer service.

Using the Internet, which is a worldwide network of computers and related services, is nothing short of miraculous. It's a means to communicate, to get advice and to share wisdom quickly and efficiently. This is important because woodworking tends to be a solitary pursuit. Books, magazines, television and videotapes provide the how and why; the Internet provides

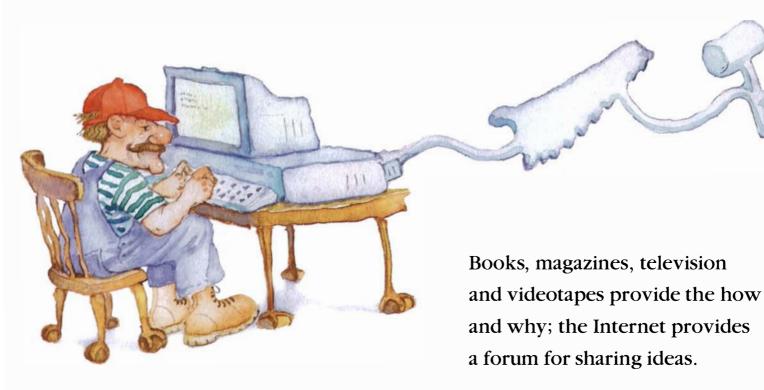
a forum for sharing ideas.

Use of the Internet is free. But most computer users will need a way to get there, and that's provided by commercial services, such as Prodigy, America Online and Compu-Serve, for a subscription fee of about \$10 per month. Software usually is free from the service (see the sources in the box on the facing page). Subscribers can exchange and access programs, documents and pictures, send messages to one another and engage in bulletin-board forums.

If you already have a computer, the only additional item

you'll need is a modem. The modem allows your computer to communicate with the service's host computer over your existing phone line. Your computer doesn't need to be state of the art, and the software will work with either DOS, Windows or Macintosh operating systems. Basically, there are three ways to tap into this information source.

Rec.woodworking is a bulletin board for woodworkers on the Internet. Simply log into the service you've chosen, find its Internet area, choose "newsgroups" and then find



"rec.woodworking." Here, hundreds of messages are posted and replied to daily. Once you're in the newsgroup area, you'll see a menu listing postings by topic and usually the number of responses made to that message. You can browse through the topic list and choose a posting that interests you. Once chosen, the message will appear on your screen; you can read it and whatever responses it has spawned. You can add your own response, move to another posting or post a new question or comment yourself.

Postings can be as specific as, "what is the cheapest source of oak in the Dallas, Texas, area?" or as open-ended as, "I am new to woodworking and have \$1,000 to spend on my shop. What should I buy?"

Others may be non-commercial advertisements from individuals selling used tools, like the one that led me to my purchase. Users vary from beginner to expert.

Individual service forums operate in a similar manner. But the number of users is somewhat smaller because on-

ly subscribers to that particular

service can use its forum, unlike the rec.woodworking newsgroup, which is open to everyone on the Internet. Forums, however, allow users to copy photos or documents that others have uploaded (copied from their computers to the main computer). So you can share a photo or plans with others. Forums also have times set aside to send conference-style messages.

Personal electronic mail,

or e-mail, is a means of direct. rapid communication. Subscribers have their own e-mail address. If, for example, someone asks, "What do you think about the Fasco F20 series air nailers?" you might not want to broadcast your response to everyone. In that case, you can get that person's e-mail address from the message and send a direct response. E-mail messages generally are received in a matter of minutes.

Brian Holton designs and constructs interactive science museum exhibits. Bill Clark is a student of mathematics and computer science at Rutgers University in New Jersey.

Computer services with Internet access



The four services listed at right offer some initial free time after subscribing, and you can cancel at any time. Some have hidden costs, such as charging for electronic mail messages.

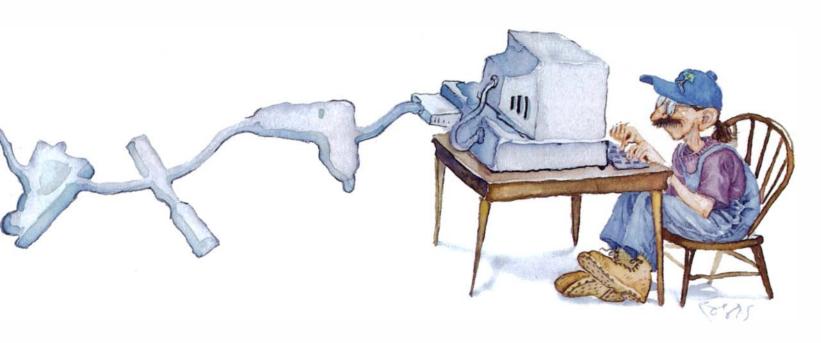
These services vary greatly in ease of use and type of woodworking forum. They have local-number access for most areas of the United States, but check if this is true for your area before subscribing.—*B.H.*

America Online 8619 Westwood Center Drive Vienna, VA 22182 (800) 827-6364

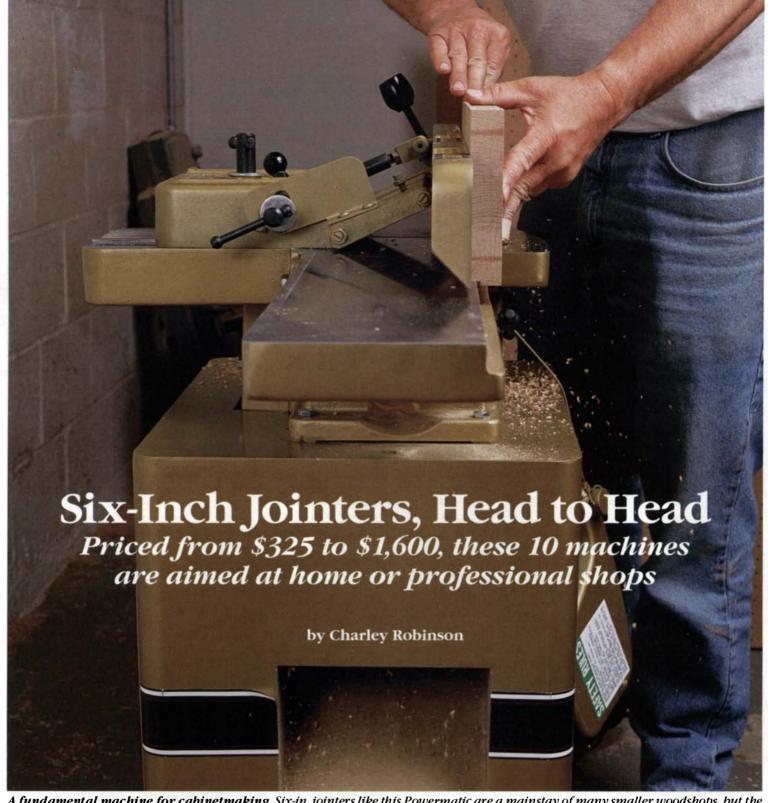
CompuServe New Member Department 5000 Arlington Center Blvd. Columbus OH 43220-9910 (800) 487-4838

Microsoft Network 1 Microsoft Way Redmond, WA 98052 (800) 386-5550

Prodigy PO Box 8667 Gray, TN 37615-9967 (800) 776-3449, Ext. 339



Drawing: Jackie Rogers November/December 1995 81



A fundamental machine for cabinetmaking. Six-in. jointers like this Powermatic are a mainstay of many smaller woodshops, but the capabilities and price tags of machines in this size category vary widely. All of the jointers reviewed by the author can cut rabbets.

If you have trouble getting tight joints, square corners and flat surfaces, chances are you're either having a jointer problem or you're without a jointer. A jointer establishes the reference surfaces from which all other machining is done. And in addition to truing edges and removing cup, bow and twist, jointers can taper, bevel, chamfer and rabbet (see the photo above).

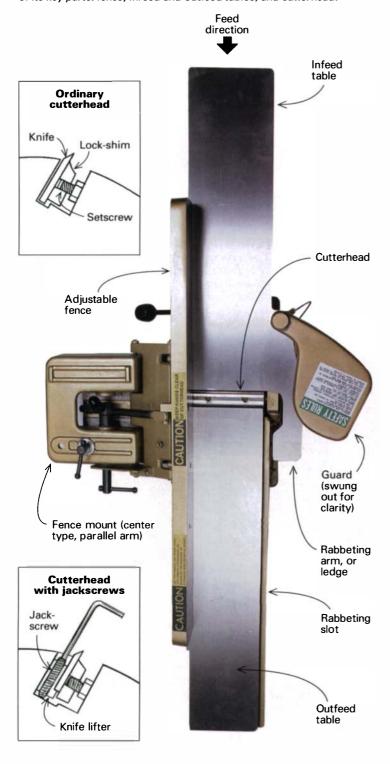
These attributes help make the jointer one of the most useful tools in the workshop and one worth choosing very carefully. Jointers are sized by the length of their knives, which translates into the widest board they can face joint. Generally, the bigger the machine, both in length and width, the easier your woodworking

will be. With a wider machine, you won't have to rip boards as often for face-jointing and, consequently, you will have fewer gluelines in panels and tabletops. Longer jointer tables (also called beds) provide better support for boards entering and exiting the cutterhead, resulting in straighter stock.

The trade-offs with a big machine are the amount of floor space it takes up and its cost. There are many other factors to consider, too, such as design, availability of parts and service, and ease of use. Some of the imported jointers are a lot alike (see the three jointers stacked up on p. 84). After you examine the castings and motors on several machines, you'll be convinced that they were

Essential parts of a jointer

How well a jointer performs depends on the design and construction of its key parts: fence, infeed and outfeed tables, and cutterhead.



made at the same plant, and you'll probably be right. However, similar-looking jointers can have some subtle differences besides different brand labels. If you look closely, you'll see that fences, knobs, levers and cranks distinguish one machine from another.

Picking a field for comparison

Most shops end up with 4-, 6-, or 8-in. jointers. I decided to look at 6-in. jointers because they're large enough for most jobs yet are reasonably priced, especially the imported tools. The small capacity of 4-in. jointers makes them impractical for many furniture-makers; 8-in. jointers are larger, so they take up more shop space

and are more expensive. From the field of 6-in. jointers, I picked 10 of the most popular brands, including Powermatic, Delta, General and a generous sampling of Taiwanese models. I chose machines that are stand-mounted with an overall table length of at least 40 in. (less than that, I think, makes it difficult to get accurate results). List prices ranged from \$329 to \$1,593. Many companies offer more than one 6-in. jointer, so I asked each for its best

model. Bridgewood (sold by Wilke Machinery) has two models. Because the better machine was out of stock, I included the less expensive one. The only differences are in the stand and in the fence.

I'm aware of a half-dozen other companies that also carry 6-in. jointers. They include AMT (800-435-8665); CP Tools (800-654-7702); Enco Manufacturing Co. (800-873-3626); Harbor Freight Tools (800-423-2567); Lobo Power Tools (800-786-5626); and Sears/ Craftsman (800-377-1565). AMT could not ship a jointer in time for this review. The Sears jointer has 36-in.-long tables. The other companies offer Taiwanese machines that are virtually indistinguishable from several I already had on my list. The 10 machines reviewed in this article are an excellent representation of what's available.

Jointers aren't difficult to understand

Jointers are pretty basic. The principal parts are infeed and outfeed tables, a cutterhead with knives, a knife guard and an adjustable fence (see the photo at left). This main assembly sits on a stand, which houses the motor (see the top photo at right). Most stands have built-in dust chutes to help evacuate the chips (see the bottom photo at right).

Adjusting the height of the



Look in the cabinet to inspect motor mounts and belt tensioning. The General is compact, and belt-tightening is simple because of a pivoting motor base. The motor comes with rubber isolation bushings and a big, balanced pulley.



Chip removal: Designs vary widely and include (from left) open dust chutes on the Enlon and General machines, a dust-collection hose adapter on the Wood-Tek jointer and no chute at all on the outfeed end of the Bridgewood machine.

infeed table determines how much stock is removed from a board as it is moved over the cutterhead. The knives in the cutterhead, which should be set level with the outfeed table, do the work. And because knives get dull, they must be removed from the machine, re-sharpened and reinstalled periodically. The quality of cut depends on these and other factors: flatness of the tables and fence, adjustments of tables, knives and fence, and performance of the motor and drive train.

Assembly: what the owner's manual doesn't tell you

None of these jointers could be used right out of the box. I had to set up the base, bolt on the jointer (you'll need help lifting the cast-iron

machines onto the bases), align the pulleys and install the belts. On some machines, I had to wire the switches. After I installed the fences and guards and cleaned off the cosmoline (a protective coating applied at the factory), I was ready to adjust the tables.

Most of the jointers took about 11/2 to 2 hours to unpack and put together; some of them took longer. With a few exceptions, the job was about what I had expected. The Enlon was coated



Two types of center-mounted fences—Both the Reliant (left) and Enlon jointers have centermounted fences. Enlon's fence is fixed by three points, so it's stable. Reliant's fence, fixed by a sliding dovetail, isn't easy to position and can't be set acutely.



Hand cranks are better. The author prefers a hand crank (left) over a lever for adjusting table beds because hand cranks make precise adjustments easier. The fence on the General jointer (left) is mounted at the end of the infeed table.

with enough thick, syrupy cosmoline to cover 10 machines. Besides being on the exposed tables, the cosmoline was on the cutterhead, the knobs, the levers and the fence carriage. The Grizzly and Bridgewood jointers have bolt-together, stampedsteel stands, which slowed assembly considerably. The Grizzly machine comes with a clearly written, 30-page manual that made the process easier. The Bridgewood manual has only an unlabeled diagram. I had to guess which screws and bolts went where.

Checking and adjusting the tables

To get flat, true tops on their jointer tables, manufacturers grind them, usually after assembly. Of the tables I compared, a few are ground to a smoother finish than others. But with a coat of wax on all the tables, I didn't notice any difference in performance between the tables that are highly polished and those that aren't.

I checked the tables for flatness with feeler gauges and a 6-ft.-long Starrett straightedge. I looked for drooping in the tables near the cutterhead and at the ends. A few of the machines had perfectly flat tops. Others had dips of a few thousandths of an inch. The Enlon table drooped .04 in. at the outfeed

end, but that should not adversely affect most jointing jobs. I would be reluctant to accept a machine that is out-of-flat by much more than .005 in., but none of these jointers had that problem.

All of the tables ride on sliding dovetail ways, except those on the Delta, which use parallelogram supports (I'll talk more about that later). All the jointers have adjustable infeed as well as outfeed tables—a handy feature for leveling the table to the knives.

Table adjustments are easier with hand cranks—Table adjustments are made by either a lever or a hand crank, as shown in the bottom left photo above. Some machines have two hand



Comments: Fence is difficult to adjust and use. Fence stops don't always repeat exact tilt settings. The table height-adjustment cranks are easy to get to (on front).

List price: \$629 **Tables:** 7% x 45% Infeed: crank Outfeed: crank Knives: 1/8 x 11/16 x 6 Setup: springs Fence: 31/8 x 271/8 Mount: center, sliding dovetail Tilt: 90°-135° Stops: 90°, 135° **Motor:** 12 amps, 110v Manual: good

Pages: 23



Comments: Fence is difficult to adjust, set and use. Stand and castings are virtually identical to Jet and Sunhill jointers but Reliant has a slightly different fence mount.

List price: \$370 **Tables:** 7% × 45% Infeed: crank Outfeed: crank Knives: 1/8 x 11/16 x 61/16 Setup: springs Fence: 31/8 x 271/8 Mount: center. sliding dovetail Tilt: 90°-135°

Stops: 90°, 135° Motor: 14 amps, 110v Manual: fair Pages: 13





Comments: Fence comes unassembled. It was difficult to set its positive stop to 90°. Fence works okay after tweaking. Bolt-on extension wings add 7 in. to table length.

List price: \$389 **Tables:** 7% x 52 Infeed: crank Outfeed: crank Knives: 1/8 x 11/16 x 61/16 Setup: springs Fence: 4 x 281/8 Mount: center. parallel arm Tilt: 45°-135° Stops: 90°, 135° Motor: 14 amps, 110v Manual: fair

Pages: 15

cranks (one for each table), some two levers and some one of each. It was much easier to adjust the tables accurately with hand cranks. One revolution of the crank moved the table a precise distance, depending on the number of threads per inch on the shaft connected to the crank. With a hand crank, I could easily position the outfeed table exactly to the maximum height of the knives as I watched a dial indicator. By contrast, I found the action of the lever-adjusted tables to be stiff and imprecise. I often had to settle for a table position that wasn't quite where I wanted it. Accurate table setting is more critical on the outfeed table. So I was glad to see that when a machine has both a crank and a lever, the lever is on the infeed table where exact settings are somewhat less critical. I still prefer jointers with hand cranks on both tables.

Delta's approach is unique. The DJ-15 uses a parallelogram support system and a pair of levers to adjust the tables. Delta's levers are smooth and easy to move, probably because the heavy castiron tables are counterbalanced by springs. Delta includes minimum and maximum depth-of-cut stops on both the infeed and outfeed tables. On the infeed table, you can set the minimum to 1/32 in. for fine cleanup passes and the maximum to about 1/8 in. to prevent taking too deep a cut. Delta suggests using the outfeed table stops to lock the table level with the knives. This keeps the table from accidentally being lowered.

Rabbeting ledges are standard—All of the machines have rabbeting ledges as part of the infeed table (see the photo at left on p. 83). All but Delta's and Enlon's are cast in place. Enlon's is bolted on at the factory and ground flush with the infeed table. Delta's bolt-on ledge added about five minutes to the machine setup but performed as well or better than the others. Its larger size provided a little more support.

Pay attention to the cutterhead and knives

How fast you feed a board and how deep a cut you take affect the quality of a jointed surface. Cutterhead speed (in cuts per minute) also determines surface smoothness. The Powermatic (21,000 cuts/min.), the Delta (16,500 cuts/min.), the Enlon and Grizzly machines (both at 15,000 cuts/min.), and the Jet (14,400) cuts/min.) have the fastest cutterhead speeds. The rest of the jointers produce only 13,500 cuts per minute.

To make knife setting easier, manufacturers try various techniques. The system that I prefer includes a pair of jackscrews mounted in the cutterhead (see the bottom drawing on p. 83). The jackscrews make the process faster and more accurate. They catch the lower edge of a knife and raise it as an Allen screw is turned. Only the Delta and the Powermatic cutterheads come equipped with jackscrews.

Several machines include knife-setting jigs (see the bottom left photo on p. 86) that work in conjunction with springs under the knives. The springs rest in the knife-holding slots in the cutterhead. With the jig straddling a knife and resting on the cutterhead, the spring pushes the knife to the proper height above the cutterhead. The locking screws are then tightened. I don't care for this arrangement because it sets the knives relative to the cutterhead rather than the outfeed table. If the cutterhead and outfeed table are not in the same plane, the jointer won't cut evenly. It's best to set the knives to the outfeed table, preferably with a dial indicator.

Fence mechanisms and settings are critical

The one part of the machine that you'll have more contact with than any other, save possibly the infeed-table adjustment, is the fence. You'll be moving it back and forth to accommodate different-sized stock, to use different parts of the blade and to cut rab-



Comments: Fence is difficult to adjust and won't tilt to stops. Stamped-steel stand lengthens setup time. Fence bowed .021 in. over its length. No dust chute.

Bridgewood BW6J

List price: \$329 **Tables:** 65% x 457% Infeed: crank Outfeed: crank Knives: 1/8 x 11/16 x 61/16 Setup: jig & springs Fence: 31/8 x 271/8 Mount: center, sliding dovetail Tilt: 90°-135° Stops: 90°, 135° Motor: 14 amps, 110v

Manual: fair Pages: 13



Comments: Guard has stiff spring and blunt front face, making stock feed difficult. Nice depth-of-cut gauge. Replaceable table inserts around cutterhead.

Delta DJ-15

List price: \$1,496 **Tables:** 6 x 551/2 Infeed: lever Outfeed: lever Knives: 1/8 x 13/16 x 6 Setup: jackscrews Fence: 5 x 36 Mount: center, parallel arm Tilt: 45°-135° Stops: 45°, 90°, 135° **Motor:** 11.4 amps, 110v Manual: good Pages: 19

bets. You want a fence that's easy to slide. The fence also must tilt accurately to at least 45° and 90°. Initially, I set each fence at 90° to the outfeed table, set the stops (see the top left photo on p. 86) and then tilted each fence through its range of motion. I returned to the 90° setting to see if the fence retained its accuracy.

There are three types of fence mounts among the jointers I reviewed: two center-mounted styles and an end-mounted version. The most common is the center-mounted fence fixed to a sliding bracket, as shown in the top left photo on the facing page. This type of mount is used on the Powermatic, the Delta and several Taiwanese jointers. The bracket rides on a fence carriage fixed to the back side of the jointer. As the fence is moved across the tables, the sliding bracket covers the blade behind the fence. Fence tilt is accomplished by parallel arms, which provide a solid threeor two-point (Delta only) mounting system.

The second most common mounting system is used on the Jet, Reliant and Bridgewood jointers. This also is a center-mounted style with a sliding bracket and fence carriage bolted to the back of the jointer. But this mount is smaller and lighter and requires a steel guard to cover the knives when the fence is toward the rabbeting ledge. The tilt mechanism on this type of mount uses a slid-

Square the fence—Install the fence 90° to the outfeed table, and then set the stop. After you move the fence through its range of adjustments, return it to the initial position, and recheck for square.



Installing knives—A couple of jointers come with knife-setting jigs, which gauge knife height above the cutterhead. Here, the author installs a knife in the Grizzly jointer's cutterhead, which has spring-loaded slots.

ing dovetail way (see the top left photo on p. 84).

The third system is a fence mounted on the end of the infeed table, used on the Wood-Tek and General jointers (see the bottom left photo on p. 84). This mount uses a sliding socket wrench to control two locknuts. One nut holds tilt settings; the other nut is for width settings.

Almost all of the fences had a slight end-to-end bow that ranged from .004 in. to .021 in. The Grizzly was the only one with a perfectly flat fence. But as long as a fence can be adjusted to a true 90° to the table, bow really has no affect on performance.

In terms of accuracy, repeatability and ease of adjustment, I found the fences on the Powermatic, Delta and General jointers to be head and shoulders above the others. The dovetailed center-mounted fences were the most difficult to use. They were awkward to slide, and the tilt mechanisms often hung up. The stops didn't always bring these fences back to accurate settings, either. I wouldn't buy a jointer with this kind of fence.

Similar motors and drive trains

All the jointer motors are wired for 110v, single phase power, but they can be rewired for 220v. The motors are rated between 3/4 and 1 hp

by the manufacturers. Motors on the Taiwanese jointers look identical, although some claim slightly different specifications. The Powermatic has a Baldor motor and the General has a Leeson motor. The Delta uses its own brand.

All of the jointers use pulleys and V-belts. With the exception of the Powermatic and the General machines, the jointers have sliding motor-mounted systems for adjusting belt tension. Access to the belt is generally through an easily removed rear panel. The access panels on the Delta and Grizzly machines are screwed in place, which is inconvenient.

The belt-tensioning arrangement on the Powermatic is the hard-



Comments: Excessive protective coating. Machined surfaces are highly polished. Nylon pads prevent the fence from scratching the table. Jointed very smoothly.

Enlon EN3104

List price: \$380 Tables: 6½ x 465% Infeed: lever Outfeed: crank Knives: ½ x 1 x 6 Setup: jig & springs Fence: 4 x 29 Mount: center, parallel arm Tilt: 55°-135° Stops: 90°, 135° Motor: 12 amps, 110v Manual: fair Pages: 24



Comments: Best fit and finish. Quietest of all machines. Blade guard for back side of fence is optional. Compact footprint. Long power cord but only 16-gauge wire.

General 1180-1

List price: \$1,295
Tables: 6½ x 42½
Infeed: crank
Outfeed: crank
Knives: ½ x ¾ x 6
Setup: none
Fence: 3½ x 34¾
Mount: end
Tilt: 45°-135°
Stops: 45°, 90°, 135°
Motor: 10.8 amps, 110v
Manual: poor

of of 1g

Pages: 4



Comments: Bolting together the stampedsteel stand and wiring switch takes longer than setting up other machines. Bracket prevents fence from tilting to full 135°.

Grizzly G1182

List price: \$375
Tables: 7½ x 47½
Infeed: lever
Outfeed: lever
Knives: ½ x 1 x 6
Setup: jig & springs
Fence: 4 x 29
Mount: center,
parallel arm
Tilt: 45°-125°
Stops: 45°, 90°
Motor: 14 amps, 110v
Manual: good
Pages: 30

est to adjust. The motor is mounted low in the cabinet, so it's difficult to get to the four bolts under the pivoting motor platform. General has the best motor-mounting system and the easiest belt adjustment. Rubber mounting pads isolate the motor from vibration. A single bolt with nuts on either side of a pivoting platform provides positive up and down adjustments. The General jointer had the only drive pulley that showed signs of having been balanced (see the top right photo on p. 83).

How they performed overall

After checking all the knives and leveling the outfeed tables to the knives on all the machines, I face- and edge-jointed maple, oak and poplar, taking 1/16-in. passes. With factory-fresh knives in properly setup machines, I expected, and got, decent results. There were subtle differences in machine performance, such as the feel of boards that had been jointed, and some more noticeable differences, such as noise levels. Although I didn't measure

Sources of supply

Bridgewood (Wilke Machinery Co.) (717) 764-5000

Delta International Machinery Corp. (800) 438-2486

Enlon Import Corp. (800) 888-9697

General Mfg. Co. Ltd. (819) 472-1161

Grizzly Imports Inc. (800) 523-4777

Jet Equipment & Tools (800) 274-6848

Powermatic (800) 248-0144

Reliant (Trend-lines Inc.) (800) 767-9999

Sunhill Machinery (800) 929-4321

Wood-Tek (Woodworker's Supply Inc.) (800) 645-9292

decibel levels, I thought that the Powermatic generated the most objectionable noise-a loud, high-pitched whine.

The Delta jointer was the best adjusted machine out of the crate. It produced glasssmooth cuts. Following closely behind the Delta were the Powermatic and the General jointers. The Taiwanese machines all did a fairly nice job, although the Enlon jointer seemed to produce a slightly smoother surface than the others. The Grizzly caused some tearout in swirly grained white oak. Edge-jointing with the Wood-Tek and the Bridgewood units produced some chatter marks, even when I slowed the feed rate.

Big bucks buy big performance

For those who have few financial or space constraints, I'd recommend the Powermatic or the Delta jointer. Either one should provide your shop with a long-lasting, high-quality

machine. Though these are the two heaviest machines, their longer beds are an advantage. For shops with less floor space, you can't beat the General: smooth-running, quiet and a pleasure to use. It has a compact stand, and because the fence mount doesn't protrude from the back side of the machine, you can tuck it close to the wall. The only thing that prevents it from being my top choice is its shorter table length.

Though the General, Powermatic and Delta are good machines, they are more than three times the price of most of the Taiwanese models. For the woodworker on a budget who's willing to put up with less convenient fence settings, one of the Taiwanese machines with either the end-mounted fence or the center-mounted, parallel-arm fence should work just fine (you should check the fence setting with a square any time you change it, anyway). But I would get one with hand cranks instead of levers. The upscale



Comments: Large stable base and the longest tables. Castings are heavy. No power cord supplied. Small on/off switch. Machine is loud. Awkward belt tensioning.

Powermatic 50

List price: \$1,593 **Tables:** 6¼ x 56¼ Infeed: lever Outfeed: crank Knives: 1/8 x 11/16 x 6 Setup: jackscrews Fence: 4 x 36 Mount: center, parallel arm Tilt: 45°-135° Stops: 45°, 90°, 135° Motor: 9.6 amps, 110v Manual: excellent Pages: 30



Comments: Only machine with pick-up boot for dust-collection hose. Includes guard for back side of fence. Fence stops require trial-and-error bolt turning.

Wood-Tek 801-589

List price: \$395 Tables: 65/8 x 421/4 Infeed: crank Outfeed: crank Knives: 1/8 x 11/16 x 6 Setup: jig & springs Fence: 33/4 x 351/2 Mount: end Tilt: 90°-135° Stops: 45°, 90°, 135° Motor: 16 amps, 110v Manual: poor Pages: 8

version of the Bridgewood (model BW6R, priced at \$429) meets all these criteria and, based on the performance of the BW6J, should be a good performer.

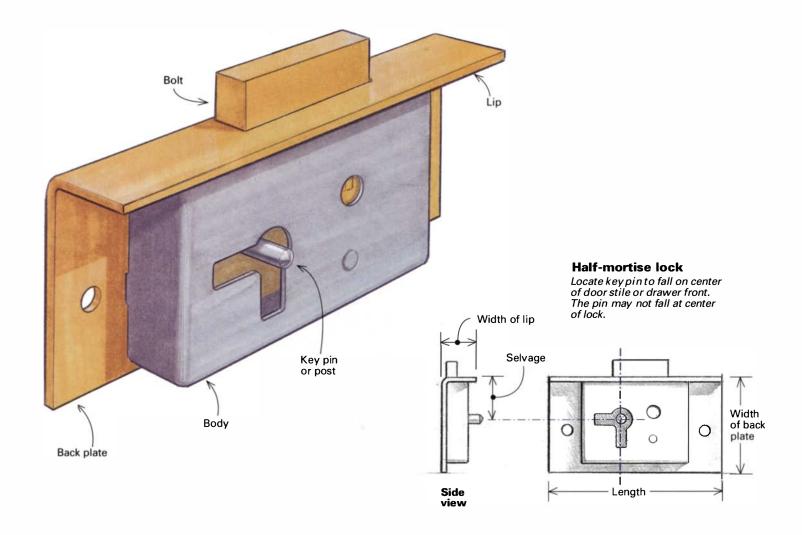
Of the Taiwanese machines I reviewed, I like the Wood-Tek with its end-mounted fence. The Sun Hill also has all the features I favor, including bolt-on extension wings that increase table length by 7 in. The Enlon and the Grizzly both perform well and have decent fences, but I don't like the fact that they use height-adjustment levers on their infeed tables. Both machines took longer to setup for jointing than the other imports. With some tweaking and tuning, though, the Enlon and Grizzly can do an acceptable job.

Charley Robinson is a writer, woodworker and former associate editor of Fine Woodworking. He lives in Sandy Hook, Conn.

Installing a Half-Mortise Lock

When you do it right, the result is your reward

by Philip C. Lowe



s a younger man, I served a stint in the Navy. I spent much of the time aboard the repair ship USS Jason out of San Diego, where I worked in the same shop alongside an older German patternmaker. I learned from him the importance of details. Not until some years later, after I'd set up shop as a furnituremaker, did I learn something (the hard way) about the value of details. I told a client who had commissioned a chest of drawers that I would throw in four locks with escutcheons for the cost of materials only. I figured the extra hardware would add just a few hours of labor to the project, and I could handle that.

Well into the eighth hour of installing the locks, I learned my lesson. When your livelihood depends on what you can accomplish in a given work day, time really *is* money. Now, when clients want an estimate on any job with doors or drawers, I always ask if they expect locks and escutcheons. They're usually amazed that such simple hardware can add so much to the total, but when they see a finished piece, they understand why.

What matters most is the kind and quality of lock you choose. If economy of time and material is important to you, a simple cylinder lock can be installed by drilling one hole and securing the lock with two screws. Surface locks are even easier because they are quickly attached with screws, no mortising.

I often use half-mortise locks. They're more expensive, but they really dress up a piece of furniture. They are set into the back surface of doors or drawers and flush to the edge. First-rate hardware for half-mortise locks is available from a number of suppliers (see *FWW* #112, pp. 68-73).

Before you pick up your tools

The size and kind of lock you use on a piece of furniture will affect basic design decisions. When I build a cupboard door with a lock, I like the keyhole to fall dead center on the width of the visible stile—not the actual width, which might also include a rabbet for overlapping doors or a piece of applied molding. So I refer to hardware catalogs and check the critical dimensions: the width of the lip, the selvage, and the length and width of the back plate (see the drawing above). For a selvage dimension of 1¼ in., I would make my cupboard-door stile 2½ in. wide.





FIND THE CENTER

- 1) Set the marking gauge to the selvage first. All other layout dimensions flow from here.
- 2) Mark the center point for the keypin hole, where the selvage meets the centerline of the workpiece.
- 3) Drill a small hole through the center point, using a bit just a little larger than the key-pin diameter. This hole will have to be enlarged later, depending on the type of escutcheon you choose.
- 4) Lay out mortise for the body. The lock is not on-center, but the key pin is. Designs vary, so be sure to check this detail when you lay out your lock.





I also determine whether the door (and required lock) are right-or left-handed. This specification can be very confusing, especially because not all manufacturers and dealers follow the same guidelines. But to make it simple, if you're standing in front of a cabinet with two doors (both hinged on the outside), the one on the left gets a right-hand lock. Be sure to check with your supplier on this detail. With drawer locks, the keyholes run perpendicular to the lip, so they are nonhanded. Some locks have the keyhole cut both horizontally and vertically, so they can be used with either a door or a drawer.

Installing a half-mortise lock

I'm ready to install and fit a half-mortise lock once a door has been hinged or a drawer carcase has been assembled. With a small drawer, you might want to do the mortising before assembly for easier access to the drawer front.

Find the center, and fit the body first—You always should start by drawing a centerline on the outside face of the drawer front,

extending the line across the top edge. Set a marking gauge to the selvage, the distance between the top of the lip to the center of the pin, and etch a short line where the selvage intersects the centerline (see photo 2 above). Drill a hole slightly larger than the diameter of the pin. Place the lock against the back of the drawer front, aligning the pin with the hole. Then draw two pencil lines on the top edge to indicate the width of the body (see photo 4). Using a square, transfer these lines to the back surface of the drawer front.

Set the marking gauge to the height of the body. Allow a little extra room if the bolt protrudes through the bottom of the lock body in the unlocked position. Some do, some don't. This little detail varies with the size of the lock and with the manufacturer. Scribe the back surface (parallel to the top edge), starting and stopping at your pencil lines. Then set the marking gauge to the thickness of the body, and transfer that line along the top edge.

With a backsaw, make two angled relief cuts along your pencil lines, stopping at the corners on the back and the top edge (see photo 5 on p. 90). Chisel away, flat side against the lines, removing waste as you go deeper into the mortise. I find that this method

Photos: William Duckworth November/December 1995 89





MORTISE THE BODY

- 5) Saw to the line to define the boundaries of the body mortise and to make chiseling easier. Some people might prefer to use a Japanese dozuki saw to make these cuts.
- 6) Relieve the inside edges of the mortise to prevent splitting and tearout as material is removed. (The author made this chisel from an old jointer blade, a scrap of apple wood and a piece of copper pipe for the ferrule.)

works better if I dig out a little at a time, chopping firmly against the grain and then cutting out the waste as I work down to the finished depth.

Follow with the lip mortise—Position the lock in the body mortise, and using a layout knife, score the lines on the top edge for the lip cutout. Set the marking gauge for the thickness of the lip, and transfer that mark along the back surface (see photo 7 on the facing page). Chisel the mortise for the lip, using feather cuts against the grain. Go easy, this is a delicate procedure. The lip sits just flush into the top edge of the drawer.

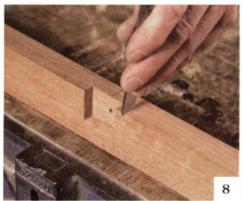
Fitting the back plate—Place the lock into position once again, and score the back-plate outline with the knife (see photo 9 on the facing page). Follow those lines with solid chisel chops. Using the marking gauge at the previous setting (lip and back plate should be the same thickness), scribe a line along the top inside edge of the drawer, within the mortise already cut for the lip. This represents the thickness of the back plate. Removing this waste should go smoothly if you use a sharp chisel. You're paring away only a

small amount of material and pushing the chisel against the grain (see photo 10 on the facing page).

Cutting the keyhole—Determine the size hole needed for the key, which will depend on your choice for the escutcheon (see the box on p. 92). Drill it. Scribe the shape of the keyhole with a pencil, and cut the keyhole, using a coping saw with the blade assembled through the hole. With a small, sharp chisel, the waste usually will pop right out in one clean strike. If not, you can fine-tune the hole with small files and rasps. I used a keyhole rim for the job shown in photos 11-15 on the facing page. If you choose an inlaid escutcheon made of a brittle material, it's a good idea to start your hole with a countersink first and follow with a drill bit. That will prevent the cutting spur of the bit from damaging the surrounding surface. After you've cut the keyhole and fitted the escutcheon, you can dry-fit the lock in place. Bore pilot holes for the screws, and secure the lock (see photo 16 on p. 92).

Mortising for the bolt—Now it's time to make a mortise cut in the cabinet for the bolt. Place the drawer in its opening, slightly





MORTISING THE LIP AND BACK PLATE

- 7) Set marking gauge for the thickness of the lip, and mark the inside face of the drawer front. Then place the lock into the body mortise, and scribe lines in the top edge with a layout knife.
- 8) Chisel to the lines made by marking gauge and layout knife. These shallow mortises require a deft and patient touch.
- 9) Once the lock body fits, score the back plate with a layout knife. This creates an incision into which you place the chisel edge for the final cut.
- 10) Mortising for the back plate is fairly easy. The author is paring away most of one side in a single, clean stroke.



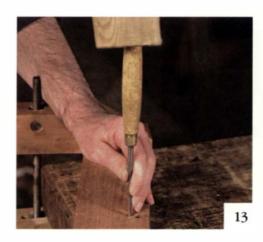






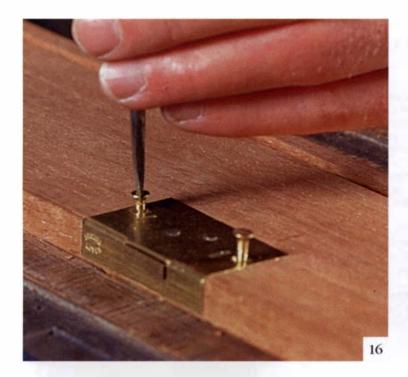
FITTING THE ESCUTCHEON

- 11) Cast keyhole escutcheons taper front to back. Use the back, or smaller profile, to mark the door or drawer front.
- 12) Enlarge the piloted key-pin hole. Assemble the coping-saw blade through the hole, and make two straight cuts, following your traced lines.
- 13) Score the back; whack the front. With the correct-sized chisel, remaining waste usually comes out with little trouble.
- 14) Force-fit the escutcheon with a clamp. Cast pieces often are rough and may need to be cleaned up with a file first.
- 15) File and sand the good face flush. Start with 120-grit sandpaper, and work up to 400-grit silicone carbide to smooth the face and polish the brass.









FINISHING UP

16) Dry-fit the lock, and screw it in place before marking and cutting the mortise for the bolt. The lock should be removed before any stain or finish is applied.

17) Check the key in the lock. The bolt should turn with a smooth, firm twist of the key.

ajar. Turn the key so the bolt is in the locked position. Gently push the drawer in place until the bolt rests against the drawer divider, and mark those lines. Using a small square, transfer the lines to the underside of the divider. Determine the distance of the bolt from the front of the drawer, accounting for any reveals when the drawer rests against its stops. Mark those lines, and chop out a mortise slightly oversized—a little play won't hurt.

If you're working within a limited space (a shallow drawer), use a chisel pitched at a steep cutting angle, so the bevel is perpendicular to the divider. On the finest work, you often will find a strike plate set flush into the divider for extra protection from the prying hands of over-zealous children or adults with criminal intent.

A good-quality mortise lock with an escutcheon can make all the difference in the finished look of a piece of furniture. Keith, a former student of mine at the North Bennet Street School in Boston, would say that it was "slicker than deer guts on a doorknob." In case that leaves you wondering, he meant it as a compliment.

Philip Lowe is a furnituremaker and part-time sailor in the waters off Beverly, Mass.

Choosing an escutcheon



This antique silver escutcheon is set into a bird's-eye box.

Escutcheons, the decorative plates that surround keyholes, can be purchased in a range of styles (see the photo below). You can buy everything from flat, circular or geometric shapes to cast ornamental forms with a highrelief detail and gilded ones known as ormolu.

There are three basic types of escutcheons: those mounted to the surface, inlaid designs cut to shape and set into the surface, and cast rims in keyhole shapes, which are set into the opening of the hole.

When selecting an escutcheon, be sure it will fit well. Refer to the dimensions in the catalog when you're in the design stage, and make the door stile or drawer front the right size for the selvage and the lip. If possible, buy the hardware before you begin building.

Surface-mounted escutcheons come in styles to match those from William and Mary designs (early 18th century) through Arts and Crafts (early 20th century) to contemporary versions. You don't like any of those styles? Make your own, or carve a shape in wax and have it

cast. Keep in mind this approach will add a lot of time (and cost) to the project.

Inlaid escutcheons offer more flexibility if you want to make your own to any shape or size. You can make inlaid escutcheons out of just about anything-wood, brass, silver, nickel, gold, pewter, mother-of-pearl, ivory or stone. These can be set into the surface before the keyhole is drilled.

Keyhole rims come as rough castings, slightly tapered from front to back. On first-rate work, I usually spend some time cleaning them with fine files, inside and out, taking care not to file away the taper. When set into the surface, they are a press fit, so the layout on the door or drawer face is done using the narrow end.

Surface-mounted plates are affixed to the surface with escutcheon pins (brass nails) or brass screws. Or the plates are secured from behind with screws into threaded posts. Inlaid plates can be glued in place. Epoxy works well for metal, stone and ivory; for other materials, your standard wood glue should work just fine. -P.L.



Factory-made escutcheons-Styles can match drop pull hardware (left) and many smaller surface-mounted versions (center). Inlaid versions (right) require more work to install.



A kitchen with character—A blend of wood, stone, metal and painted surfaces makes this Johnny Grey kitchen vibrant and practical.

The Kitchens of Johnny Grey

Forget those long, straight runs of built-in cabinets and yards of plastic laminate

by Scott Gibson

ohnny Grey is driving fast along a rural highway southwest of London, leaning way back in the seat with one hand draped loosely on the wheel. At 75 miles an hour, his Toyota minivan passes a string of slower cars, but Grey doesn't seem to notice.

He's explaining what he dislikes so much about standard kitchen design, and he hasn't run out of things to say since we tore past Stonehenge, 10 miles back. The boring uniformity of long runs of rectangular cabinets, fitted exactly to the width of the room and topped by shiny plastic laminate,



A good kitchen is more than a good design. After laboring at the drafting board, Grey banks on careful construction in the shop (above and below). Curved components, inlay and other detailing add up to a demanding exercise for cabinetmakers.

leave Grey cold. Those kitchens, he says, are a "foul and unnatural environment."

It's what you'd expect to hear from Grey, an architect best known for kitchen designs that upend the rules. Grey decided in the mid-1980s that standard kitchen designs didn't make much sense. Cabinets could be made quickly and shipped easily. Whole kitchens could be ordered out of a catalog, but Grey didn't think the designs were either comfortable or efficient.

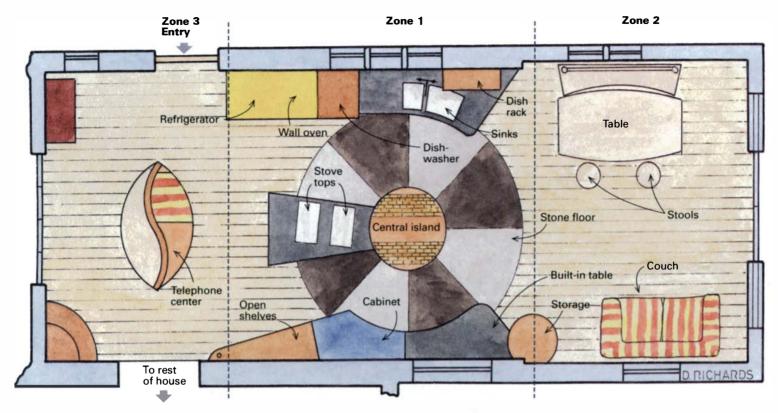
In 1987, Grey approached Smallbone, an English cabinet company, with his ideas for the "unfitted kitchen." He wanted to re-



place standard cabinets with what looked like a collection of individual pieces of furniture. After designing kitchens for Smallbone, Grey is once again on his own. He designs what he calls "sociable kitchens" for well-heeled clients in England and the United States. He favors a mix of freestanding and built-in cabinets, and he wants his kitchens to be the hearth that modern houses sometimes lack (for more on the specific design elements, see the story on p. 97).

Grey's kitchens are appealing and interesting but are much harder to build than

A kitchen planned for efficiency



This Johnny Grey kitchen includes three zones, each with a different purpose. Food preparation and cooking take place in the center of the room around a work island. A couch and table at one end provide a place to relax; a high-traffic area at the opposite end of the room includes a telephone center.

standard kitchens. To try one, you would have to throw out a lot of what makes standard kitchens so straightforward. Counter heights vary. Carcases are often curved. You just can't build plywood boxes and fasten them to the wall.

A central island to face the room

A Grey design often revolves around a central kitchen island (see the drawing). Islands are seldom rectangular. More often, they are circular in plan, or contain some curved element, making them a cabinetmaker's puzzle and a delight for users. Grey's island work areas are designed for four distinct jobs: food preparation, cooking, serving, and appliance storage and use. As a result, Grey's island designs often include four different counter heights and at least three different materials.

He chooses granite or stainless steel for a heatproof stove-top surface. Chopping blocks are end grain—never the face-grain butcher block you can buy at your local building-supply dealer. It wears much better, Grey says, and it won't collect food particles as easily as regular butcher block. His islands may even have two chopping blocks—one for strong-tasting foods and a separate one for delicate foods.

Appliance areas are as low as 31 in. and often of granite or slate. Other common

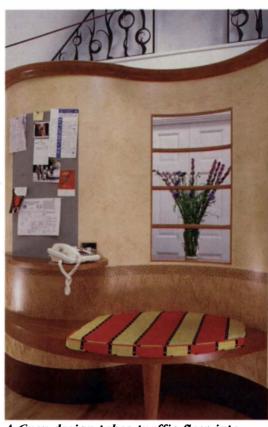
details include a hole in the top of the chopping block that empties into a tinlined drawer for food waste and a slight overhang to stick a plate well beneath the counter edge, so the mushrooms you've just chopped don't end up on the floor.

To keep the islands from looking too big, Grey often supports one of the work surfaces with a leg, leaving open space beneath to make it look lighter. Or he'll put the stove top in a separate granite counter supported at one end by a pair of legs and at the other by the side of the island (see the photo on p. 93).

Skip the plastic laminate

There's as much melamine, plastic laminate and easy-care vinyl flooring in one of Grey's kitchens as there is good bourbon at a meeting of the Woman's Christian Temperance Union. Instead, you'll find lots of wood (both solid and veneer), wood inlay, stone, stainless steel and painted surfaces (see the photo on p. 97).

Wood adds warmth and texture. Grey uses teak on wood drain boards and dish racks, where moisture resistance is important, and a variety of other species elsewhere. Olive ash, cherry, figured sycamore (which looks like the figured maple available in the United States) and exotic veneered panels all are used. He's not afraid



A Grey design takes traffic flow into account. This curving built-in provides a phone and a place for posting family notices. Located just inside the main entry, the built-in also helps direct traffic either to the kitchen or through a door, which leads to the rest of the house.



Areas for work, areas for comfort—If room permits, Grey includes a couch in the kitchen. This "soft area" shouldn't interfere with food preparation or cooking, but it should encourage people to see the kitchen as a place to relax as well as work.

to use more than one kind of wood in the same kitchen but not more than two. He also uses wood inlay, usually in a checker-board pattern. Grey calls these strips of inlay an ideal decorative element because, unlike carved details, the inlay strips won't gather dirt or grease, and they help tie different parts of the room together visually.

Stone shows up on stove-top counters and on the floor. It's beautiful, durable and balances the warmth of the wood. Grey also likes paint. He skips bland colors—the ones that go with everything but inspire

no one. He'll mix yellow drawer fronts with orange detailing around drawer pulls (see the photo on the facing page), run a blue cabinet into one painted eggplant purple or choose a steel blue to offset a figured-wood door panel. Paint, he says, lets you take more risks than virtually any other material because it can be changed.

Include a couch, soften corners

In one corner of Grey's own kitchen is a sagging couch. It collects raincoats, briefcases, drawings, his dog and anyone who

happens to stop by. Couches are a fixture in many of his kitchens. A couch is part of what Grey calls a "soft area" where people can hang out comfortably. The furniture doesn't have to take up much space but lends a nice feel to the room and makes it easier for people to talk with each other while food is being prepared.

His kitchens may include built-in eating areas that give another social focal point to the rooms. They're also practical because they provide space for working and eating. And these areas may be part of a



Checklist for a good kitchen

- Identify sources of light and the natural routes people take through the room, and plan a kitchen layout accordingly.
- If at all possible, build a central island. The minimum clearance on all sides should be 3 ft. If space is a problem, use a small peninsula or a worktable instead.
- Use a variety of natural materials. Try using

more than one kind of wood, but avoid too much wood because it absorbs light. Balance wood with other materials, such as stone and painted surfaces.

- Make sure the workmanship of the cabinetry is first rate.
- Vary counter heights to suit their purpose. A good rule of thumb is to build standard work counters 2 in. below the height of the

client's flexed elbow. Stove tops are somewhat lower and other areas are higher.

- Include a "soft area" in the room for relaxing.
- Don't kill the architecture of the room. If possible, leave two of the room's corners exposed, along with any other architectural features of merit.
- Include good artificial lighting so that no one works in shadow.



Practice what you preach—Grey does more than tell other people how their kitchens ought to look. He puts his principles to work in his own kitchen, which he shares here with his children Felix (left) and Guss.

larger scheme of traffic control. Grey's kitchens are carefully planned for efficiency; they keep sink, refrigerator, dishwasher and food-preparation areas close together. At the same time, the designs accommodate natural traffic patterns (see the drawing on p. 95).

Craftsmanship is paramount

Grey is a designer, not a builder. But he credits high craftsmanship as well as the best materials for making his designs work. "A kitchen in a small space means

that your eyes are closer to the furniture, architecture and fabric of the room," Grey writes in *The Art of Kitchen Design* (Sterling Publishing Co. Inc., 1994). "The craftsmanship is therefore crucial because you are so near to it so much of the time. The same applies to quality of the materials, the finishes and the construction." He has too much work for one builder, but his favorite is Jonathan Morris, a close collaborator whose workshop has produced many Grey designs.

Drawers are beautifully fitted. Seams and

joints are tight. Curved doors hang in their carcases perfectly, with the same reveal on all four sides and no corners out of line. Grey celebrates the practical art of cabinetmaking: "Good craftsmanship," he writes, "stimulates a response beyond the mere recognition of an efficient execution of a design...there is a response which great craftsmanship inspires akin to the highest achievements of man."

Scott Gibson is editor of Fine Woodworking magazine.

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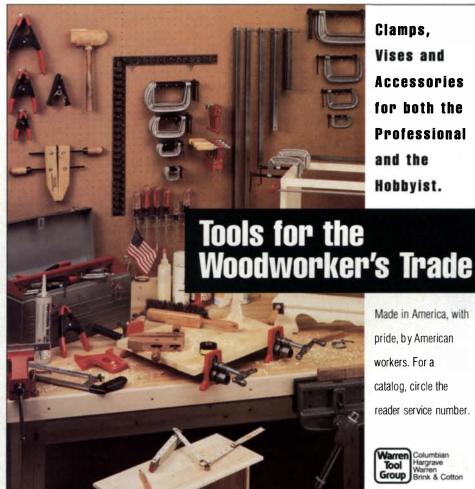
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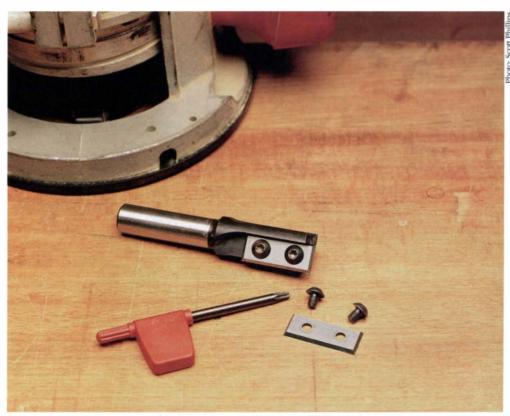
Amana insert-tooling router bits

Carbide-tipped router bits stay sharp for a long time, but eventually, they must be reground. You can box them up and send them out for sharpening. But if you need a new bit right away or your old one has been reground once too often, you may end up buying a new one at \$20 or \$25. Not cheap. And it doesn't make much sense to replace a whole bit when only the cutting edge is worn out. If you've ever faced this situation, you'll like Amana Tool's router bits with replaceable knives.

The bits use relatively inexpensive knives that can be changed when they get dull (this is called insert tooling). The company offers straight, trim and roundover bits with one or two carbide knives, plus a rosette cutter. Because the knives are not brazed onto the tool, a better grade of carbide can be used, and there's no heat distortion to worry about, Amana says.

Knives can be changed without altering the cutting profile. And each knife has two cutting edges (some have four). The 3/4-in., two-flute bit that Amana sent for review was beautifully machined, and in Honduras mahogany, it cut chip-free dadoes and rabbets with ease. The cutters were precisely seated in the tool body and held in place by two Torx-head screws.

Although the up-front cost of these bits is high, replacing the cutters is much cheaper than buying a new bit. Amana figures one of its new bits costs about the same as buy-



No waiting for a sharp bit-Amana offers a limited line of router bits with replaceable carbide knives. Changing them takes no more than a minute or two.

ing a standard tool and having it resharpened four or five times. The router bit I used is \$96; each replaceable knife is \$5.80.

Insert tooling is perfect for bits that get heavy use in your shop or on a job site. In the long run, they're cheaper and reliably sharp. Available sizes are not as extensive

as standard bits, but the selection Amana offers will take care of many routine router operations, and the line may be expanded later. For more information, contact the Amana Tool Corp., 120 Carolyn Blvd., Farmingdale, NY 11735; (800) 455-0077.

–Scott Gibson

New DigiTool InchMate



The InchMate+ makes working with fractions easy. It also calculates rise, run, diagonal and slope for triangles.

The InchMate+ is an updated version of DigiTool's builder's calculator. This model calculates the third leg of any right triangle after values for the other two legs are entered. It also gives slope. Units in feet, inches, fractions, decimal feet and meters can all be entered for calculation. The calculator does the basic four functions (add, subtract, multiply and divide) and square and square root. You can enter feet and fractions without any conversions.

If you are familiar with a pocket calculator, you'll have no trouble using the Inch-Mate+. Answers can be displayed in any of the four modes: feet-inch-fraction, inchfraction, decimal feet or meters. Fractions shown on the display are rounded off to the nearest 1/16 in. The InchMate+ is a handy tool for builders and carpenters, but the 1/16-in. round off may be a little too coarse for fine cabinet work.

If you've ever added and subtracted a long list of dimensions only to find you've cut the last piece of stock too short or you're intimidated by converting units, then you'll find the \$49.95 price worth every penny. Otherwise, you can match the same features with a basic pocket calculator. The InchMate+ is available from DigiTool Corp., 414 North Mill St., Aspen, CO 81612; (800) 223-7511.—Dennis Preston

New Danish oil finish

When I heard about Hydrocote's new water-based Danish oil finish, a "Watco substitute" that is nonflammable, I was interested. I've been fortunate, but I've heard too many stories of oily rags spontaneously combusting.

I wondered how an oil finish could be water-based. A company chemist said an emulsifying agent is used to prevent the water from separating from the other ingredients (a polymerized tung oil, a polyurethane resin and another proprietary oil). The water (25-30%) makes the mixture noncombustible.

I prepared a couple of white oak samples, one with the original Watco and the other with the Hydrocote Danish oil finish. I put three coats on each board, waiting several days between coats. The first thing I noticed about the Hydrocote is that it looks just like every water-based polyurethane I've ever used-about the color of skim milk with the consistency of heavy cream. Applying it is just as straightfor-

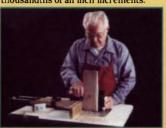


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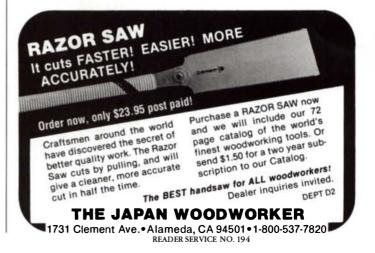
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ward as applying Watco. You just wipe it on, and then wipe off whatever's still on the surface 5-10 minutes later.

The finished surface it leaves is unique: It's just as flat (in terms of sheen) as you could imagine. That may not be to everyone's taste, but I kind of like it. On some projects, I just want to slow moisture exchange between wood and air, but I don't want a very obvious finish. This is perfect for that situation.

Hydrocote's Danish oil finish isn't going to replace any other finish that I use now, but at about \$9 a quart, I'm going to keep some around. It's worth checking out.

-Vincent Laurence



Hydrocote's Danish oil produces a dead-flat finish with the safety and the convenience of a water-based finish.

Wolfcraft cordless screwdriver accessory set



Wolfcraft's accessory set includes hex sockets, drills, countersinks and bits.

Cordless drills and power screwdrivers have earned their place in and out of the shop. The Wolfcraft cordless screwdriver accessory set makes this tool even more convenient by placing a good selection of bits, drills and drivers in one handy storage box to pack along with the power tool.

The set includes 13 hex-shank screwdriver bits for Phillips, square, straight and Torx drives, eight sockets sized from 5/32 in. to 7/16 in., three drill bits, two countersinks,

a bit extender and a keyless chuck.

The bits and sockets worked fine in my cordless drill/driver. The set is well designed for the torque output of cordless drivers. However, I suspect that a hefty electric drill would push the sockets to the limit, but that's not what this set is designed for.

The accessory set sells for around \$25 and is available at home centers and hardware stores.



The Ralston chair scrape is terrific for fine finishing.

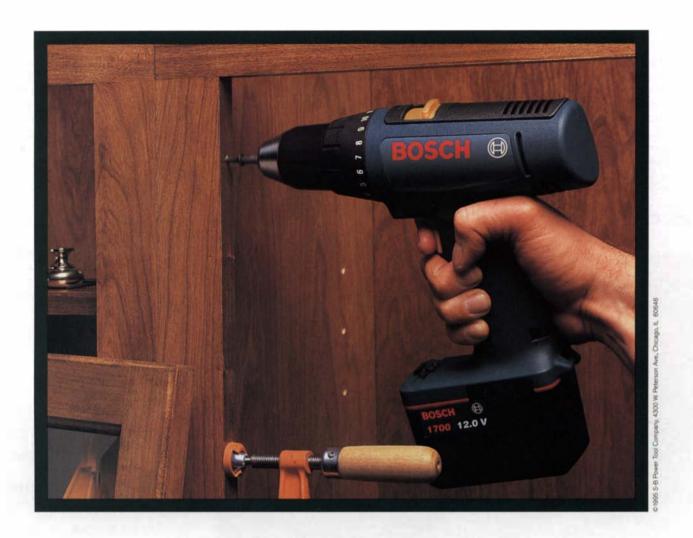
Ralston chair scrape

I use flat scrapers constantly in my reproduction and restoration work. They're effective for taking down seams on veneer repairs, removing shallow scratches or smoothing mild curves. And there's nothing better or faster for finishing curly grain or bird's-eye.

But as much as I rely on cabinet scrapers, they can be uncomfortable to use. Often their sharp corners dig into my hands, and they can become uncomfortably hot to handle when I use the tool vigorously.

Recently, I tested a new two-handled scraper modeled after an antique version of a similar tool. What interested me about this tool was that it was designed and produced by a working cabinetmaker.

This chair scrape is made by Bill Ralston of Cooperstown, N.Y. Its slender, 11-in.long maple body, similar to a spokeshave, holds a 15%-in.-wide blade. The blade's edge is prepared with a mill file to a 45°



It only has a bit in common with other cordless drills.

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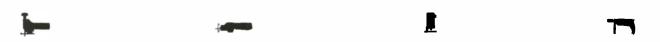
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edge and then hooked slightly to form a burr. Clear instructions for sharpening are provided. The whole sharpening process took me about three minutes.

This tool is simple to use. Unlike a spokeshave, where you often apply pressure above the mouth of the tool with your forefingers, the Ralston scrape actually worked better with my hands apart and the pressure applied at the ends of the handles. I could draw fine or heavy shavings by adjusting the projection of the scraper blade or by regulating pressure on the handles.

The chair scrape is a small and lightweight tool, and I thought it would be prone to chatter and skipping. Well, I was wrong. I used it on padauk, pearwood, white oak and some mahogany end grain. I even worked veneer edging with it. The surface it left was smooth, clean and ready for fine sanding.

The Ralston chair scrape sells for \$29.95 and is available through many mail-order catalogs. -Mario Rodriguez

Edgecraft 420 diamond file



Edgecraft diamond file cuts quickly and doesn't require lubrication.

Sharpening tools is a drag. That's why I use the fastest method that gives me the best results. So when I came across the Edgecraft 420 diamond file set, I was eager to try it. Whenever I get my hands on a new sharpening gadget, I try it on everything in the house and shop.

The Edgecraft 420 has a plastic, file-type handle with three interchangeable steel plates coated with diamond grit. The plates (coarse, medium and fine) are held to the handle by a magnetic strip. Changing the plate is simply a matter of lifting one off and setting another in place.

The tool can be used in a file fashion or clamped to the bench and used like a stone. No lubricant is needed because the grit doesn't seem to clog with metal particles, but you do need to brush away the accumulated metal particles periodically. The coarse plate is very aggressive, and I found it too rough for any of my edged bench tools. The medium- and fine-grit plates were great for flattening the backs of chisels and plane blades quickly. The fine grit worked well at establishing a new bevel on the chisels and did a good job at giving extra life to some worn carbide router bits and a carbide masonry bit. But even the fine grit was too rough to put a honed edge on my chisel and plane blades.

The medium and fine grits worked well on all my kitchen knives. The minute roughness gives a little bit of "tooth" on the edge, which allows the blade to slice through vegetables.

The Edgecraft 420 is convenient and fast. It cuts carbide and is a good addition to a sharpening arsenal, but you'll still need a fine honing stone, strop or buffing wheel for the ultimate edge. The diamond file set sells for \$29.95 and is available from Edge-Craft Corp., 825 Southwood Road, Avondale, PA 19311-9727; (800) 342-3255. –*D.P.*

Briefly noted

New from Jet: two tablesaws and a molder/planer

Jet Equipment & Tools of Auburn, Wash., has introduced two new tablesaws. Designed for professional use, the JTAS-10 features a 27-in. by 40-in., cast-iron top, widely spaced, cabinet-mounted trunnions and a 3-hp motor. The price of the saw, equipped with the customer's choice of a Biesemeyer, Vega or Excaliber fence, is about \$1,400.

The JWCS-10 is a cabinet-base tablesaw with the same size top, 2-hp motor and trunnions supported from the underside of the top like Jet's current JWTS-10JF contractor-style tablesaw. Supplied with a standard fence, it sells for about \$1,000.

The JPM-13 molder/planer has a 13-in.wide by 6½-in.-thick planing capacity with two feed rates. Jet offers more than 40 stock molding cutters. And cutters smaller than 2 in. can be installed without removing the planer knives.

The machine, powered by a 11/2-hp totally enclosed, fan-cooled (TEFC) motor, comes with a stand and lockable casters and sells for about \$1,000.

For more information, call or write Jet Equipment & Tools (P.O. Box 1349, Auburn WA 98071-1349; 800-274-6848).

New Leigh D3 dovetail jig user's guide is now available. The guide has 166 clearly written, well-illustrated pages. You get the updated guide when you buy a new jig, or you can purchase the guide separately for \$9.95 plus shipping and handling from Leigh Industries Ltd., P.O. Box 357, Port Coquitlam, B.C., Canada V3C 4K6; (800) 663-8932.

The Belsaw Co. announced the opening of a showroom in Minneapolis, Minn. This maker of planers, molders and other machinery has, over the last several years, marketed its products through catalogs. But in response to many requests, the company said, it opened a showroom to give customers a better look at the equipment before they buy.

For directions to the showroom or to request a catalog, contact The Belsaw Co., 4111 Central Ave. N.E., Minneapolis, MN 55421; (800) 468-4449.

Felder woodworking machines has a new distributor. For more information, call Felder USA at (800) 572-0061.

Scott Gibson is editor of FWW. Dennis Preston is an assistant editor of FWW. Vincent Laurence is an associate editor of FWW. Mario Rodriguez is a contributing editor to FWW and a woodworker in Warwick, N.Y.

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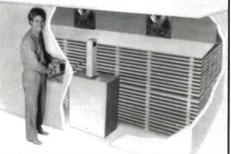


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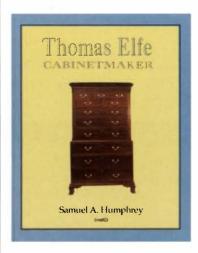
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Thomas Elfe: Cabinetmaker by Samuel A. Humphrey. Wyrick & Co., P.O. Box 89, Charleston, SC 29402; 1995. \$24.95, paperback; 128 pp.



Thomas Elfe's legendary status in the lore of Charleston, S.C., makes him a wonderful subject for this handsome book. Elfe (1719-1775) was a contemporary of Thomas Chippendale and, as the book amply documents, their lives followed similar paths.

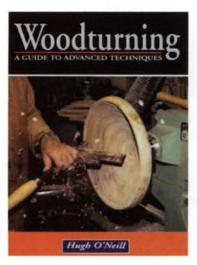
Samuel A. Humphrey has chosen some wonderful pieces to illustrate this book. The double chest, or cheston-chest, is shown in as many varieties as one could imagine. The two breakfast tables, shown with their pierced and carved skirts,

rank among the best of that form produced in Colonial America. With the bedsteads, chairs, chests, desks and the library bookcase, Mr. Humphrey shows us examples of some of the finest furniture built in Charleston during the 18th century.

This book contains a thorough list of references and other sources but is missing an index, which limits its use as a reference tool. The author's drawings of many of the pieces are far more detailed than what was available to cabinetmakers reading Chippendale's *The Gentleman and Cabinet-maker's Director*. But for those who want to build copies, be warned: The author assumes a fairly advanced degree of cabinetmaking skills.

For those readers who are just looking, the color photos and the drawings will give them a good view of the pieces. Those with enough skill and imagination can use the photos and drawings to produce some beautiful furniture. -David Beckford

Woodturning: A Guide to Advanced Techniques by Hugh O'Neill. The Crowood Press, Ramsbury, England. Distributed by Trafalgar Square, Howe Hill Road, North Pomfret, VT 05053; 1995. \$39.95, hardback; 192 pp.



Hugh O'Neill has written an excellent summary of techniques for the advanced woodturner. Although there are many books catering to the beginner, I have seen only a few that answer questions more accomplished turners might ask. I doubt I'll be able to experiment with every method covered in this book, but I sure would like to try.

O'Neill has organized his work along logical lines. He starts with an introduction to the shop and proceeds through timber (watch out for the Briticisms), design concerns, methods of hold-

ing workpieces securely, tools and decorative techniques. He concludes the book with a section on coloring wood.

Each section is presented thoroughly and factually. A slightly more scientific approach to the art of woodturning helps one to plan a job better, avoid failure and minimize waste. Charts with

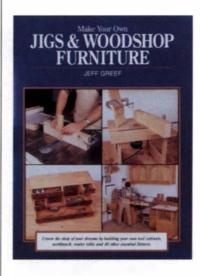
information on moisture content, drying time, shrinkage and dimensional changes in various species are especially useful.

The section on tools is very comprehensive—nearly all the latest types of turning tools are mentioned, and how they work is clearly explained. The best section of the book covers design: balance, curves and straight lines, and shape and proportion in horizontal and vertical forms. The text includes drawings and mathematical formulas based on the golden mean and the rule of thirds—ratios of proportion developed by the ancient Greeks.

This book belongs in every woodturner's library. Novices can learn to plan their approach to a project more carefully, and more experienced turners can strengthen their technical skills.

-David M. Goldenberg

Make Your Own Jigs & Woodshop Furniture by Jeff Greef. Betterway Books, 1507 Dana Ave., Cincinnati, OH 45207; 1994. \$24.99, hardback; 144 pp.



The first half of this book introduces the home hobbyist to basic jig construction. The second section contains shop projects that put those jigs to work. Jeff Greef believes that by building shop furniture, beginners develop the skills necessary for making more advanced pieces.

The author gives a thorough review of many commercially made jigs available through mail order. His presentation of the pros and cons of various dovetailing, doweling and tenoning jigs is strong. He's dead-on accurate when considering the

cost of these jigs vs. the amount of actual use they'll get.

The strength of this book is the "Projects" section, which provides numerous ideas for benches, vises and cabinets. The small tool chest, large toolbox and wall-mounted storage cabinets are both functionally and aesthetically successful. The book presents several great workbenches.

He complements his bench ideas with precise drawings for front and tail vises, as well as directions for mounting the standard metal type. He also discusses making and storing clamps, shop layout and wood storage. His instructions and drawings are clear; ample photos fill in the gaps.

Parts of this book fall short. Although Greef focuses on router and tablesaw techniques, he fails to educate his readers about the various types of blades and bits that are available. Also, there is no serious discussion of material options or hold-down devices hobbyists can purchase for building their jigs. A book on jigs should contain that sort of information—no matter what the level of the target audience.

Some of the jigs are great—the adjustable tenoning jig is both accurate and versatile. Many, however, are unnecessarily complicated, as in the case of his plunge-router mortising jig. And some are far too simple. Troubleshooting for the more common jig problems is absent from this book.

All in all, I found the \$24.95 price tag pretty steep for the information provided. I'd look this one over very closely to determine if it truly fills your needs. -Steve Latta

David Beckford restores furniture in Charleston, S.C. David M. Goldenberg is a physician and a woodturner. Steve Latta is a furnituremaker at Kinloch Woodworking in Unionville, Pa.

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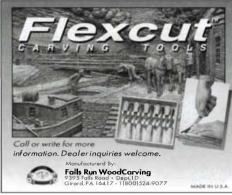
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Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. We list events (including entry deadlines for future juried shows) that are current with the time period indicated on the cover of the magazine, with overlap when space permits. We go to press three months before the îssue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

ALASKA: Meetings-Alaska Creative Woodworkers Association meets at 7 p.m. on the fourth Monday of each month at the Anchorage Museum. For more info, call (907) 345-3077.

ARKANSAS: Meetings-Woodworker's Association of Arkansas meets the first Monday of each month at 7:00 p.m. at Woodworker's Supply Center, 6110 Carnegie, Sherwood, 72117. For more information, call (501) 835-7339.

Workshops-Canoe making, kayak making, thru November. White River Artisans School, PO Box 308, 202 South Ave., Cotter, 72626. (501) 435-2600.

CALIFORNIA: Workshops-Woodworking for women. Furnituremaking with hand tools using traditional joinery, weekends. San Francisco. For more info, contact Debey Zito (415) 648-6861.

Classes-Classes on wood finishing and decorative painting for furniture and cabinets. For schedule, write Studio 1829, 1829 Stanford St., Santa Monica, 90404. (310) 453-0230.

Workshops-Shaker bench, sof a table, Mission lamp table, Adirondack chair, more. Saturdays and Sundays. No experience necessary. Private instruction available. For more information, contact the Woodworkers Place at (818) 952-3177.

Workshops-Woodworking and carving. Martin Pierce Furnishings, 5433 W. Washington Blvd., Los Angeles. For more info, call (213) 939-5929.

Workshops-Various workshops including Japanese woodworking, joinery and sharpening. For more info, contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700. Exhibition-Masterpieces from the Museum of Classical Chinese Furniture thru March. Pacific Heritage Museum, 608 Commercial St., San Francisco, 94111. (415) 399-1124.

Lecture-Leon Marcotte, New York cabinetmaker and interior decorator, Dec. 12. The American Decorative Arts Forum of Northern California, Trustees Auditorium, M.H. de Young Museum, Golden Gate Park, San Francisco. For more information, call (415) 456-8177.

Show-Celebration of Craftswomen, Dec. 2-3 and Dec. 9-10. Fort Mason Center's Pier 1 and Pier 2, Buchanan St. and Marina Blvd., San Francisco. Formore info, call (415) 361-0700.

COLORADO: Classes-Woodworking and related classes. year-round. For more info, write Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.

Classes-Traditional hand woodworking, year-round. Contact Tom Larkin, Shadow Mountain School of Woodcarving, 32037 Stenzel Drive, Conifer, 80433. (303) 674-8560.

Exhibition-Woodworkers Guild of Colorado Springs 11th annual exhibit, thru-Nov. 25. Pioneers Museum, Colorado Springs. For info, contact William Jeavons at (719) 593-8461. Exhibition-1996 American Craftsmen 11th Annual Custom Woodworking Exhibition, Jan. 14-28. Vail Public Library, Vail. For more information, call Tim O'Brien (970) 328-7253.

CONNECTICUT: Exhibition-Shaker: The Art of Craftsmanship, thru Dec. 3. Wadsworth Atheneum, 600 Main St., Hartford, 06103-2990. (203) 278-2670.

Classes-Veneering, turning, Shaker bench, boatbuilding, basic woodworking techniques and more, thru November. For more info, contact Brookfield Craft Center, PO Box 122, Route 25, Brookfield, 06804. (203) 775-4526.

Classes-Hands-on woodworking, finishing and lathe classes. Call for complete schedule. Harris Enterprise Corp., 80 Colonial Road, Manchester, 06040. (203) 649-4663.

DELAWARE: Show-Brad Smith, Farm Fresh Furniture and Don Titlow, Country Carvings, Nov. 3-30. Creations Fine Woodworking Gallery, Powder Mill Square, Greenville, 19807. For further information, contact John Sherman at (302) 655-8311.

DISTRICT OF COLUMBIA: Classes-Furniture Conservation Training Program: The Smithsonian Institution's Conservation Analytical Laboratory's fourth triennial class, August, 1996. Deadline: Dec. 1. For further information, contact Training Secretary, CAL/MSC, Smithsonian Institution, Washington D.C. 20560. (301) 238-3700, ext. 103.

FLORIDA: Meetings-South Florida Woodworking Guild meets every second Monday at 7 p.m. Constantine, 1040 East Oakland Park Blvd., Ft. Lauderdale. For further information, contact Woody McLane at (305) 565-2729

Meetings-Central Florida Woodworkers Guild meets the second Thursday of each month at 7:30 p.m. Woodcraft Supply Corp., 246 E. Semoran Blvd., Casselberry. For more information, contact Bob Elliott (407) 695-8960

Meetings-St. Petersburg Woodcrafters Guild meets the fourth Thursday of every month at 7 p.m. Montgomery Electric and A/C, 1200 19th St. N., St. Petersburg, 33713. For more info, contact Don Montgomery at (813) 898-0569.

GEORGIA: Meetings-Woodworkers Guild of Georgia meets the second Monday of every month. Southern College of Technology, 1100 S. Marietta Parkway, Marietta. For more information, call (404)299-3972.

Workshops-Japanese woodworking by Toshihiro Sahara. One Saturday each month. For further information, contact Sahara Japanese Architectural Woodworks at (404) 355-1976.

ILLINOIS: Show-Belleville Wood Carvers Club 25th annual Midwestern Wood Carvers show, Nov. 4-5, Belle-Clair Exposition Hall, 200 S. Belt East, Belleville. Formore info, call (618) 233-5970.

Show-Artistry in Wood: 1995 Woodcarving Show, Nov. 4-5. Chicago Botanic Garden, Lake Cook Road, one-half mile East of Edens, Glencoe. For more information, call (708) 394-1310.

INDIANA: Classes-Hands-on woodworking classes with Michael Van Pelt. Superior Woodworking Supply, Inc., 922 Ft. Wayne Ave., Indianapolis, 46202. (317) 635-5747.

IOWA: Exhibition-Virtual Rurality, an exhibition of the woodcarvings of Fred Cogelow, Nov. 2 thru Jan. 3. The Putnam Museum, Davenport. (319) 324-1933.

KENTUCKY: Workshops-Woodturning and joinery instruction. For further information, contact Jim Hall, Adventures in Wood, 415 Center St., Berea, 40403. (606) 986-8083. Meetings-Kyana Woodcrafters Inc. meets the first Thursday of each month. Bethel United Church of Christ, 4004 Shelbyville Road, Louisville, 40207. For info, call (502) 426-2991. Workshops-Traditional Windsor chairmaking. One-week courses. For info, contact David Wright (606) 986-7962.

MAINE: Workshops-Two-week basic and intermediate furnituremaking courses. Faculty includes Peter Korn, Silas Kopf, Bob Flexner, Nora Hall, Michael Emmons. For more information, contact the Center for Furniture Craftsmanship, 125 W. Meadow Road, Rockland, 04841, (207) 594-5611. **Meetings**-Guild of Maine Woodworkers meets the first

Wednesday of every month. For time and location, call Guild of Maine Woodworkers at (800) 805-5100.

MARYLAND: Exhibition-Ghost Vessels: turned wood by Geoffrey Wilkes, thru Nov. 18. Franklin Street Gallery, 7 W Franklin St., Hagerstown, 21740. (301) 791-3132.

MASSACHUSETTS: Classes-Woodworking classes most of the year. Contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.

Instruction-Full-time program in fine furniture construction. Complete facilities. For more info, contact Wm. B. Sayre, Inc., One Cottage St., Easthampton, 01027. (413) 527-0202.

Classes-Woodworking turning, carving, finishing, veneering, beginner, intermediate, classes for women. One Cottage Street School of Fine Woodworking, One Cottage St., Easthampton, 01027. (413) 527-8480.

Workshops-Toolmaking for woodworkers. First three weekends of each month. Registration limited to two students per weekend. Contact Ray Larsen, Genuine Forgery, 1126 Broadway, Hanover, 02339. (617) 826-8931.

Workshops-Summer intensives. Faux finishing, chair basics, more. Horizons, The New England Craft Program, 108 N. Main St., Sunderland, 01375. (413) 665-0300.

Workshops-One-week woodworking and related workshops year-round. Contact The Heartwood School, Johnson Hill Road, Washington, 01235. (413) 623-6677.

Hill Road, Washington, 01255. (415) 025-067/. **Classes-**Ongoing woodworking classes and one day seminars. Beginner thru intermediate. For information or brochure, call Michael Coffey at (413) 527-8480. **Workshops-**Three day intensives for traditional or contem-

porary styles. Sharpening, layouts, carving techniques, sign lettering, tool forging and design study. Taught by professional carver with 16 years experience. Calvo Studio, 17 Mill Lane, Arlington, 02174. (617) 648-5589.

MICHIGAN: Workshops-Woodwrighting. Tillers International, 5239 S. 24th St., Kalamazoo, 49002. For more informa-

tion, call (616) 344-3233. **Show**-Fruitbelt Woodcarvers Show, Nov. 4-5. Bridgman, Cook Energy Information Center, I-94 Bridgman Exit 16, three and a half miles north on Red Arrow Highway. For more information, call (800) 548-2555.

MINNESOTA: Classes-Woodcarving classes year-round. For information, contact the Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.

Meetings-Minnesota Woodworkers Guild meets the third Tuesday of each month at 7:15 p.m. Demonstrations present-ed each month. Contact Richard Gotz at (612) 544-7278.

Classes-Ongoing classes. Wild Earth Woodworking at a Minneapolis/St. Paul facility. Contact Wild Earth Woodworking, 401 Hunter Hill Road, #3, Hudson, WI 54016. (715) 386-3186.

MISSISSIPPI: Classes-Various woodworking classes. For more information, contact Allison Wells School of Arts & Crafts, Inc., Canton, (800) 489-2787.

Show-Chimnevville Crafts Festival, Dec. 1-3, Mississippi Trade Mart, Jackson. For info, contact Craftsmen's Guild of Mississippi, Inc. at (601) 981-0019.

MISSOURI: Show-Wood Concepts '95, thru Nov. 9. For information, contact Columbia Art League, 1013 E. Walnut St., Columbia, 65201. (314) 443-2131.

NEBRASKA: Meetings-Omaha Woodworkers Guild meets at 7 p.m. the third Tuesday of every month. Westside Community Center, Omaha. For more info, contact John Cahill at (402) 334-5550.

NEW HAMPSHIRE: Classes-Fine arts and studio arts. For info, contact Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104, (603) 669-2731.

Classes-Various woodworking classes. For more info, contact The Hand & I, PO Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.

Auctions-Antique and craftsman's tool auctions, yearround. Contact Richard A. Crane, Your Country Auctioneer, 63 Poor Farm Road, Hillsboro, 03244. (603) 478-5723. **Workshops**-Week-long Shaker-style furniture and chair-

making workshops, year-round. For more info, contact Mary Sweet, Dana Robes, Wood Craftsman, Lower Shaker Village, Enfield, 03748. (603) 632-5385.

Classes-Make a Windsor chair with Michael Dunbar. Also, sack back, continuous arm, fan back, writing arm. Classes start in January. For information, contact Michael Dunbar, PO Box 805, Portsmouth, 03802. (603) 431-4676.

NEW MEXICO: Classes-Woodworking classes. For more information, contact North New Mexico Community College, El Rito, 87520. (505) 581-4501.

Classes-Woodworking classes. For info, contact Santa Fe Community College, Santa Fe, 87502. (505) 438-1361.

NEW YORK: Classes-Traditional 18th-century woodworking techniques with Mario Rodriguez. For more info, contact Warwick Country Workshops, PO Box 665, Warwick, 10990 (914) 986-6636

Meetings and classes-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd. St.) New York City. Contact Howard Alalouf (914) 337-0226.

Classes-Woodworking, traditional and contemporary; turning and finishing with Maurice Fraser and Bill Gundling. All levels. The Craft Students League at the YWCA, 610 Lexington Ave., New York City. For information, call (212) 735-9731. **Show.** The Handmade Home Show, Nov. 17-19. Lexington Ave., Armory at 26th St., New York City. For more information, contact Richard Rothbard (800) 834-9437.

Classes-Wood inlay, routing, woodcarving, veneering, finishing, tablesaw techniques, more. Saturdays, January thru April. For more info, contact Albert Constantine & Son, Inc., Woodworking Classes, 2050 Eastchester Road, Bronx, 10461. (718) 792-1600

Meetings-The Long Island Woodworker's Club meets the first Wednesday of every month, Sept thru June at 7:30 p.m. Brush Barn, 211 Jericho Turnpike, Smithtown. For more information, call (516) 360-1216.

Exhibition-Norwegian Folk Art, thru Jan. 7. Painted cupboards, carved ale bowls and more. Museum of American Folk Art, Two Lincoln Square, New York City, 10023-6214. (212) 595-9533.

NORTH CAROLINA: Meetings-North Carolina Wood-turners meets the second Saturday of each month. For more information, contact North Carolina Woodturners, PO Box 1833, Hickory, 28603. (704) 324-5960. **Show**-The Chair Show, thru Nov. 30. Folk Art Center,

Asheville. For more info, contact Katherine Duncan, South ern Highland Handicraft Guild, PO Box 9545, Asheville, 28815. (704) 298-7928.

Classes-Bedside table, Queen Anne bench, pencil post bed, thru December. Benjamin C. Hobbs, Cabinetmaker, Route 1, Box 517, Hertford, 27944. (919) 426-7815.

OHIO: Meetings-Cincinnati Woodworking Club meets from 9:00 to noon on the second Saturday of January, March, May, September and November. Reading High School, 801 E. Columbia Ave., Reading. For more info, contact the Cincinnati Woodworking Club, 5974 Gaines Road, Cincin-

Workshops-Windsor chairs, taught by Joe Graham. For more information, contact Lenox Workshops, 1192 Webster Road, Jefferson, 44047. (216) 576-0311.

Workshops-Various workshops, year-round. Conover Workshops, 18125 Madison Road, PO Box 679, Parkman, 44080. (216) 548-3491.

Meetings-Woodworkers of Central Ohio meets on the second Saturday of November, February, April, and June. For more information, call Chuck at (614) 457-3704.

Classes-Bowl turning, chip carving, router techniques, finishing, November thru March. The Hardwood Store, 1695 Dalton Drive, New Carlisle, 45344. (513) 849-9174.

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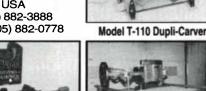
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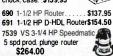
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OREGON: Meetings-Cascade Woodturner's Association meets every third Thursday. For more info, contact Cascade Woodturners, 11575 S.W. Pacific Highway, #104, Tigard, 97223, (360) 887-3903,

Classes-Oregon School of Arts and Crafts 8245 SW Barnes Road, Portland, 97225. (503) 297-5544.

Exhibition-Guild of Oregon Woodworkers 12th annual exhibition and sale of fine furniture, Nov. 17-19. Miller Hall of the World Forestry Center, Portland. For more information, call (503) 492-1515.

PENNSYLVANIA: Classes-Windsor chairmaking, weekand weekends. For more information, contact Jim Rendi, Philadelphia Windsor Chair Shop, PO Box 67, Earlville, 19519. (610) 689-4717.

Meetings-Black Hills area woodworkers interested in organizing for purposes of sharing information and working toward a show. To be on mailing list, call (605) 343-1878.

Classes-Furnituremaking, joinery, chip carving, restoration, woodturning and more, thru December. For schedule, contact the Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Road, York, 17402. (717) 755-8884.

Workshops-Week-long woodcarving workshops, thru November, Sawmill Center for the Arts, PO Box 180, Cooksburg,

Call for entries-Holiday ornaments, Nov. 17-19. Palmer Museum of Art, Pennsylvania State University, University Park, 16802-2507. (814) 865-7627.

Classes-Bowl turning with David Ellsworth. Three-day weekend classes in private studio, beginner to intermediate For schedule, contact David Ellsworth, Fox Creek, 1378 Cobbler Road, Quakertown, 1895. (215) 536-5298. **Exhibition**-The Philadelphia Museum of Art craft show,

Nov. 9-12. Philadelphia Museum of Art, Benjamin Franklin Parkway, Box 7646, Philadelphia, 19101-7646. For more info, call (215) 763-8100.

RHODE ISLAND: Exhibition-Marriage in Form: Kay Sekimachi & Bob Stocksdale, thru Feb. 4. Museum of Art, Rhode Island School of Design, Providence. For info, call Palo Alto Cultural Center, Palo Alto, CA. (415) 329-2605.

SOUTH DAKOTA: Classes-Various classes and workshops, all levels. Iron Mountain Wood Shop, 4302 S. Highway 79, Rapid City, 57701. For more info, call (605) 343-1878.

TENNESSEE: Workshops-Turning, carving and more, vear-round, Arrowmont School of Arts and Crafts, PO Box 567, 556 Parkway, Gatlinburg, 37738-0567. (615) 436-4101.

Classes-Lumber selection, grading, stacking, drying, kiln operation, sawmilling, more. Tennessee Valley Authority, 17 Ridgeway Road, Box 920, Norris 37828-0920. (615) 632-1656. Show-Tennessee Technological University's BFA Show featuring Alan Frederick and Dennis Meador, Nov. 20-Jan. 5. The University Craft Center's Small Gallery. For more information, call (615) 372-6328.

TEXAS: Meetings-North Texas Woodworker's Association meets the third Tuesday of each month. Contact Bruce May, North Texas Woodworker's Association, PO Box 831567, Richardson, 75083. (214) 271-0125.

Classes-Woodworking classes year-round. Bowl turning basics to advanced furniture and cabinetry. For info, contact Woodshop, Inc. Woodworking School, 1225 West College, Suite 612, Carrollton, 75006. (214) 466-3689.

Meetings-Woodturners of North Texas meets the last Thursday of every month, 7:30-10:00 p.m. For more information, contact the Paxton Beautiful Woods Store, 1601 W. Berry St.,

Fort Worth, 76110. (817) 927-0611.

Classes-Carving classes with Don Schol, every Thursday, 6:00-9:00 p.m. For information, contact Paxton Beautiful Woods Store, 1105 Sixth St., Carrollton, 75006. (214) 245-1192. Show-10th annual Rio Grande Valley Woodcarvers show and sale, Jan. 19-20. McAllen Civic Center, McAllen. For information, contact Dorothy Chapapas, Route 2, Box 150, McAllen, 78504, (210) 581-2448.

VERMONT: Courses-Yestermorrow Design and Building School, Route 1, Box 97-5, Warren, 05674, (802) 496-554

VIRGINIA: Show-Beads on Target, thru-Nov. 25. Contact Friends of the Torpedo Factory Art Center, 105 N. Union St. Alexandria, 22314. (703) 683-0693.

Classes-Fundamentals of woodworking, router techniques, bowl turning and more. Classes offered year-round. For class schedule, contact The Woodworkers Club, 216 Dominion Road, N.E., Vienna, 22180. (703) 255-1044.

Exhibition-Revolutions in Wood: Retrospective of the work of Mark Lindquist, thru Nov. 12. Hand Workshop, Virginia Center for the Craft Arts, 1812 W. Main St., Richmond, 23220. For more information, call (804) 353-0094

WASHINGTON: Workshops-Build a sea chest, small boat construction, hand plane repair and construction, paddle carving, woodturning. Northwest School of Wooden Boat Building, 251 Otto St., Port Townsend, 98368.

Classes-Woodcarving, lathe, router, tablesaw, furniture and cabinetmaking. Individual and small group. Common Sense Woodwork, 8231 S.E. 67th St., Mercer Island. For schedule, call (206) 232-1714

WEST VIRGINIA: Workshop-Flat plane figure carving, Harley Refsal, Nov. 3-5. Crafts Center, Ccdar Lakes, Ripley, 25271. (304) 372-7873.

WISCONSIN: Workshops-Furniture design, cabinet construction, picture frames, planing, finishing, guest speakers, thru December. The Wisconsin Woodworkers Guild. For more information, call Matthew Bohlmann at (414) 258-3132.

CANADA: Workshops-Traditional Windsor chairmaking. Weekly courses. For more info, contact David Goodwin, Village Chairmaker, Sparta, Ont., NOL 2HO. (519) 775-2751.

Association-Canadian Woodturners Association. Markham, Ont. For info and quarterly newsletter, call (905) 479-0755.

Meetings-West Island Woodturners Club (Montreal) meets every Tuesday, thru May. Contact Dennis Brown, 8817 Cure Legault, Lasalle, Que. H8R 2V9. (514) 366-6071.

Association-Superior Woodworking Association meets 7:00 p.m. the last Monday of each month. Confederation College, Ont. For more information, contact Vic Germaniuk at (807) 767-5964.

Classes-Fall Woodworking, carving, finishing, lathe turning, router and toymaking courses. Furnituremaking seminar with Sam Maloof, Nov. 4-5. For more information, contact Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C. V9A 3S8. (604) 383-9600.

ENGLAND: Workshops-Restoration, hand finishing, cabinetmaking for beginners, marquetry, furniture design, yearround. Bruce Luckhurst, Little Surrenden Workshops, Bethersden, Kent TN26 3BG. 0233-820-589.

SCOTLAND: Workshops-Ongoing workshops. For more information, contact the Myreside International School of Antique Furniture Restoration, Myreside Grange, Gifford, East Lothian, Eh41 4 JA. (062 081) 0680.





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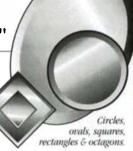
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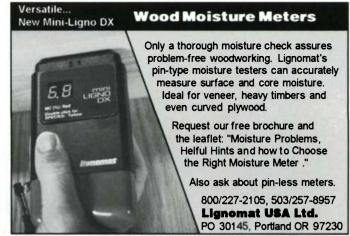
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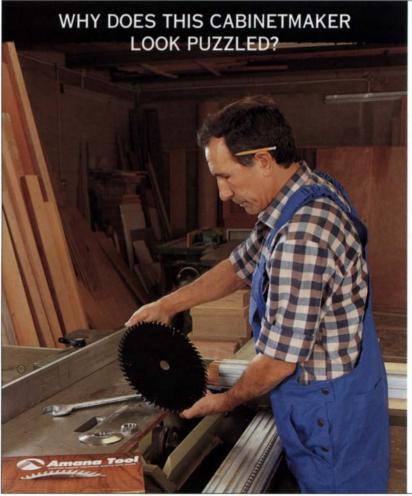
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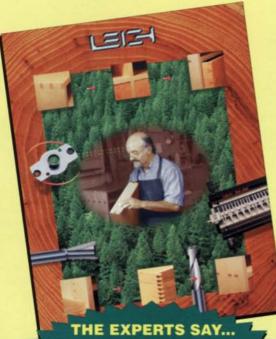
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Nocturne

Twinkle, twinkle, little bat!
How I wonder what you're at!
Up above the world you fly,
Like a teatray in the sky.
—the Mad Hatter,
Alice's Adventures in Wonderland



Bats, despite lurid tales of vampires that feed on your neck, are for the most part harmless little creatures that simply like to eat at night.

This cabinet, permeated by imagery of bats, was made by a pair of California woodworkers for a show at the William Zimmer Gallery in Mendocino, Calif. Time was the theme of the show (the daytime of bats being nighttime). It was inspired by the Mad Hatter's poem at left.

Built of Honduras mahogany, with bats and other details of cocobolo, the cabinet is a skillful synthesis of fine joinery, inlay and carving in the round. Flying into the dusk as bits of inlay on the doors, two of the bats emerge from perspective into basrelief, and two more flap completely into three dimensions as the pulls. A bat is even expressed as shadow in the silhouette scroll-sawn in the faces of the drawers.

The piece, now in a private collection, was made by Sarah Wheaton of San Jose, Calif., and David Moore of Willetts, Calif., collaborating as Noctiluca Studios (*noctiluca* means "night-blooming, phosphorescent plankton").

The cabinet was designed to contain a tea service, for use at "tea time." It might be a good idea to hang a braid of garlic in there, too.—Glenn Gordon, St. Paul, Minn.

Like a bat cave, the interior of this tea service cabinet (left) is a mysterious place to secure something of value. Inlaid bats fly from two dimensions into three (right).



Eggplant harpsichord

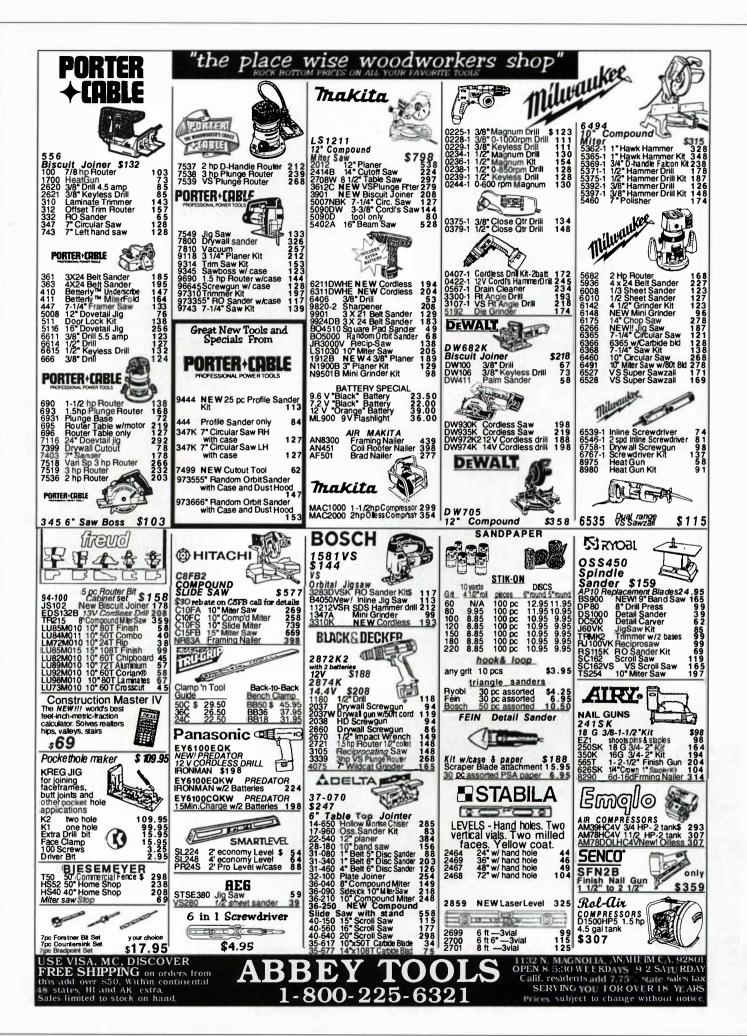
When he saw the 20-year-old kit-built harpsichord, he knew it was beyond repair; it needed a complete rebuild. Lewis Schultz, a photographer and sometime harpsichord builder, quoted a price and offered to buy the instrument for parts. Soon the harpsichord was in his shop.

There was no sense in returning the kitbuilt harpsichord to its original condition, he reasoned. "It's just another French double," he said. "There are thousands of them. Let's do something different."

Schultz's rebuilt harpsichord became a hybrid of a modern kit and classical technology. Much of the case and action were simply repaired, but the parts that have to do with sound were rebuilt according to the designs of Pascal Taskin, a Parisian harpsichord maker of the late 18th century.

The cracked soundboard was replaced with a thicker one built of quartersawn

This harpsichord began life as a kit. Rebuilt to sound like a period instrument, it looks like nothing else.



Sitka spruce. The plywood internal bracing was discarded and replaced with pine, and the wrest plank (the plank just behind the keyboard that holds the tuning pins) was refastened with more substantial dowels. The modern zither pins and steel strings were replaced with old-style tuning pins and soft iron wire to get a more classical sound. This also required moving all the bridges to change the string length closer to Taskin's design.

The hybrid's elaborate decoration is in the classical tradition, even if the theme is not. An art historian, Schultz can defend his choice with references to early Baroque painters and their vegetable motifs, but the main reason for the decoration was simply to be different.

The iridescent purple case is offset by lots of vegetables. Though not visible in the bottom photo on p. 126, the area beneath the strings is decorated with paintings of squash, corn, beets and other common vegetables. The name board is painted with an eggplant vine that seems to be growing from one side to the other; the legs are carrots, and the lid is held up by a giant asparagus. The lid is topped off with a painting of Pan dancing toward a group of naked maidens, none of whom are holding or eating vegetables.

After displaying his harpsichord, Schultz got an anonymous hate letter full of vegetable puns, advising him to practice crop rotation and plow the thing under. He figures the letter came from a professional harpsichord builder steamed by the competitive pressures of the field. "I realize the decorative theme is not historically correct," he says. "But I thought if I was going to go crazy, I should go absolutely crazy."

-Aimé Fraser, assistant editor

The Mesquite tree that stayed close to home



This mesquite clock stands only a few feet from the tree from which it was made. It was built for the South Texas Cancer Therapy and Research Center in San Antonio.

As chairman of the building committee, Gerald Dubinski knew all about the state-of-the-art medical center to be built in San Antonio, Texas. As an amateur furniture-maker, he thought it would be fitting to turn one of the mesquite trees from the site into a clock for the hospital lobby.

After some trouble, the job superintendent came up with a crooked tree, 18 in. in diameter at the bottom, that yielded about 80 bd. ft. of wood, the longest board only 4 ft. long.

To fill the unavoidable worm holes, Dubinski used a common local technique. He packed the holes tightly with bronze powder to about half their depth and capped them with a thin layer of cyanoacrylate glue. Then he put in a little more bronze followed by some glue, continuing in thin layers until the hole was full. Instead of looking like voids, the wormholes now appear to be flecks of gold.

The top of the clock is an exact replica of a Simon Willard clock Dubinski saw in a museum, as are the columns. The sunburst (carved by Judy Duke) and the base moldings were added near the end of construction, when Dubinski decided that the wood itself didn't have enough character to be left unadorned.

It took about three months of nights and weekends to build the clock, during which Dubinski found he was allergic to mesquite. His reactions were so severe he was urged to forget the clock, but he was committed to the project.

Today, standing very near the place where the wood stood a year before as a tree, the clock chimes the hours. -A.F.



It takes concentration to use a saw. Jökull is beginning his second project.

Shop class

Fall is young, but the air is more than just nippy on the first day of school in Iceland. Grade by grade, the kids come into the school woodshop for the first lesson of the year. One semester of shop class is required at each grade level for children up to 15 years old. The requirement is partially a survival necessity in this rugged, isolated land and partly cultural.

The 6-year-olds are full of wonder. They gape at the double row of benches and count the still mostly nameless tools neatly hanging on their pegboards. They compare colors. You have a red hammer! Mine's yellow! What's this?

At 6, every effort is a work of art, and every obstacle is a mile-high wall. By Christmas, though, most of them have begun to learn not to force the tools but

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DESIGN BOOK SEVEN

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See the October 1995 issue of Fine Woodworking (#114 p. 18) for information and entry form or call 203-426-8171, ext. 535.



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rather to let the tools help them.

The second-graders, old hands at 8 and 9, already know the tools by name and function, and they also know important secrets-like where the sandpaper is stored and how to change a drill bit. They want to get right to work, and chafe at the requirement that they get approval from the teacher. This is their first taste of planning. They must choose something from the project bank and learn to explain what materials they will use and how they will do the work. That's a hard job at 28 or 58; it is a supreme challenge for an irrepressible third-grader.

At 11 or 12, the fumble-fingered still hope that they might become capable, and the talented have an assurance that borders on hubris. Now they must use the skills they have learned in their other classes. They must use arithmetic to calculate a materials list. They must use language and pictures to show what they are going to do. They must make a plan and stick to it. All at once, there's some purpose to their schoolwork.

The ones who won't work—the lazy ones, the cocky ones—begin to cut up and to play hooky. A lot of nails get pulled out in these years, and too many corners get sanded round and won't line up. Parts get lost and found, but somehow individual responsibility grows out of the collective chaos. The careful and diligent ones will be introduced to the lathe and the bandsaw. The slow ones will receive extra help and encouragement. And once in a while, there is a spark of hidden talent. If nur-



Gudrün finds that power tools take more skill and strength than she expected.

tured, it will grow into a blaze of genuine interest which, with luck, will spread to other subjects.

For students 13 to 15 years old, the class is optional. These kids know their way around a shop, and they can be trusted to work independently. Now is the time to train the eye and to begin to teach the principles of design. Simple joinery and some freehand carving provide the most skillful and talented with challenges worthy of their abilities. The ones who prove they are good enough get mahogany, birch and beech to work. The others hone their hand skills on simple, practical things.

The right mistakes made now teach far more than all the lecturing and demonstrating in the world. Students must be allowed the right mistakes, but the wrong ones must be stopped before destroying not only the project but the maker.

Once in a while a student stands out, not for what he can do in shop class but for what shop skills can do for him. I'm lucky, I have two this year. A dyslexic boy who still reads poorly at 12 decides to carve a complex pattern in bas-relief. Even though he can barely read, the boy has good hands. Over the semester, the hands start to train the eyes, and eyes that can comprehend the pattern begin little by little to comprehend letters.

The other is a shy, intense little girl with a difficult home life and a wicked speech impediment. She independently designs a project almost too sophisticated for her 9-year-old skills. Somewhat reluctantly, I allow it. She pours all her intensity into her work and completes it in a careful, craftsmanlike manner. Others try to copy but don't get the same results. Success breeds success, and the shyness and the stutter drop away as she loses herself in measuring, sawing, drilling, sanding and painting. At last, she is best at something, and it makes a world of difference in her life.

I have taught everything from fifth-grade arithmetic to college-level philosophy, but I have never enjoyed my work as much as I enjoy teaching shop to elementary school children. Shop class provides them the opportunity to learn and practice skills they need for living. Planning, real-life arithmetic, verbal explanation, visual expression, creativity and patience all get exercised. And when everything is right, little miracles can happen.

-Louise Heite, Austervegi, Iceland

The McGuffy **Table**





Remembering a tree-David Ramazani built this table from a famous ash on the grounds of the University of Virginia.

Legend has it that William Holmes McGuffy, author of McGuffy's Eclectic Readers, gathered local children beneath a certain ash tree on the grounds of the University of Virginia. Under its spreading branches, he'd spin his tales.

The McGuffy Ash stood for almost 165 years. Last year, the tree succumbed to old age, and it was taken down.

The university Arboretum Committee decided the tree should be given a second life as a piece of ceremonial furniture for Pavilion 7, where the cornerstone was laid by Thomas Jefferson himself.

David K. Ramazani, a furnituremaker in Charlotte, N.C., was humbled by the honor of being chosen to build the table. Only the choicest flitches were used. The focal point of the elliptical table is a portrait of the tree inlaid with 1/4-in.-thick black walnut. There also are inlaid ash leaves on the batten and the sculpted base.

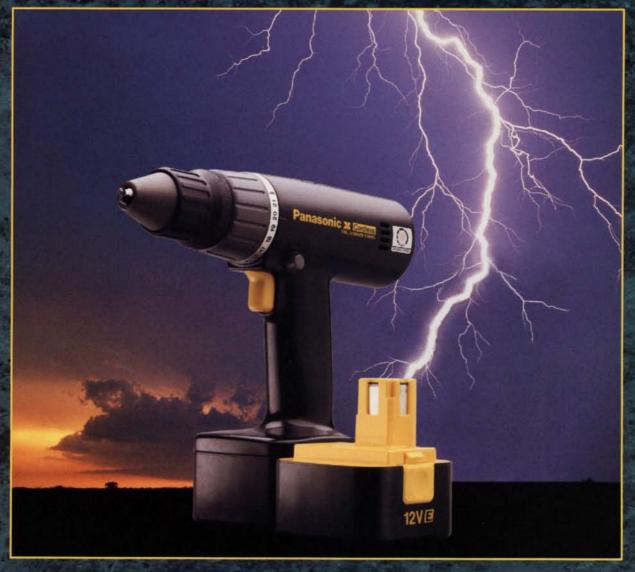
The pedestal is made of four turned pillars, copied from the shape of the marble balusters in the rotunda of Pavilion 7. The table was sanded to 1,000-grit and given 24 coats of oil before being polished.

Ramazani writes, "I am a passionate woodworker, and this table is the culmination of all my years of study and practice. It represents the finest turnings, the finest inlay work, the most stable joinery, and the most excellent finish I am capable of producing. I have tried to embody the excellence of teaching extolled by Jefferson's university, and it is my hope that the table will be enjoyed by its faculty and students for a very long time."

Notes and Comment

Feel free to send us material that could be used in Notes and Comment. That might include anything from photos of a project you've just finished to anecdotes about the triumphs and disasters of work in the shop. Submissions should be sent to Notes and Comment, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.

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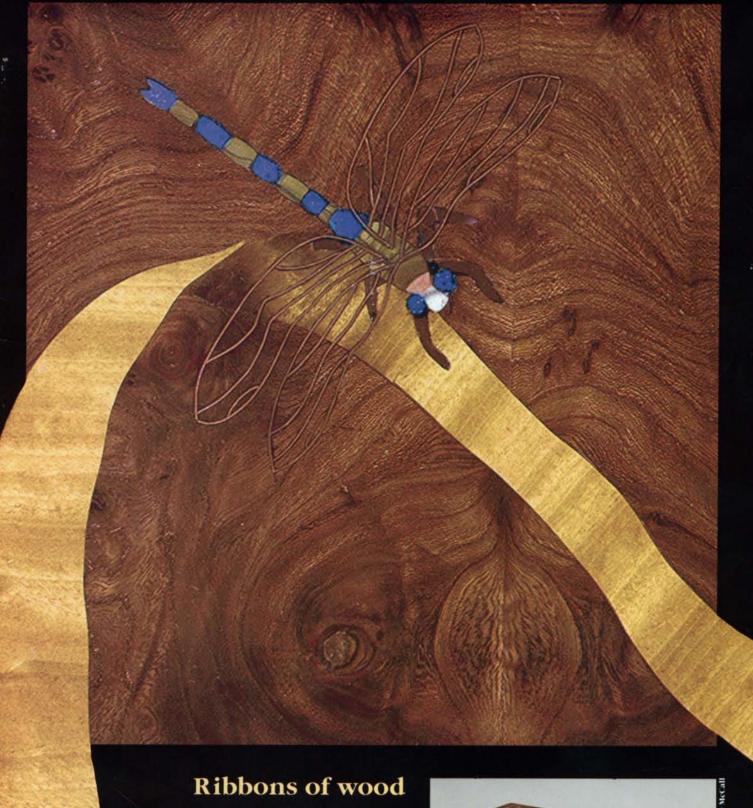
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Paul Schürch has studied woodworking in Switzerland, Japan, England and Italy and now runs a furniture studio in Santa Barbara, Calif. Some of his recent work is enlivened by lemon-wood ribbons inlaid on veneered backgrounds. Shaded with hot sand, the ribbons look real enough to touch. This 21-in. by 42-in. table is elmburl with olive borders; the dragonfly is made of lapis, marble and copper wire.



Photos: Wayne McCa