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September 1999 #110

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IN EVERY ISSUE

ON THE COVER

Associate Editor Jim Stuard checks the bottom of a Stanley #5 plane for flatness using a straightedge and a desk lamp. In this issue, Rick Peters shows you all the steps to transforming old handplanes into woodshop workhorses.

Cover photo by Al Parrish, Parrish Photography

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One-handed editor

Remember Harry Truman struggling to get the economy moving, asking his economists for the right strategy? The economists would invariably say, "On one hand, blah, blah, blah. But on the other hand...." Finally, in frustration, Truman responded, "What I need is a one-handed economist!" Regular readers of this column know I'm not shy about expressing an opinion, sometimes strongly. I've tried to be that one-handed economist Truman longed for.

I see the mission of *Popular Woodworking* as a clear voice speaking consistently about proven and practical ways of woodworking. A beacon in a sea awash in so many impractical and hair-brained techniques that it's impossible to identify sound advice when it slaps you in the face.

Our mission continues, but I want to let you know that we're going to show a wider range of techniques now and in the future. Some might say I'm mellowing, but I say I'm finally making the transition from cabinetshop manager to magazine editor.

In a shop, you see, there are approved ways of doing things. It contributes to quality control and making sure a job gets done on time. I've come to realize that a woodworker at home pursuing the craft for his own enjoyment might not be so concerned with practicality all the time. He might choose a joint that's more traditional, or just more personally satisfying to him. Even in the commercial custom furniture world, more traditional methods, which may be more labor intensive, are certainly appropriate for some cabinetmakers and their clientele.

I've never believed there was just one way to do something. We all know there can be several. Even among the staff here we often go about things in different ways. It leads to discussions on the merits of a method as well as its shortcomings. It's healthy.

So starting with this issue you'll see projects and techniques featuring some new faces. Professional furnituremakers Glen Huey and Troy Sexton share their work. I've been familiar with and admired their woodwork for several years now. Rick Peters, who writes on rehabbing old handplanes, has been an acquaintance for a number of years as well. Finishing expert Bob Flexner is highly regarded, as is the work and wisdom of woodworker/author Roger Holmes.

Nonetheless, there's still a lot of flotsam and jetsam floating in the sea of woodworking advice. Junk like discussions on how many thousandths of an inch a perfect wood shaving is, or making jigs to make jigs to make a hidden sliding dovetail joint.

Some of this arises from a group of authors I call X-treme Woodworkers — you know, like those X-treme Sports guys — who go to outrageous lengths to do something just to show they can. Their goal is to impress you with their prowess, not teach you anything useful.

So now that the castle gate is open and the bridge across the moat is down, rest assured I'm still going to check credentials before anyone's work is given the go-ahead for publication. It may not be the most politically correct attitude in these days of "diversity," but I'm following the advice of a magazine editor who said, "There's no such thing as a good magazine that's a democracy." **PW**

Steve Shanesy

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If you haven't checked out our website recently, you might want to try some of the new features we've recently launched. First is our new Searchable Links feature. Type in a few words describing what you're looking for (for example, router bits) and you'll get a list of links that's up-to-date, to-the-point and double-checked. Second, we've launched a free newsletter distributed by e-mail. Every couple weeks you find out who has the best deals on tools, you'll get workshop tips and get to read some stuff before it gets in the magazine. And did we mention it's free? Plus you can now purchase Popular Woodworking Books on-line.

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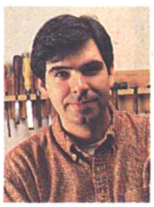

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Wetsanding Works Wonders

This is in regards to your great and final installment in your finishing series in the March 1999 issue (#107) "Secrets to a Silky Smooth Finish." What a new and fresh approach to finishing a finish, especially for a DIYer like myself. Up until now it was a labor of love to finish a finish. Now it has become a labor of fun, and it is so easy. Thanks a million.

Unfortunately, I missed your previous stories on finishing because local magazine stores didn't carry your magazine until recently. Would it be possible to obtain reprints of some of your previous articles from your finishing series without having to purchase all the back issues? Once again, many thanks for such a well-written and illuminating article.

Murray Ross
Moncton, New Brunswick, Canada

At this time, reprints are not available. However, we will be posting portions of the series on our newly expanded website at www.popwood.com. Click on "Select Articles" to find the latest finishing stories.

The Magic of Unplugging Your Charger

Just wanted to thank you for your article about NiCad battery chargers in the Tricks of the Trade column (#108). I had a 12-volt battery that wasn't taking a charge. After reading your article, I unplugged my charger for a few hours, then plugged it back in and — woooo-hoooooo — it worked like magic. Thanks for saving me $50 or more.

Kevin Roberts
Katy, Texas

Another 'Botched' Band Saw Blade

I read the story about the guy who thought his band saw blade was welded inside-out ("Tales From the Wood" #107) and nearly laughed myself off the throne in the reading room (a.k.a. my library). After regaining my balance and not dropping anything, I finished reading the story of the backwards band saw blade. I once accomplished this same task. The only defense I have is that I was very young at the time in age and in experience. I have learned much in my few years of practicing woodworking, construction and engineering.

The worst part about my backwards band saw blade experience was that I confronted the guy who welded the blade for me at work (needless to say the blade-welding job was what is commonly known as a government job) in front of several coworkers. Needless to say I wanted to crawl in a hole. Try facing those guys on a daily basis and being teased mercilessly! Tons of fun. Thanks for the laugh.

Andy Youngblood
Eau Claire, Michigan

Everything Old is New Again

Like Aubrey Thomas, whose letter was published in the May '99 issue, I get a big kick out of your column, "Projects From The Past."

The word "Deltagram" rang a bell, so I went through my horde of woodworking magazines and located 30 or so copies of the old Deltagrams dating from 1943 to 1963.

As an old patternmaker with 50 years experience with cutting wood, I still putter around my shop making sawdust. Your article made me look at the old mags, and I might start making projects again. The column is great, keep it up.

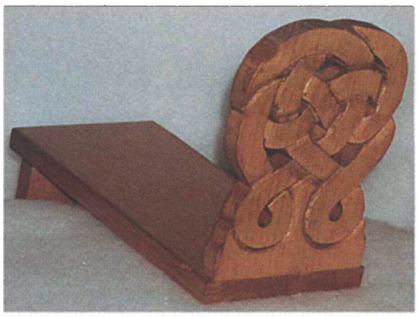
Rocco Legiadre
Delhi, New York

Buying Your Doors is Cheating

I have just received my May 1999 issue of your magazine, and I read an article that I just couldn't understand, "Commercial-Grade China Hutch." Why on earth would this person go through all the trouble of building this great-looking hutch and then wimp out and buy the doors for it? I just don't understand why this was done, and I don't for one second believe the line about it is "cheaper." I am really disappointed in that part of the article. Just thought I would drop a line and let you know that I am really pleased with most of the issues. Keep up the good work. Just don't buy furniture and try to pass it off as hand made.

Brian K. Powers
Delphi, Indiana

You raise a good point that we discussed at length here about doors. Thing is, a lot of professional cabinetmakers order their doors for kitchens and these built-ins because it's so much faster for them — and the cost gets passed onto the client. The reason we say it's "cheaper" is because we think that most woodworkers would have to first buy some cope-and-stick router bits (or shaper knives), some cathedral door templates, and the bit to raise the panel before they could build these doors. So if you were going to build this hutch once for your home, we guessed it would be cheaper to buy the doors than all the tooling. If you've already got the tooling, of course, then you're absolutely correct. Building the doors would be cheaper.



Celtic Chair Turns Bookish

I am a very green woodworker (pun intended) and am taking a beginning woodworking course. Your September 1998 issue was my first, and I fell in love with the Celtic peasant chair, but thought it a bit over my head for being only in my eighth week of class.

Instead, I took your Celtic chair pattern, shrunk it and incorporated it into the design of a little bookshelf. I am pleased with the results. Thanks for the help for this really green beginner.

Cynthia Williams
Grant Terrace, California

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Woodworking an Odd Combination of Sharing and Solitary Struggle

The "Out of the Woodwork" column has always been a great parting shot for the magazine. Reading Todd Peterson's "Dovetail Dilemma" (#107) made me think a lot about why I love woodworking so much. It reminds me of the tedious fumblings I had with trying to get my first block plane to extrude that perfect, paper-thin shaving of wood, but instead getting chattered, torn fibers that mocked my passion to become a "craftsman." With the help of people like you I can now produce piles of shavings as thin as I like.

My own infatuation with woodworking I suspect originates from its similarities to my training as a physician. Studying the properties of wood itself, reflecting on the history and tradition of woodwork, learning the technology and mastering the skills to use it to do a thing that people marvel at, and question the mystery of its creation.

The phenomenon I did not count on in either venture was the impact that the dissemination of knowledge from one to another would have on me. The process of acting as both teachers and students makes us special. The unselfish sharing of wisdom binds us as a community.

The letters in this month's issue of PW bother me somewhat. I find it upsetting that my fellow woodworkers are arguing about whose style of tape measure is best. As we endeavor to improve ourselves, and our craft, we learn that there is more than one way to do a thing. Using a machinist's rule, a tape measure or a familiar length of stick can all produce the exact same thing...a transferable reflection of dimension. My grandfather, who was a tool and die maker for Fischer Body, taught me that tools allow the craftsman to express his skills in a meaningful way, and in return, he gives them a lifetime of care and respect.

Yancey Holmes, M.D.
Highland Heights, Kentucky

More Advice on Making Drawers

I made some nice dovetail drawers after I read your article a few months back ("Fear Drawers No More" #108). What I'm finding is mounting those drawers (because of the near zero clearance between the drawer face and the side of the drawer opening) required me to rout a track in the side of the drawer and then make some hardwood rails that screwed into the inside of the desk.

Although the plan was to have the drawers ride smoothly on the rail, they tend to bind and be too snug. I could continue to shave the side of the drawer down and sand the rails but thought there might be an easier way. It's going to take some work to get these right. Any ideas?

Jim Endicott
Newberg, Oregon

It sounds like you're on the right track. Some commercial drawer manufacturers will actu-

Continued on page 13

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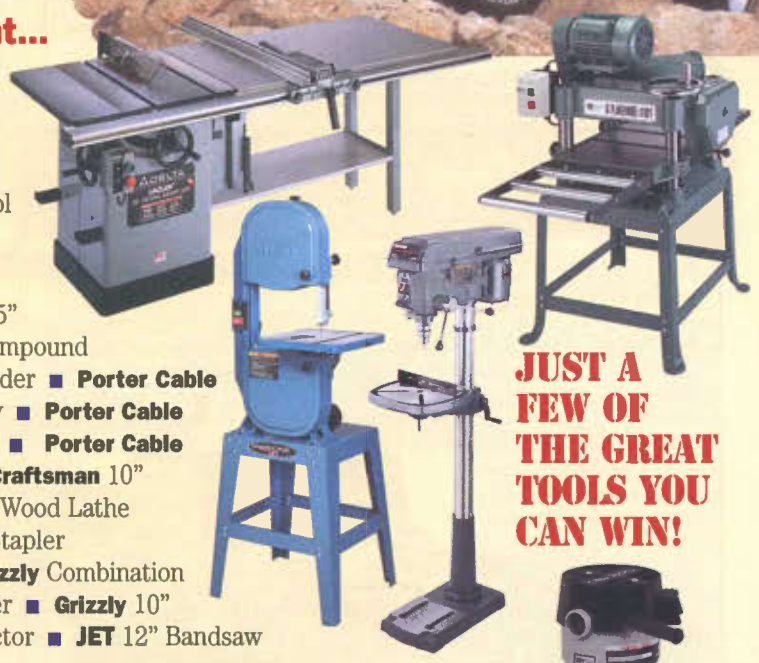

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Letters

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ally take a 1/32" jointer cut on the side of a finished dovetailed drawer and stop 1/4" from the front to give some slop to the drawers' fit. If your drawers aren't too tall you could try something like this on the jointer. Another option is to try building half-overlay dovetails with a lip on the drawer front. Even if the lip is flush with the supporting sides and rails, you can nail unobtrusive stops into the cabinet to stop the drawer. Otherwise you're stuck with being brain-surgeon accurate and worrying about the drawer swelling into the opening (I've seen it happen).

The old-timers really used the lipped drawer to their advantage back in the 18th and 19th century. It lets you make a fairly sloppy drawer that will accommodate wood movement and still looks good.

—Jim Stuard, associate editor

Woodworking — In the Eye of the Beholder

I thought that you might want to see a board that I cut out of a white oak log from my property. When I was cutting through the log I noticed some unusual grain on the board. Only after I planed the wood about a year later did I see what was really hidden in the wood, and I decided to build a cabinet around this board. The image in the grain looks different to everyone who sees it. Some see a naked lady; others see Jesus Christ. **PW**

Tom Rowan
Danville, IA

We welcome your comments about PW or anything related to woodworking. We'd also like to see color pictures of what you're building. Send your input to: Letters, Popular Woodworking, 1507 Dana Ave., Cincinnati, OH 45207. Our e-mail address is: PopWood@FWPubs.com. Letters may be edited for publication.

HOW WE RATE TOOLS

We test a lot of tools at *Popular Woodworking*, and while we don't often test tools until they fall apart, we do give them an honest, real-world workout. Each issue we share the results of our hands-on experience with you and offer insights to help guide your shopping decisions. The ratings reflect the opinion of the magazine's editorial staff.

Here's how our rating system works. Performance: A rating of "five" indicates we think this tool is a leader in its category — for now. (You won't likely see performance ratings of "one" or "two" in these reviews because we wouldn't publicize an inferior tool.) Value: "Five" is a great tool for the money; "one" isn't the mark of a value. However, a low "value" rating shouldn't prevent you from buying that tool. Some tools might be worth a little more because they're one-of-a-kind or just a really great tool.

If you have a question about a specific tool — whether it has been reviewed or not — you can contact me at (513) 531-2690, ext. 255, or by e-mail at DavidT@FWPubs.com.

And by the way, many of our past tool reviews appear on our website at www.popwood.com, including data on entire categories of tools (such as table saws). Check it out.

— David Thiel, senior editor

Quick Grip® Line Re-Tools to Clamp/ Spreader Design

Performance: ●●●●○
Value: ●●●○○

The tool that revolutionized the clamping world is undergoing a facelift and improving performance. The Quick Grip line of one-handed bar clamps from American Tool is now available with a quick-change jaw that quickly converts the clamp to a spreader. This was an option on earlier models of the clamp, but you needed a hex wrench to make the change. Now you simply pull down on a "quick-clip" on the jaw, which allows it to slide freely off the bar and be reversed for use as a spreader. Also, new "stay-on" jaw pads have been added that will not work loose during operation. And the upgraded line is now sporting new bright yellow resin on some of the main components.

We were pleased to see the changes in two areas that had been minor annoyances in an otherwise handy clamp. The quick conversion to a spreader clamp and the no-slip pads will make working with the Quick Grips more convenient, and cement the benefits for one-handed clamps in any wood shop.

The new Quick Grip line will be available in September in most woodworking and home center stores and catalogs, but the improvements aren't free. The redesign will increase the clamp price by a couple dollars.

For more information, circle #164 on the Resource Directory Coupon.

Performance: ●●●●●
Value: ●●●○○

Throw Some Halogen Light on Your Woodworking From Regent

I'd been complaining about the lack of light over my bench at work for a while now, and I hadn't gotten any satisfaction. So when I ran across this halogen task light and saw the reasonable price, I took matters into my own wallet.

The twin 150-watt shop light was a pleasant addition to my home away from home. Designed to hang from hooks from a ceiling (hardware included), the light fixture puts out 4,800 lumens of light, which is more than enough to bathe my bench in a bright, warm light. The halogen bulbs turn on instantly and will start in any temperature without hesitation, unlike florescent fixtures. The bulbs are protected in reflective boxes with diffused tempered glass lenses and wire safety cages over the front. For $35 it's a great and simple way to light your work area. One minor drawback I noticed is the heat produced by the halogen bulbs. Drawback, I say, because I installed mine in the summer. In the winter in a less than perfectly heated shop I'd move that into the benefit column. The HSL3000 fixture is available from a number of woodworking catalog companies, or contact Regent at 800-334-6871 by phone, or on their website at www.regentlighting.com.

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

Performance: ●●●●○
Value: ●●●●○

Makita Cuts the Cord On Two New Cordless Jigsaws

Adding to its extensive cordless tool line, Makita is now offering a 12-volt and a 14.4-volt cordless jigsaw, both in the 2.0 amp hour category. Both jigsaws offer cast aluminum bases that bevel from 0 to 45 degrees to the left or right, with stops at 0 and 45 degrees; three orbital settings; a large trigger with lock-on button accessible from either the left or right side; and externally replaceable brushes to simplify routine tool maintenance.

The 12-volt model, 4330DWA, retails for about $215, and the 14.4-volt 4332DWA is about $235. Both offer a 1" length of stroke and use either tang, universal shank or Makita blades. The 12-volt model produces 2,400 strokes per minute, while the 14.4 volt produces 2,800 strokes per minute.

The performance of these tools is as good as most corded, with the obvious lack of continuous run-time. There was plenty of power to scroll-cut through 1" ash, and though the blade wandered a bit, the cut was efficient and clean. With a number of new jigsaws offering tool-less blade changing, we were disappointed to have to use a hex wrench on these models. Regardless, these tools will prove useful anywhere access is difficult (in the attic, a crawl space or at the top of a 20-foot extension ladder), and dragging an extension cord is awkward. If you already own a 12- or 14.4-volt Makita tool, then either of these tools would fit into your cordless tool crib easily.

For more info., circle #161 (12v) or 162 (14.4v) on the Resource Directory Coupon.

Performance: ●●●●○
Value: ●●○○○

Affordable Quality Band Saw Guides

Band saws are great tools and belong in every woodworking shop. But, as with the miter gauge, the blade guides are OK, but not what you would call precision. Carter Products makes excellent replacement guides that provide the precision we all want from our band saw — but the guides cost about $150.

The good folks at Woodcraft now carry a new product called BandRollers that are a more affordable option to Carter guides. The BandRollers are ball bearing guides mounted in aluminum bar stock that replace the stock guide blocks. The BandRollers are currently available for Delta, Jet and most imported 14" band saws and install and adjust very quickly. They provide solid blade support leading to less blade "wander" and a much more precise cut. Priced at $70 they aren't cheap, and when you're holding them in your hand they don't feel like $70 worth of metal, but the performance is definitely improved. We're anxious to see how they hold up over time. They're not Carter guides, but they are half the price. **PW**

For more information, circle #163 on the Resource Directory Coupon.

Tool Scoop

Out of This World Makita Tools

While many tools used in space exploration won't be available at a home center store in your universe any time soon, some of the tools woodworkers use are making their way into space. During a recent space shuttle *Endeavor* mission, astronauts used Makita's 6213D cordless drills with modified Makita 12-volt batteries and chargers to construct components of the International Space Station. Specifically, the 6213D drills were used to attach handrails and fasteners to the walls of the *Unity Module*. The handrails will be used by astronauts to guide themselves weightlessly through the space station. The 6213D drills are the first commercially produced power tool to be used in outer space by NASA. Previously, power tools had to be custom made for space.

Delta International and Porter-Cable Centralize Operations

Delta International and Porter-Cable (both subsidiaries of Pentair Inc. of St. Paul, Minnesota) are consolidating their headquarters beginning the first quarter of 2000, forming the Pentair Tool Group located in Jackson, Tenn. (the current location of all Porter-Cable operations). The two brands will remain separate and distinct companies in the marketplace, with the consolidation expected to provide the Pentair Tool Group with "the strength of top management working together to support all distributors with the most complete line of tools in the industry (and) provide the most efficient means to serve today's industry," says Porter-Cable president Jack Garlock. Delta is currently headquartered in Pittsburgh, Penn., and has a distribution facility in Memphis, Tenn., as well as a manufacturing plant in Tupelo, Miss.

Jet Paints Tools White in Response to Popular Demand

When JET Tools offered its 40th Anniversary woodworking tools in a white limited edition, company officials thought they had a winner. The popularity and positive response from customers has led to the introduction of the "JET white" powder-coated finish this summer. Now JET's entire line of woodworking tools sport a white finish with red and black accent striping.

"This is something we've been working on for a long time," says JET president Bob Skummer. "We couldn't be more pleased with how well our new, rich white has fared with the woodworking public." PW

Forrest Saw Blades: Woodworker I & II

Are you one of those people that has to have a Lie-Nielsen plane when a very nice Record plane would do almost as well? Do your layout tools have to have Rosewood handles, or can you get by with plastic? If spending a little extra money to have the best is worth the effort — Forrest blades are for you. Don't get me wrong, the benefit is more than perceived — these are excellent blades. But you have to ask yourself, at what price excellence?

A quality blade for the *Popular Woodworking* shop will cost between $40 and $60. So when Jim Forrest of Forrest Manufacturing Co. offered us a $120 blade to test I was ready to shoot it down before making a single cut because of the premium price. Four years and a lot of board feet of lumber later I understand the difference, and yes, I'd spend the extra money.

When you add up the benefits (a cleaner saw cut, money saved by going longer between sharpenings, improved safety by not having to force a piece of 8/4 maple through a rip cut), you'll probably break even with the price difference, and still have the best blade money can buy.

Forrest's blades offer a superior cut that leaves a rip-cut saw edge that is as smooth as if it had been sanded, and a cross-cut edge that is almost mark-free. The blades run very quietly, and backside tearout in plywood is negligible.

Each blade is virtually hand-made. The plate is hand-tensioned (up to 15 minutes per blade), superior C-4 carbide teeth are hand-brazed to the plate, and the blade is straightened and restraightened multiple times throughout the process.

Think of a Forrest blade as a tool in your shop, not an accessory. Forrest stands behind its blades by offering a sharpening service that bring blades back to the exact tolerances offered in a new blade. And this same exacting service is available for other manufacturer's blades as well, so they should come back better than new.

Forrest offers a variety of blades for most types of woodworking machinery. The most popular blades include the Woodworker II combination blade offered as a 10" x 40 tooth for a little more than $100, or a 10" x 30 tooth for about $90 in either a 1/8" standard kerf, or 3/32" thin kerf.

The Woodworker I crosscut blade is available in a 60-tooth design for 10" and 12" saws for $130 or $140.

RECOMMENDATION: The Forrest blades' performance and benefit are hard to believe until you have the chance to use one. Effortless, super-smooth performance that makes using your table saw a pleasure. It really is worth spending the extra money.

Continued on page 18

RESULTS

WOODWORKER II

NICE FEATURES
- Super smooth rips and crosscuts
- Negligible backside tearout
- Low noise
- Superior re-sharpening available

RECOMMENDED MODIFICATIONS
- Buy a couple to bring the price down
- Send your old blade to Forrest for resharpening

Forrest Blades are sold by Forrest (800-733-7111) or select catalogs.

ABOUT OUR ENDURANCE TESTS

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

WOODWORKER'S DREAM

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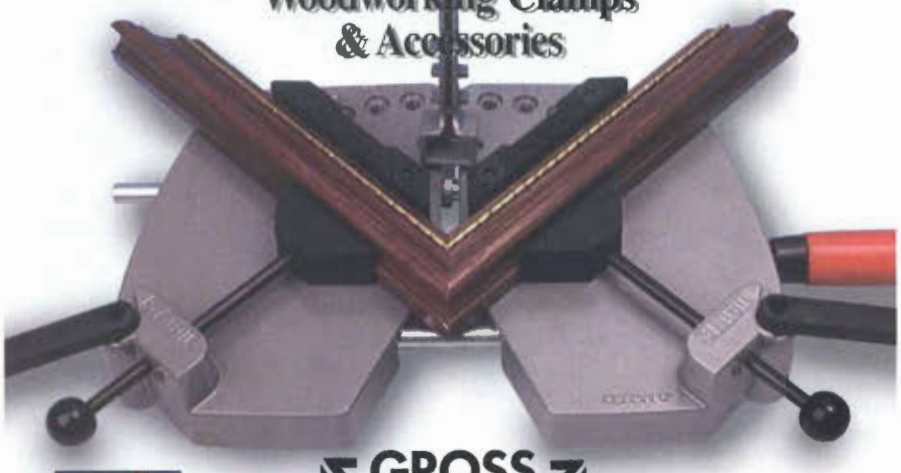

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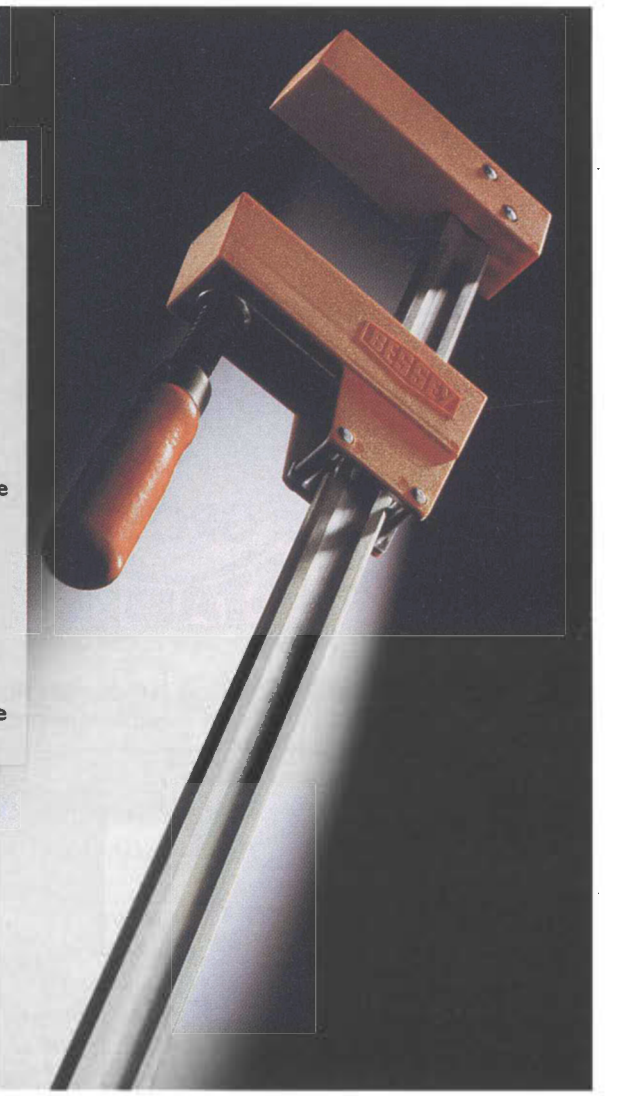
Continued from page 16

POPULAR WOODWORKING
AWARD
SEPTEMBER 1999

Bessey K-Body Clamps



Most of us "grew up" in shops that survived on multiple lengths of pipe clamps. If we were really lucky, we had some old-style ratcheting I-bar clamps. They did the job, but we were always fighting with aligning the clamps to avoid cupping and slipping, and we had to leave panels lying where they were clamped up for fear of moving them. We knew there should be a better way, but what?

Then along came Bessey (who was already a well-known friend to the woodworker) with the K-Body clamp. It sneaked into our lives three years ago, (actually we saw it on Norm's show first, and decided we had to get some) and revolutionized our clamping chores.

In a nutshell, Bessey designed a clamp with jaws that stay parallel to one another and at a right angle to the bar. They then made the face of the jaw flat along the entire length, so you can clamp anywhere on the jaw and be assured of parallel and even pressure. You can even clamp from the side of the clamp to provide wider surface pressure for panels. No more need to alternate clamps or clamp from both sides of a panel.

The moveable jaw slides easily without any releasing mechanism, but it retains a toothed grip to avoid slipping during setup. Both faces are encased in Superpolyamide, which is break-proof, and glue and solvent safe.

The bar rail is make of bright-drawn steel and does not flex under pressure. In addition, the steel doesn't mar the wood when in contact with glue.

And it gets better. The fixed jaw is flat on the outside face, so when clamping a panel it can be stood up anywhere in your shop to dry. No worry about shifting or leaning against a wall. Also, the back edge of both jaws is flat, allowing the clamps to lie flat on a work surface while clamping, again without any shifting.

OK, now the downside. They're not cheap. Ranging from $25 for a 12" length, to $45 for a 50" length, the average woodshop would need to spend $200 to $400 to have enough clamps for a decent-sized project. And you know you never have enough clamps. The upside is when you bite the bullet and spend the money, you won't be replacing these clamps for a few decades. We're not very polite with our clamps in the *Popular Woodworking* shop, and these clamps have held up extremely well.

We have noticed the need for some maintenance. Dried glue on the bar can cause the jaw to hang-up. And when the moveable jaw is opened to its full length (a little roughly sometimes) the jaw will stick and need a love tap to knock it loose. A little WD-40 every now and then will improve that situation.

We have managed to crack one of the break-proof jaw casings, but we had to work at it, and the clamp is still very serviceable.

The clamps are available in 12", 24", 31", 40", 50", 60", 82" and 98" lengths with 1½" x 3½" jaw faces.

RECOMMENDATION: If you're just starting your shop, or adding to existing tools, you owe it to yourself to try these clamps. And even though they're pricey, once you try them you won't be able to go back. Our recommendation is to start small and let the set build. Christmas isn't too far away to start dropping hints to your family. **PW**

RESULTS

BESSEY K-BODY CLAMPS

NICE FEATURES

- Parallel, right angle jaws
- Even clamping along entire jaw length
- Excellent holding pressure
- Simple, mess-free operation
- Sturdy, reliable construction
- Flat surfaces for easier glue-up

RECOMMENDED MODIFICATIONS

- Buy them in sets or bulk to reduce the price
- Do routine maintenance to keep everything moving freely

Bessey clamps are a product of American Clamping. For more information about the K-Body clamps, visit their web site at www.americanclamping.com. Or call toll free at 800-828-1004 for the nearest distributor.

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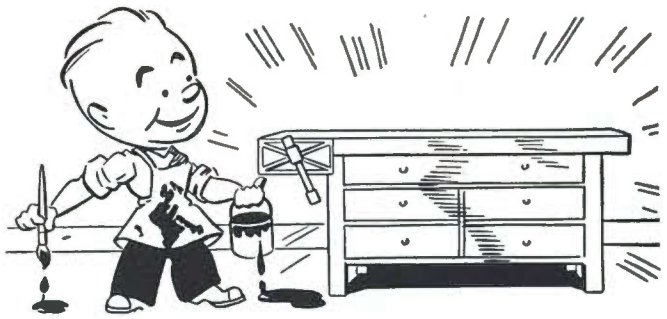
The Deltagram

TRADE MARK REG U S PAT OFF

A nostalgic look back at plans published by Delta Machinery after World War II.

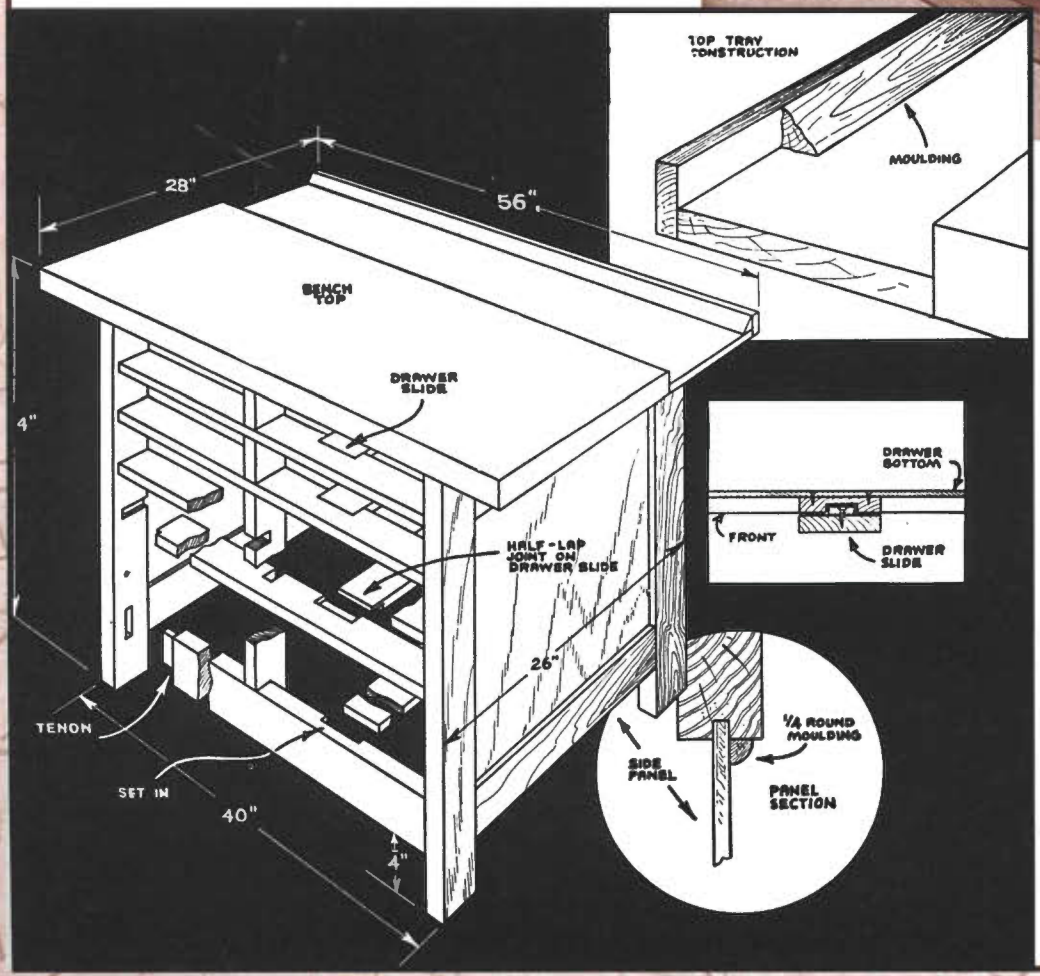
From "How to Plan a Home Workshop"



Woodworking BENCH

A simple sturdy work bench will give you an excellent place to spend many happy hours at your hobby. You can build this one in your own shop. The bench may be increased in length to suit your own needs. Perhaps you would like it twice the length shown, with cabinets and doors on the other half.

The bench top is constructed of hardwood strips. The size of these strips will vary depending on the wood you have available to you in your locality. The construction, however, is the same. The strips are planed smooth for a good glue joint and the holes are drilled for the bolts. Glue and bolt the top together and allow to dry. Dowel onto this the tool tray and back board. Bolt the top to the frame with lag bolts or carriage bolts with heads countersunk as shown in the top.



The drawer sides and backs are made of ½" material, with ¾"-thick fronts and ¼" bottoms. The sides are slipped into dadoes in the drawer front and the backs fit into dadoes in the sides. The bottom fits in a groove in the sides and front and slides under the drawer back.

We recommend buying a good quality wood vise for your bench. There are several good makes on the market which will fill your requirements. **PW**

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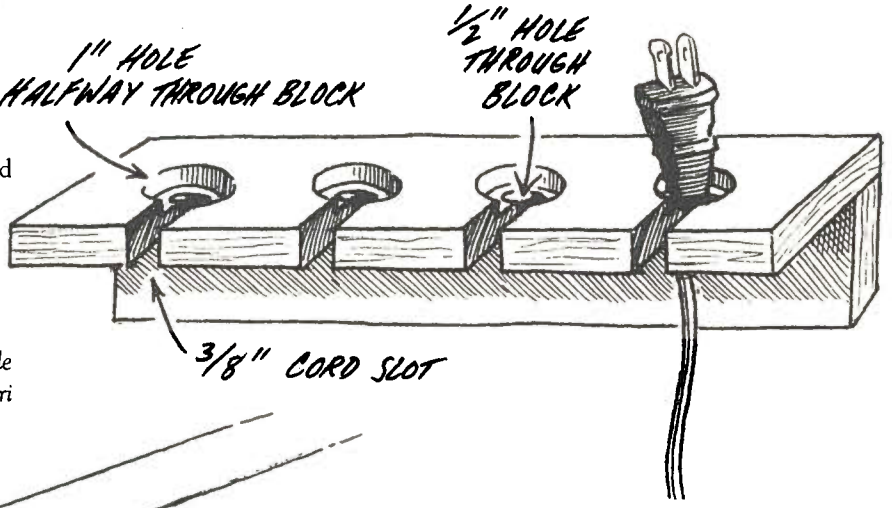
Safety Tip for Cords

Power tool cords have a tendency to get tangled when not in use. Or worse, they can get damaged, trip you or knock other tools over. To keep cords out of the way, use this cord keeper that mounts 30" above your bench. Slip the plug end of the cord in one of the slots. The rest of the cord can be coiled and slipped on the other notches. Or use the keeper for three different plugs.

Roland Oesterle
Saint Louis, Missouri



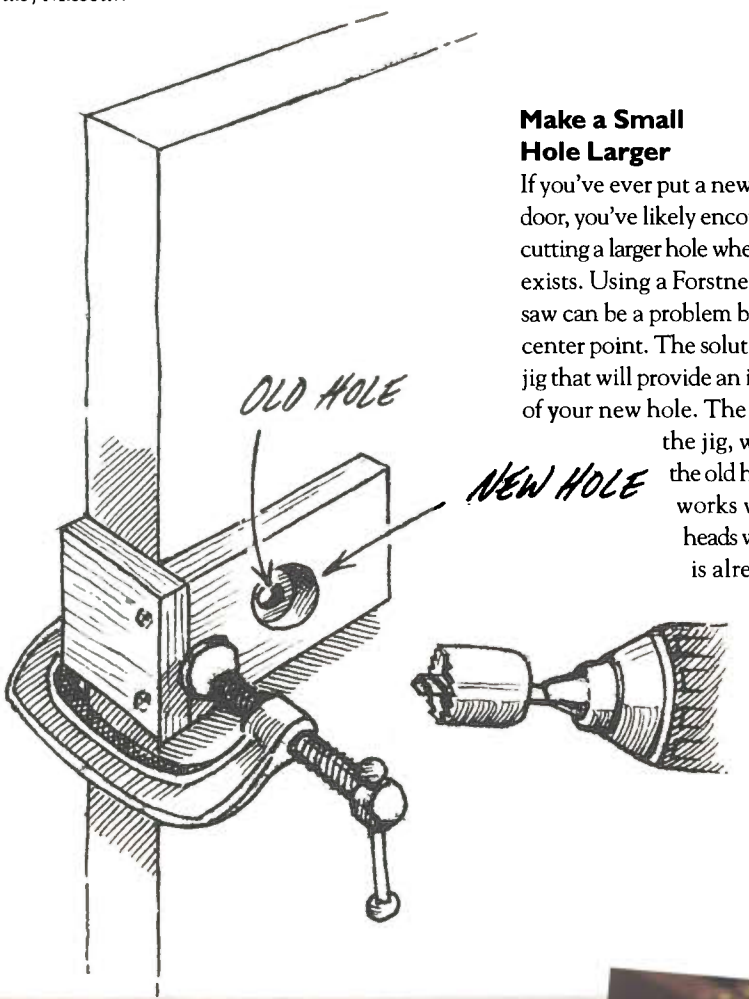
Splitting Odd Fractions

It's easy to divide an even fraction in half. You can almost do it in your head. Odd fractions seem much more difficult, but they can be just as easy using the following process.

To find half of $5\frac{7}{16}$", first divide the 5 by 2, leaving 2 and ... just forget about the rest. Then add the numerator and denominator of the $\frac{7}{16}$" together (7 + 16 = 23). You know that the denominator of the fraction you working for will by 32nds, so take the 23 and make it the numerator, $\frac{23}{32}$".

Add the whole number, and the answer is $2\frac{23}{32}$". Simple.

Bud Deunk
Fairview Park, Ohio



Make a Small Hole Larger

If you've ever put a new handle on an existing door, you've likely encountered the problem of cutting a larger hole where a smaller one already exists. Using a Forstner bit, spade bit or hole saw can be a problem because they guide on a center point. The solution is to make a simple jig that will provide an inside diameter the size of your new hole. The bit will then guide on the jig, which is centered over the old hole. This type of jig also works well for recessing bolt heads when the clearance hole is already cut, and will also work well to guide spade bits whose tips have been ground to make a flat-bottomed hole. **PW**

The Editors

Illustrations: John McCormick

SHARE YOUR KNOWLEDGE AND WIN!

Turn your woodworking knowledge into a truly tricked-out tool from the Simpson Machine Tool Co. (www.smtco.com). Your best trick or shop tip can earn you a reproduction of the 19th Century Stanley Odd Job #1 — the original multi-tool — and a check for $50. The Odd Job is an inside miter and try square, mortise scribe, layout tool, depth gauge, beam compass and bubble level, with a 6" and 12" brass-lined maple rule. This re-creation of a classic tool is cast from solid manganese bronze and is machined to within .0015 tolerance. One winner will be chosen each issue; published runners-up receive $25.

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

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$19.99 Dovetail Jig

You don't have to be a master craftsman or have deep pockets to cut perfect half-blind dovetails.

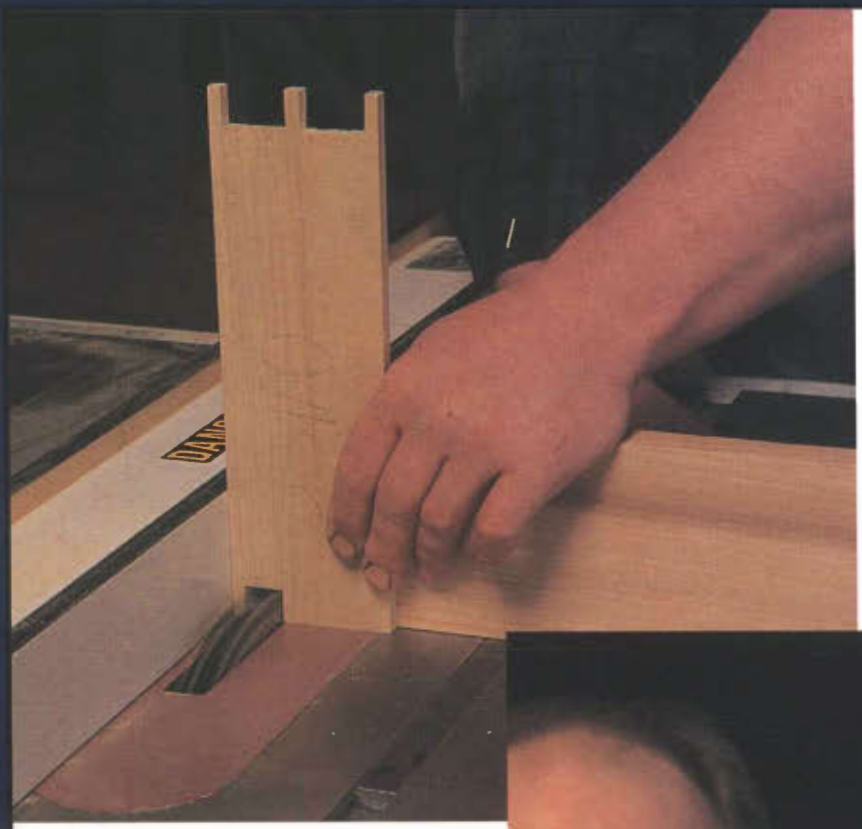
Seems to me that most people think there are only two ways to cut half-blind dovetails: by hand or with a jig that can cost as much as $300. As someone who makes a lot of custom furniture, I can tell you that neither method has ever worked well for me. Sure, the size and spacing of hand-cut dovetails are easily customized, and it's nice to sometimes work in a quiet shop. But the handwork just takes too long when time is money. Dovetail jigs, on the other hand, are fast. But the size of your drawers is dictated by all but the most expensive jigs on the market.

That's why I've come up with a method that's fast enough to use in a professional furniture shop but allows you to space the tails almost anyway you want. The price? Only $11 for a template guide and $8.99 for a carbide-tipped dovetail bit

by Troy Sexton

Troy Sexton designs and builds custom 18th century furniture and is a private woodworking instructor in Sunbury, Ohio, for his company, Sexton Classic American Furniture.

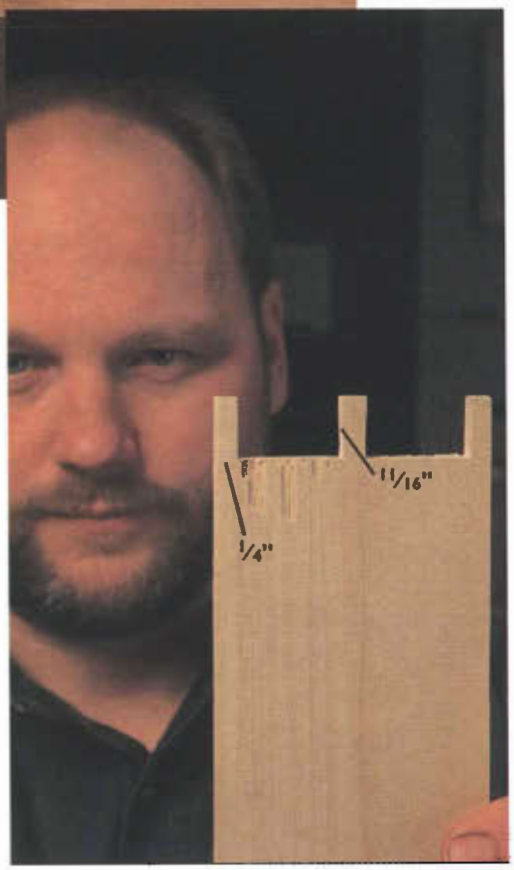
Photography by Christopher Schwarz



A dado stack in your table saw is all you need to make the template for routing the pins. Don't worry too much about tearout on the backside of the work. It's just a template ***(left).***

When you finish making the template, here's what it should look like. For this 3"-wide drawer, I made two notches. Each of the teeth is 1/4" wide. You can make the notches almost any width you want. The spacing can be varied by using a smaller template guide in your router ***(below left).***

Here you can see how the bushing rides against the template, while the bit cuts the pins. When you cut your pins be sure to stand in front of the work so you can better see what you're doing. I stepped aside for the photo ***(below).***



(you'd have to buy both for a dovetail jig, anyway). I've probably made more than 500 drawers using this method, and if you own a router, table saw and band saw you can make them this way this weekend.

In a nutshell, here's how it works. While you're ripping your drawer pieces to width, rip an extra piece of scrap to use as a template. Use a dado stack in your table saw to cut notches on one end of the template. One notch for each tail. Clamp the template to the back side of your drawer front. Install the template guide and dovetail bit in your router, set the depth and run the router in and out of the notches. Congratulations. You've just cut the pins.

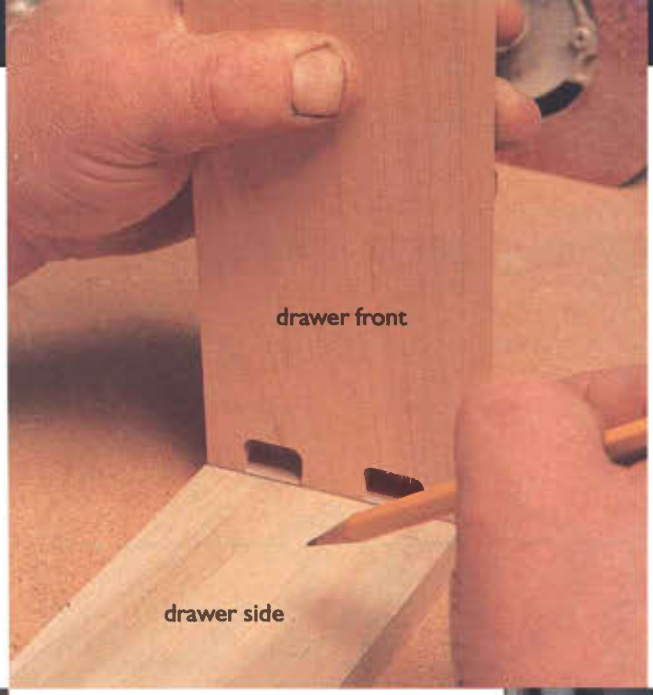
Now use the pins to lay out the tails on one drawer side. Cut the tails on your band saw. It's simple work. Occasionally you'll then have a little fitting to do, but after a little practice your dovetails will fit snugly the first time.

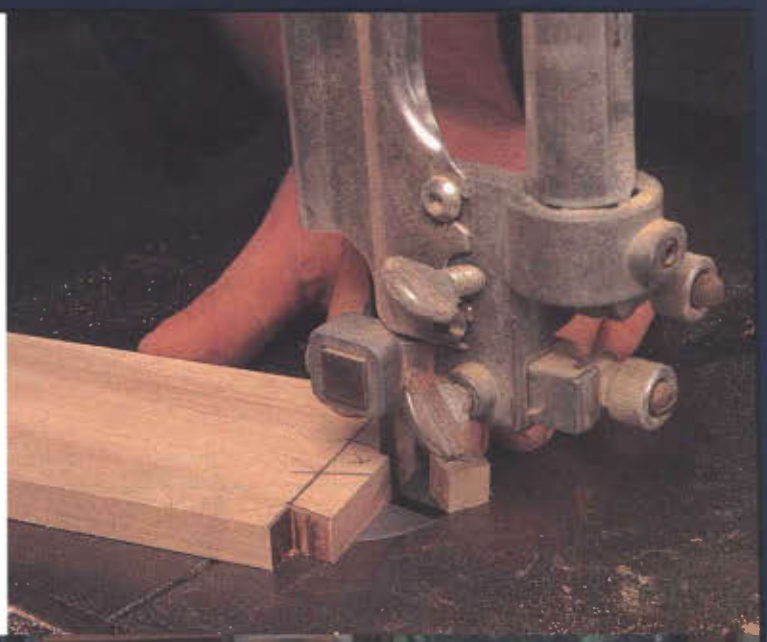
Get Started

When you're doing this for the first time, keep in mind that all the measurements and settings I'm about to give you apply to drawers with 3/4"-thick fronts and 1/2"-thick sides. I use a 23/32"-diameter template guide in my router (though 11/16" or 3/4" will work fine, as well) and a 1/2"-diameter dovetail bit with sides that slope 14 degrees. See the "Supplies" box at the end of the article for ordering information.

Begin by making the template. They're real easy to make. So easy, in fact, that I've got dozens of them for almost every size drawer I need. While you're ripping out your drawer parts, rip an extra piece of 5/16"-thick stock for the template. Check the depth of your bushing because the thickness of your template needs to be slightly thicker than the depth of your bushing. For this particular drawer, my sides were 3" wide. Now go to your table saw and set up a dado stack. Don't worry about how wide the dado cut is, the idea here is to get a feel for how this system works. You'll see how to fine-tune the tails after you make a few templates. Set the height of the dado stack to 11/16". Now set your table saw's fence so there's 1/4" of space between the fence and blade. Using your miter gauge and a piece of scrap attached to it, run the template on end as shown in the photo.

Turn the template around and run the other side of the template. Now move the fence away from the blade and remove more material from the template until you





Now lay out the tails by tracing around the inside of your pins. A sharp pencil is key ***(above).***

Cutting the tails on a band saw is a breeze once you get the hang of it ***(top right).***

After a while you'll have enough templates to cut dovetails for almost any drawer ***(right).***

have three teeth on the template, each ¼" wide as shown in the photo.

Cut the Pins

Now set up your bench to cut the pins in the drawer front. Put the drawer front face down on your bench. Line up the template on top of it and clamp the two together to your bench. Install the bushing in your router and then the dovetail bit. Set the bit's height to ¾" (including the bushing on the router's template guide). Different depths will work. I use ¾" because the amount of carbide on my dovetail bit suits that depth perfectly. Cut the pins by running the router in and out of the notches.

Cut the Tails

The hard part is now done. Unclamp your drawer front and place it on top of its mating drawer side as shown in the photo. Using a sharp pencil, trace the outline of the tails onto the drawer side. Cut the tails using your band saw or coping saw. Be sure to cut outside the lines for a tight-fitting joint. If necessary, pare the tails with a chisel. Then comes the moment of truth.

Let me say that after a couple attempts the truth won't hurt so much, so don't get discouraged. I think you can now see how easy it is to customize the location and size of your tails. Use a smaller-diameter bushing and you can make your tails even closer together. This will require some trial and error on your part. Basically, the outside teeth will have to be slightly wider than ¼". And if you make different-sized notches in your template, you'll produce drawers that are impossible to make with a $99 dovetail jig. Best of all, you can stop planning your projects around a jig, and you'll be cutting dovetails fast enough to have some hope of finishing your project when you actually thought you would. **PW**

SUPPLIES

Bushings are available from many catalogs. Woodcraft (800-225-1153) carries several universal bushings that fit a wide range of routers. Price of the bushing: $7.50. The lock nut costs $3.50.

Carbide-tipped dovetail bits (½" diameter, 14-degree slope) are available from almost every woodworking catalog and home center. Expect to pay about $8.99 on average, and a little more from specialty bit manufacturers.

MARTHA'S VINEYARD *Cupboard*

Though I swiped about 50 percent of the look of this piece from an antique, the joinery is 100 percent traditional.

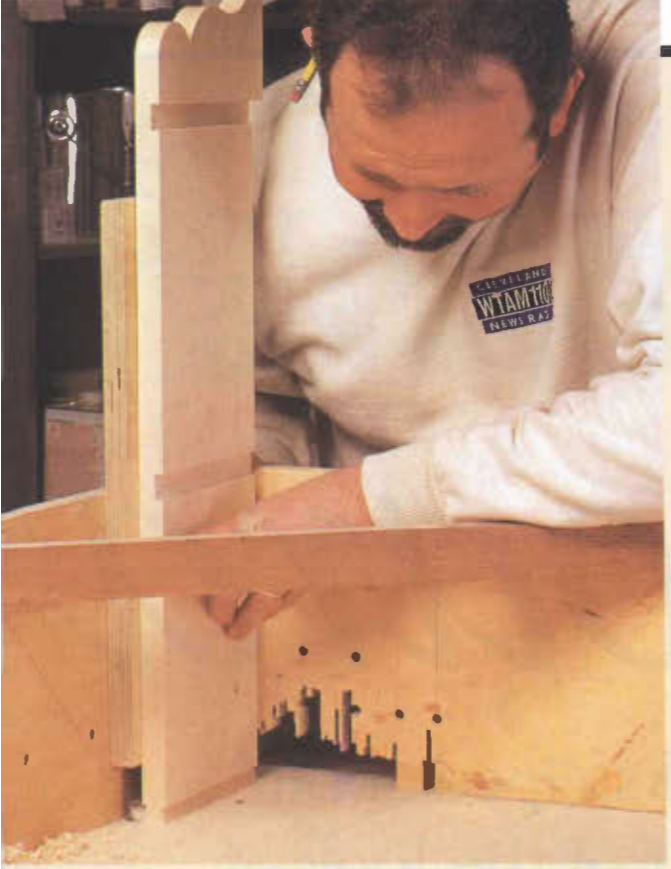
A few summers ago my wife and I were traveling through Martha's Vineyard on vacation when we stopped at a small antiques store. On one wall was a simple hanging cupboard with two flat panel doors. Its simplicity and convenience caught my eye, and I had never seen one quite like it before. Rather than buying the piece I took a photo and thanked the storekeeper for her time. Once home I spent some time rethinking the cupboard and redesigned it to add some details, including the beading on the door edges and the back slats. The original had been made of pine, but I opted for a more dramatic bird's-eye maple for the exterior with painted poplar inside.

Here's how the cupboard goes together: sliding dovetails hold the top to the two sides. The center shelf and bottom rest in dadoes cut in the sides. To strengthen the cabinet, I use traditional square pegs to attach the shelf, bottom, face frame and doors. And I've got a great trick to get the pegs to fit easily. See the story "Square pegs, round holes" to learn how.

Construction begins by planing the wood to proper thickness, then cutting the top, sides, bottom and shelf to size. Next, using the diagram, mark the dado locations on the sides and cut the ½"-deep dadoes. Cut ¾"-wide by ⅜"-thick rabbets on the sides to hold the back. The scroll work pattern for the bottom edge of the sides is available at our website at: www.popwood.com/fixes/scroll.htm

by Glen Huey

Glen Huey builds custom furniture in his shop in Middletown, Ohio, for Malcolm L. Huey & Sons and is a regular contributor to Popular Woodworking.

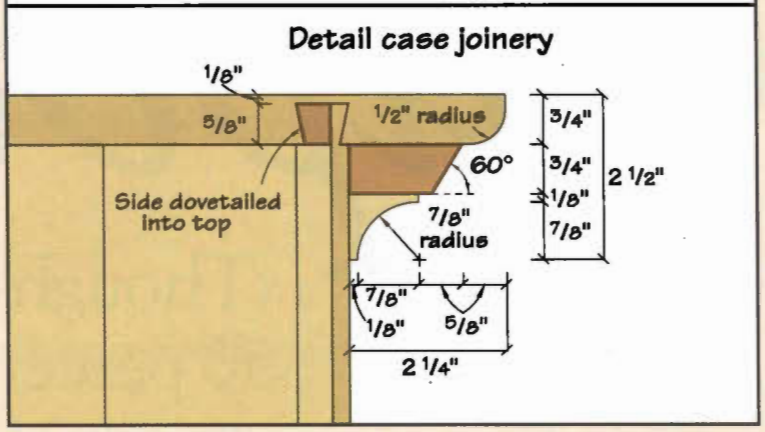


Cutting the sliding dovetail on the sides using a homemade jig. Cut the female part first, then cut the male part as shown here.

MARTHA'S VINEYARD CUPBOARD

No.	Item	Dimensions T W L	Wood
1	Top	3/4" x 10 1/2" x 35 1/4"	P
2	Sides	3/4" x 7" x 26 5/8"	P
2	Shelves	3/4" x 6 1/4" x 30 1/4"	S
2	Face frame stiles	3/4" x 3" x 22 1/2"	P
1	Frame lower rail	3/4" x 1 7/8" x 26 3/4"	P
1	Frame top rail	3/4" x 3 5/8" x 26 3/4"	P
1	Frame center stile	3/4" x 2 1/4" x 19"	P
4	Dr rails	3/4" x 2 7/8" x 9"	P
4	Dr stiles	3/4" x 2 1/2" x 17"	P
2	Dr panels	1/2" x 6 7/8" x 11 7/8"	P
1	Hanging strip	3/4" x 1 3/4" x 29 1/4"	S
7	Beaded bkbrds	3/4" x 4 13/16" x 22 1/2"	S
4 1/2	Linear feet of 1" x 1" cove moulding		
4 1/2	Linear feet of 3/4" x 1 5/8" intermediate moulding		

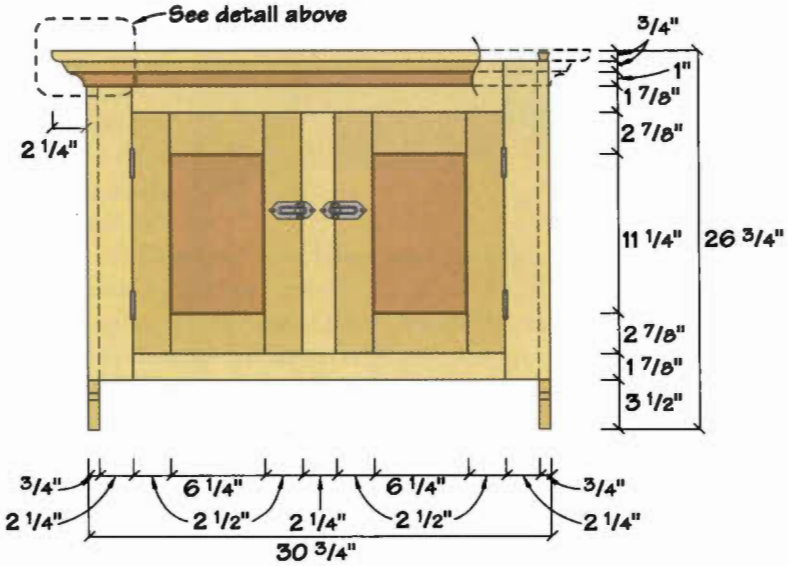
P=primary wood: Bird's eye maple • S=secondary wood: Poplar

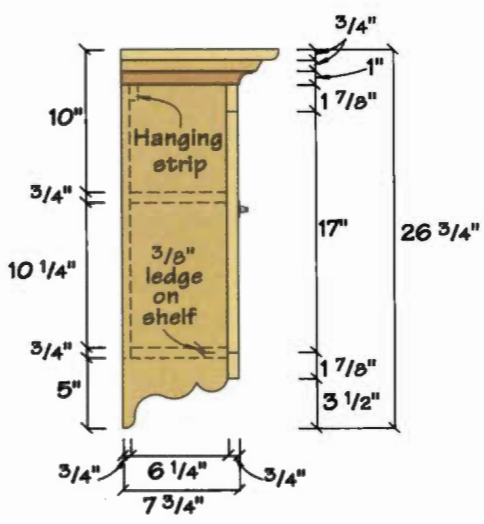


The next step is to plough the dovetail slot in the top piece, then form the 1/2"-long sliding dovetail pin on the top end of the sides. Again, find the location for milling the top on the diagrams. A router table works well for both steps, running the top flat on the table, and the sides on end against a fence. Now cut a 1/2" roundover on the front and sides of the top.

With all the pieces milled, assemble the carcase. Dry-fit the pieces and clamp them in place. Unclamp the piece, add glue and reassemble the carcase. Clamp it up, then drill 1/4" clearance holes for the pegs through the sides and into the shelf and bottom and drive the 1 1/2"-long square pegs into the 1/4" holes.

The face frame uses mortise-and-tenon joinery for strength. Once you've cut the 1"-long tenons and the mortises, dry-fit the face frame. Locate and cut the recesses for the hinges on the stiles. Glue and clamp up the face frame. When dry, drill for pinning the mortise and tenon with





After you've dry-fit the case, disassemble the case, add the glue in the dadoes and clamp it up. Drill the clearance holes for the square pegs and knock the pegs home **(left)**.

Square Pegs, Round Holes

I'm sure you know the adage about how you can't fit a square peg into a round hole. But I'm here to tell you that in woodworking, you can fit a square peg in a round hole using a pencil sharpener. I start with 1/4" x 1/4" square pegs and then sharpen them in the pencil sharpener. Then I add a little glue and pound them in place in the 1/4" clearance holes I've drilled in the project. The round part slips in easily, and then the square part cuts into the round edges of the hole— creating the illusion of a square hole. Some people add the square pegs after finish sanding, then sand them so they're just a little proud of the surface. It's a traditional method. Plus, if you sand the pegs flush, you'll sometimes start to reveal some of the round shape of the hole.

square pegs. Then fit the frame to the front of the carcase, apply glue and peg the frame in place.

The back pieces use a 5/16" x 3/8" mating rabbet (or shiplapped joint) to allow movement in the pieces while still maintaining a gapless back. The back pieces rest in a rabbet cut in the sides, against the shelves and the hanging strip. The hanging strip is nailed between the sides and flush against the top, 3/4" in from the back edge. Once the back pieces are cut to size, run the mating rabbets on the edges (except for the two outside pieces). As a nice detail I used a moulding cutter head in my table saw to run a single bead on the inside edge of each piece. Test the fit of the back pieces, but leave them unattached at this time to make finishing easier.

The next step is to make the doors. Like the face frame, they are assembled using mortise-and-tenon joinery, with the rails captured between the stiles. The door tenons are 1 3/8" long. Cut a 1/4" x 3/8" deep groove in the center, inside edge of each door piece to hold the panel, which has a 1/4" x 5/16"-long rabbet on all four sides to form a tongue. Don't forget to cut a bead on the outside edge of each stile.

Assemble the doors using glue in the mortises, but keep the glue out of the panel grooves to allow the panel to float in the door frame. Again, the mortise-and-tenon joints are drilled and square pegs added for strength. After the glue is dry, locate and recess the hinge locations, then fit the doors, allowing space for the hinges.

The doors **(left)**, before assembly and after. Notice the haunched tenon on the rails to hide the panel groove. The back **(below)** is shiplapped and nailed in place. Because the back is the last thing to go in, I paint the back pieces while finishing the rest of the cupboard. Then, when everything is dry, nail the back in place to the hanging strip and shelves.

The last construction detail is to add the intermediate and cove moulding to the underside of the top to finish off the upper section of the cabinet. The diagram shows the orientation of the pieces. Miter the moulding to fit, then nail it in place.

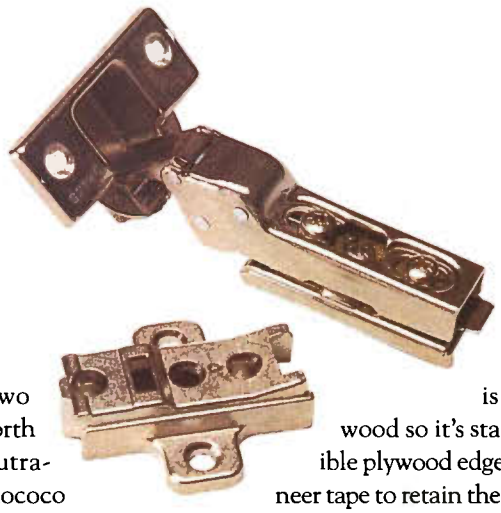
Paint the interior of the cabinet. The exterior is finished with a homemade finish of equal parts boiled linseed oil, varnish and turpentine. I follow that up with a coat of wax. After the finish has dried, attach the hardware, doors and add wall hangers for mounting the cabinet. **PW**

Supplies

From Horton Brass, 800-754-9127
2 - Door catches #SL3, $11.00 each
2 - Pair - hinges #DH-2-125 $4.50 a pair

MODERN wardrobe

Use subtle black accents to complement the understated grain pattern on this maple chest.



Furniture design in the last two centuries has swung back and forth wildly between austere and outrageous. One year everything's Rococo and carved; the next year the far simpler Hepplewhite style is the thing. Then comes the ornate Victorian stuff, which is followed immediately by the straight-lined Arts & Crafts style. It's no wonder furniture manufacturers stay in business.

If you haven't noticed yet, the country is heading into another era where simple is better. And while some of these clean and contemporary pieces are criticized as merely boring wooden crates with drawers, others show off the elegant proportions of the furniture using only understated accents. We hope you'll agree that the subtle black accents on this wardrobe have achieved that goal.

The wardrobe uses frameless construction, and it is built almost entirely of plywood so it's stable and lightweight. The visible plywood edges are covered with iron-on veneer tape to retain the simple clean lines of the piece. The concealed hinges (above) provide smooth door operation without interrupting the proportions of the door and drawer arrangement of the front. The pulls are unobtrusive and echo the black line of the reveal at the top and the bottom and the black base.

Construction begins by cutting the case pieces to size. Next, cut $\frac{3}{8}$" x $\frac{3}{4}$" rabbets on the back, top and bottom of both side pieces to accept the back, top and bottom. Also rabbet the top and bottom pieces on the back edge to hold the back. Now cut a $\frac{3}{8}$"-deep x $\frac{3}{4}$"-wide dado in the top and bottom pieces to leave an 11" opening between the right side and the vertical partition.

Before rushing to assemble the case, there are a

by David Thiel

Photo by Al Parrish, Parrish Photography

Learn Something From the Europeans

European hardware is a broad term covering a number of hinges and shelving systems. Best known for its use in commercial furniture, I chose to use it in this piece for a number of reasons. The door hinges allow adjustment of the door in three dimensions after the door is attached, and it is invisible from the exterior of the piece, keeping the lines clean and simple. The hinges do require a 35mm Forstner bit ($14.99) to insert the hinges in the side of the cabinet, and a jig designed just for installing "cup" hinges is available from Rockler (800-279-4441) for $29.99, (item #10260).

Contemporary decorative hardware can be tricky to find, so I was pleased to find Spokane Hardware on the Internet (see the Supplies box). Offering a large and varied selection of contemporary, fanciful and traditional hardware for sale on the web, this saves a lot of time running from store to store. The pulls selected for this piece are commercially available to cabinet shops, but it's nice to find them accessible for the home woodworker as well.

This was the first time I'd used the drawer front adjusters, though they've been available for years. Having fought with adjusting drawer fronts on inset and flush-mount drawers forever, I found these clever plastic devices to be a big help. Allowing 1/8" adjustment in any direction, fine-tuning a drawer front is now a snap rather than a chore. Though the instructions specify a 25mm bit to mount the adjuster in the drawer face, a 1" Forstner works admirably with a little shimming.

Before assembly it's best to mark and drill the locations for the shelf pins, and to lay out and mount the base plates for the hinges. As always, a little masking tape on the drill bit makes a handy depth stop.

few things to do first. Cut your four drawer dividers to size and apply veneer tape to the front edge of each. Mark the location of the drawer dividers and decide whether you want to use biscuits or dowels to hold the drawer dividers in place between the left side and the partition. The drawer openings are graduated in size and should be as follows from top to bottom: 5"; 5⅞"; 7¼"; 9" and 11⅛".

Because the door section of the wardrobe is only 11" wide, it's a good idea to pre-drill the right side and partition for shelf pins and also for the European-style hinge plates before assembly. One more pre-assembly task: sand the inside of the shelf section and the part of the back that's visible. You'll be glad you did.

Now assemble the case using glue and by driving nails through the top and bottom pieces into the sides and partition. When in place, the drawer dividers should be proud of the front edge of the case by the thickness of the veneer tape. Lastly,

The drawer face adjusters are a simple plastic pocket with a metal "nut" captured inside. When attached, the nut will slide freely within the plastic case, allowing the face to be moved 1/8" in any direction.

The hardboard reveal strip is painted black, then mitered to extend beyond the front of the cabinet itself. The reveal strip is recessed 1/4" in from the edges of the top.

nail the back in place into the rabbets. This will square up the case.

With the case assembled, go nab your spouse's iron. Apply veneer tape to the front edges of the case, and to the top of the case on the front edge and sides to hide the rabbet joint. The 7/8"-wide tape is plenty because the reveal will only show 1/4" of the top of the case.

The false top is simply a piece of plywood edged with veneer tape. Check the size against the finished size of the assembled case to make sure the false top will flush up with the sides, front and back. Remember that the false top extends over the door and drawers and should flush up to them. The 1/4" reveal between the top and case is created using strips of 1/4" x 1" hardboard, with one edge spray painted black. Fit the strips to the underside of the top, allowing the 1/4" setback on the front and sides. Add a fourth strip flush to the rear of the top to level it out. With the strips fit, use black spray enamel paint to coat the visible edge and the underside of the front piece, then attach the reveal strips to the underside of the top.

Now attach the false top to the case. Drill clearance holes through the case and attach the false top using screws up through the inside of the case, again, flushing the back edges of the case and the false top.

The base is a simple frame held together by biscuits, dowels or mortise-and-tenon joinery, with the legs attached between the stretchers at the corners. With the base glued and assembled, add 1/4" x 13/16" hardboard strips to the top edge as you did to the underside of the top. Next, finish the base and strip with black paint to add visual "weight" at the base of the chest. When dry, attach the base to the cabinet using metal chair braces at the corners.

Now build the drawers using simple 1/4" x 1/2" rabbet joints on the sides, with the fronts and backs captured between the sides. The bottoms slide into 1/4" x 1/4" grooves in the sides and front that are cut 1/2" up from the bottoms of the drawer pieces. The back is cut 1/2" shorter than the front to allow the bottoms to slide into place. Use the bottoms to hold the drawers square while the glue dries, then remove them to make finishing the drawers easier. I set up a 1/4" radius router bit in a router table and ran the top edges of the drawer parts (both sides) to make them

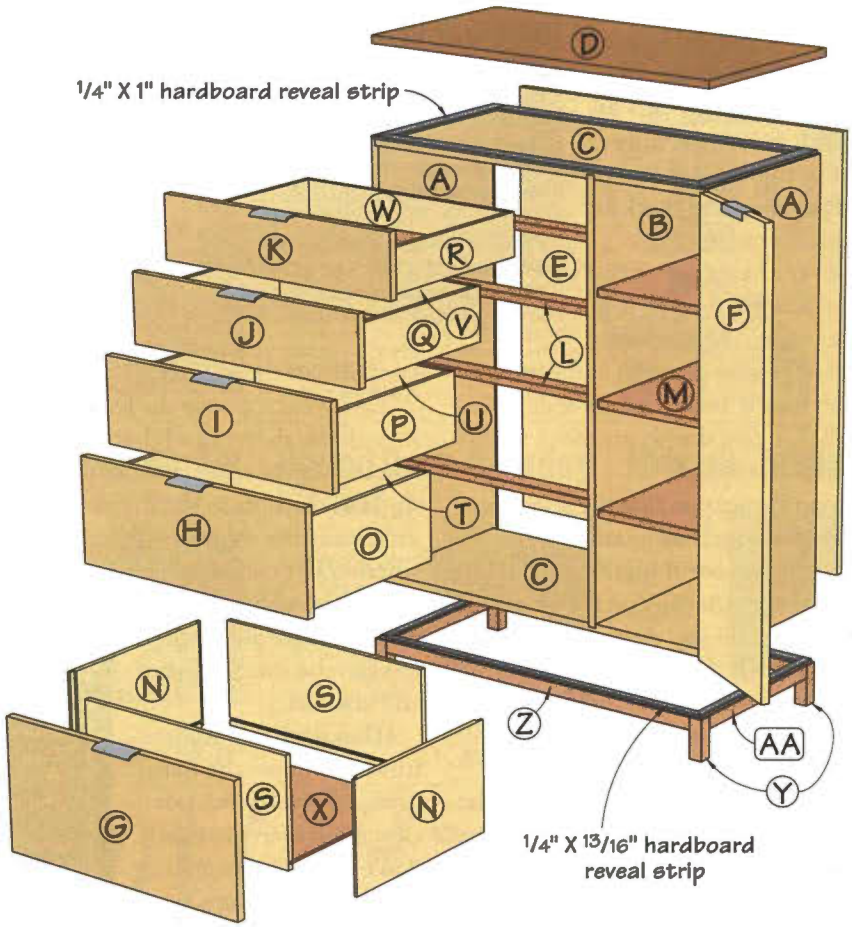
MODERN WARDROBE

No.	Letter	Item	Dimensions T W L	Materials
2	A	Sides	3/4" x 17 1/4" x 42 3/4"	MP
1	B	Partition	3/4" x 16 1/2" x 42"	MP
2	C	Top & bottom	3/4" x 17 1/4" x 35 1/2"	MP
1	D	False Top	3/4" x 18" x 36"	MP
1	E	Back	3/4" x 35 1/4" x 42"	MP
1	F	Door	3/4" x 12" x 42 1/2"	MP
1	G	Drwr face	3/4" x 12" x 23 7/8"	MP
1	H	Drwr face	3/4" x 9 9/16" x 23 7/8"	MP
1	I	Drwr face	3/4" x 7 13/16" x 23 7/8"	MP
1	J	Drwr face	3/4" x 6 7/16" x 23 7/8"	MP
1	K	Drwr face	3/4" x 5 7/8" x 23 7/8"	MP
4	L	Drwr dividers	3/4" x 2" x 22 7/8"	MP
3	M	Shelves	3/4" x 16" x 10 15/16"	MP
2	N	Drwr sides	1/2" x 10 1/16" x 16"	BB
2	O	Drwr sides	1/2" x 8 1/16" x 16"	BB
2	P	Drwr sides	1/2" x 6 1/4" x 16"	BB
2	Q	Drwr sides	1/2" x 5" x 16"	BB
2	R	Drwr sides	1/2" x 4" x 16"	BB
2	S	Drwr front & back*	1/2" x 10 1/16" x 21 1/4"	BB
2	T	Drwr front & back*	1/2" x 8 1/16" x 21 1/4"	BB
2	U	Drwr front & back*	1/2" x 6 1/4" x 21 1/4"	BB
2	V	Drwr front & back*	1/2" x 5" x 21 1/4"	BB
2	W	Drwr front & back*	1/2" x 4" x 21 1/4"	BB
5	X	Drwr bottoms	1/4" x 21 1/4" x 15 3/4"	L
4	Y	Legs	1 1/4" x 1 1/4" x 4"	P
2	Z	Base stretchers	3/4" x 1 1/4" x 33 7/16"	P
2	AA	Base stretchers	3/4" x 1 1/4" x 15 9/16"	P

9 - Linear feet each of 1/4" x 1" and 1/4" x 13/16" hardboard reveal strip
75 - Linear feet of 7/8" maple veneer tape

*If using a "slide in" drawer bottom, subtract 1/2" from the height on the drawer backs.

MP=Maple plywood
BB=Baltic birch plywood
L= Luan plywood
P=Poplar



I cut the top and back recesses for the handles using the same jig. Unfortunately I made my jig a little short and had to move the clamps between cuts. Make your jig the width of the drawer and to fit your own router template guides and you'll be in good shape ***(left)***.

The drawer face adjusters are attached by first drilling two clearance holes in the drawer box front. Then locate the approximate spacing of the drawer face on the drawer front (the closer the better) and make a mark through the clearance hole on the back of the face with a scratch awl. Remove the drawer box and drill the 1" holes for the adjusters. Then just screw the face on and adjust ***(below)***.

more finger-friendly. Don't round over the front edge where the drawer face will attach. With the drawers assembled, attach the drawer slides to the cabinet and to the drawer sides and check for smooth operation.

Cover the edges of the drawer faces and the door with veneer tape. Then rout the a shallow mortise centered in the top edge of each for the pulls. Use a router with a straight bit. See the photo above for the jig I built for this.

I want to mention that the screws provided with the pulls are round-head screws. In an effort to keep things flush and simple I used a countersink on the clearance holes in the pulls and then used flat-head screws to attach the pulls. Now attach the drawer faces to the drawers using the hardware shown in the photo on page 34. This allows for easy adjustment.

Now drill the door to accept the European hinges and mount them to the cabinet. If you haven't used concealed hinges before, take a few minutes to play with the adjustment to get a feel for the versatility of these hinges.

Lastly, cut a groove the length of both sides of the shelves and then add veneer tape to the front edge. The shelf pins shown slip into the slots in the shelves and provide invisible support. It's your choice whether to make the shelf locations adjustable by adding more shelf pin holes. I preferred to use set locations to keep the interior clean and unmarred.

The case is now ready to finish. Remove the hardware and finish sand. Use a clear finish everywhere, and don't worry about coating the black accent strips. After the finish has dried, attach the hardware and hang the door. Adjust the drawer fronts and door to make all the spaces equal. Then step back and enjoy the clean simple lines of your work — until the tastes of the furniture world swing back the other way. Then perhaps you'll have to apply some fancy moulding or something. **PW**

WOOD WORDS

REVEAL: A decorative detail formed by offsetting a portion of the side to form a recessed feature. This can be done by adding pieces, or a groove can be cut in the material to create the same effect.

PROUD: Where two pieces meet with one slightly raised above the other, it is said to be "proud."

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#1302	1/2" Shank Router	* 3-1/2"	$79.95
#1303	1/2" & 3/4" Shaper	4-5/8"	$99.95

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Value	★★★★★

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- Ideal for clamping drawers, doors, picture frames, boxes, cabinets, etc. Holds firmly in square.
- Adjustable, uniform clamping pressure on all sides
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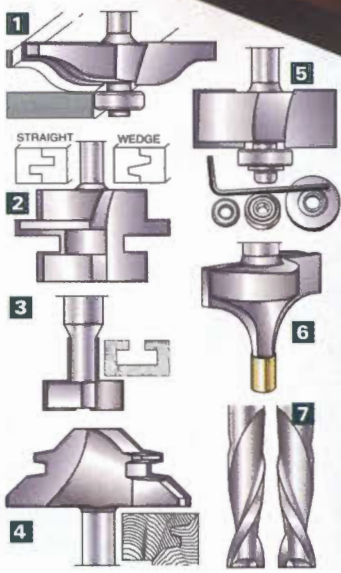

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hand

restoring a plane

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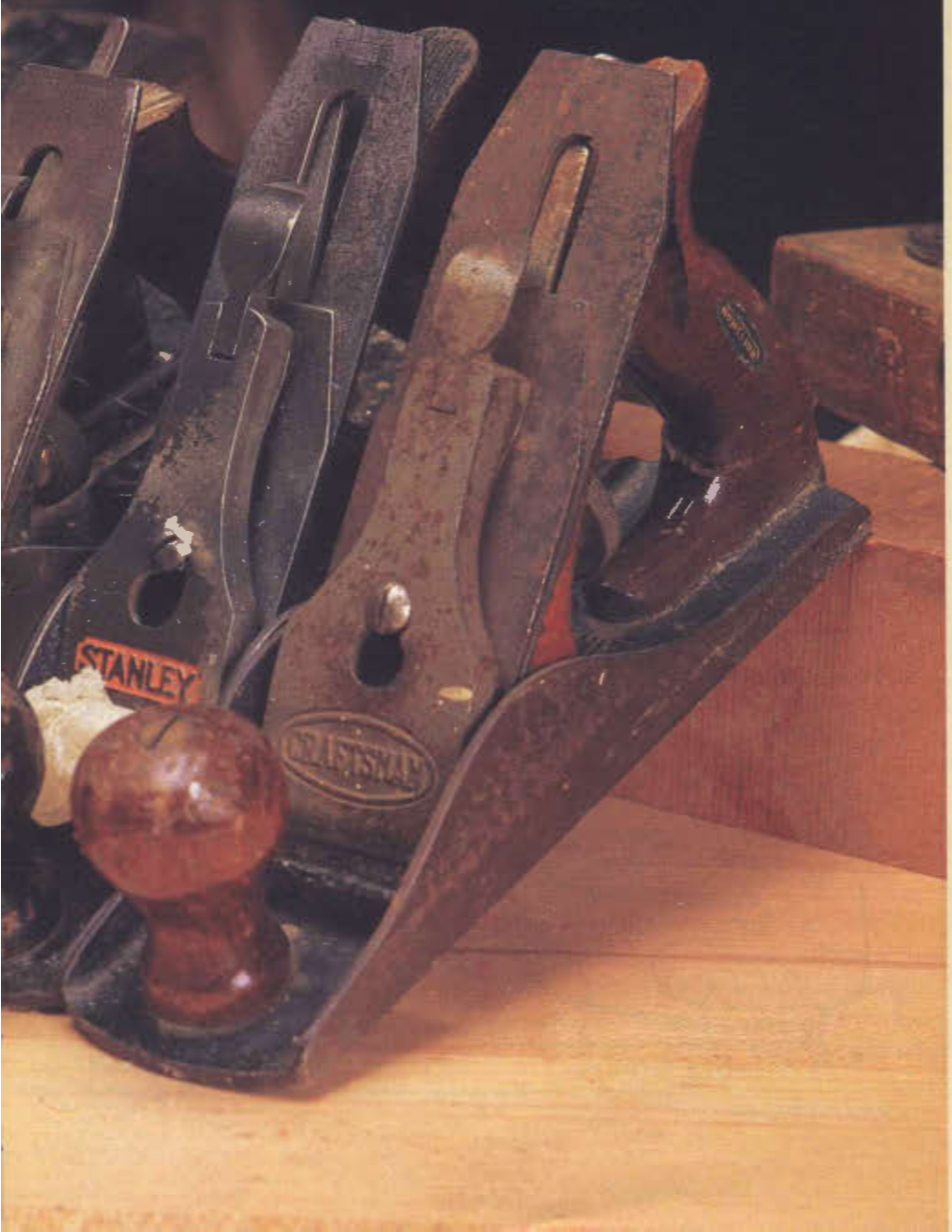


A diamond in the rough. That's how I view every old tool I pick up at an auction or a yard sale. And the old, rusty Stanley No. 5½ that I bought recently for $4 is no exception. Before the auction, I examined the plane just like a diamond merchant would when buying a rough stone — I looked for flaws. I made sure all the parts were there, that castings were intact, and rust was only surface deep.

With my new treasure in hand, I headed for the shop to restore it. Why bother you might ask? Why not purchase a new plane? Three reasons. First, you can't buy a quality hand plane for four bucks. Second, the old adage "they don't make 'em like they used to" is true; it's virtually impossible to find castings as nice —and of such high quality as these old planes. And third, I really enjoy restoring one of these old beauties. There's tremendous satisfaction gained from giving a fine, old tool a new life.

There are three main tasks involved with restoring a hand plane: disassembly and cleaning, reshaping parts for optimum performance, and re-assembly and adjustment.

Disassembly and Cleaning

The first thing to do to your old plane is disassemble it. Take the time to familiarize yourself with the parts and learn their correct names (see the illustration for the parts to most planes). Start by lifting the thumb lever and sliding off the lever cap. Remove the plane iron and chip breaker, unscrew the frog, and remove the front knob and handle.

Now give all the parts a mineral spirits bath and a good scrubbing with an old toothbrush. In many cases, this removes the surface rust along with caked-on dirt and grime. Set the parts on a clean rag to dry overnight.

With your squeaky-clean plane parts in hand, the next step is to remove any remaining rust on the parts. If the rust is light, you can rub it off with steel

by Rick Peters

Rick Peters is a woodworker and publishing professional and resides in Emmaus, Pennsylvania.

Remove old grease and grime by scrubbing all the plane parts with an old toothbrush and mineral spirits ***(top)****. Steel wool, abrasive pads or a Wonderbar (shown here) all work well to strip off surface rust* ***(inset).***

To ensure solid contact between the frog and the blade, use a diamond hone ***(shown)*** *or a small file to flatten the top surface.*

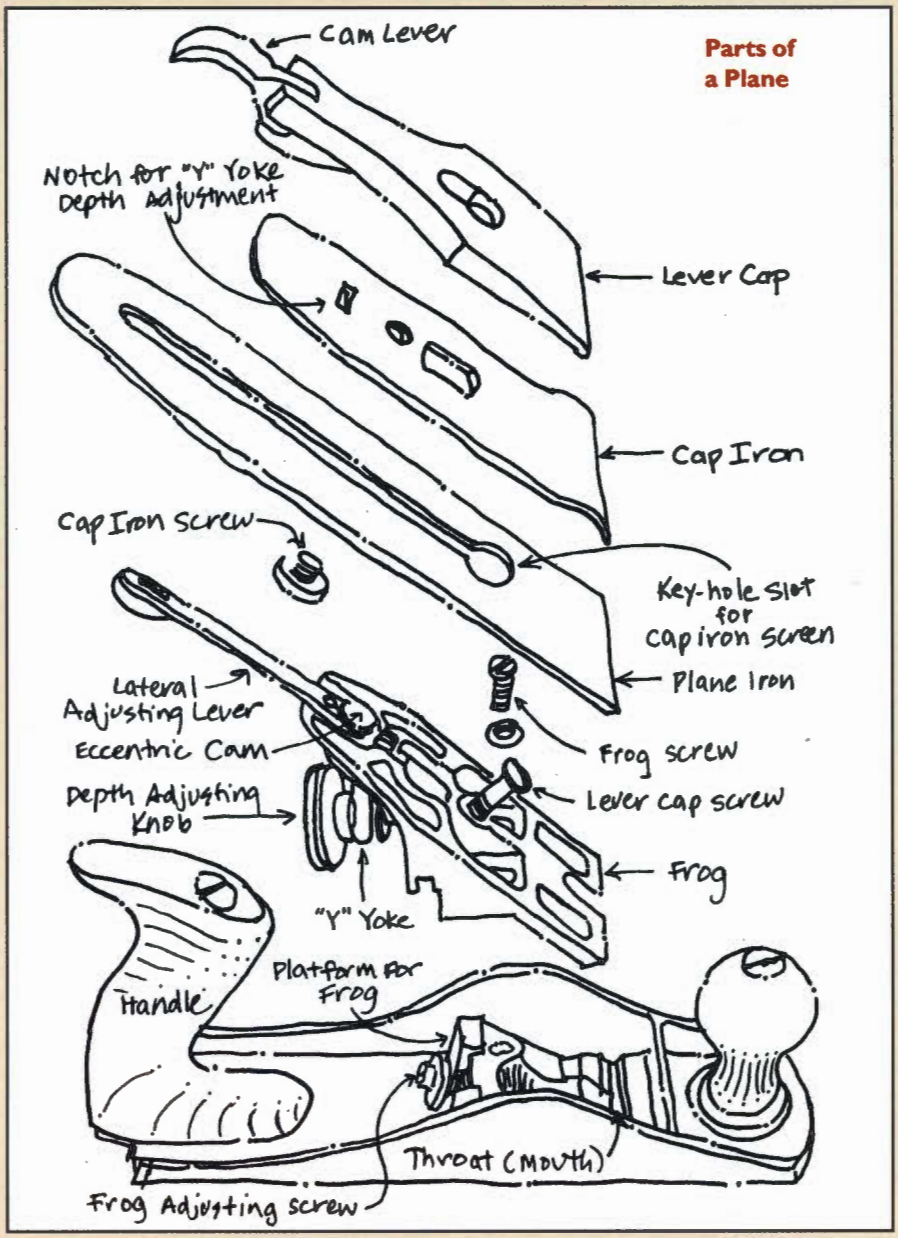
wool or a rust-erasing abrasive product called Wonderbar™. If the rust is stubborn, consider using the miracle of electrolysis. (See the story at right.)

Reshaping Parts

Although it has a funny name, the frog is one of the most important parts of the plane. It holds the plane iron firmly at the proper angle, while at the same time allowing you to adjust the depth of cut and the position of the iron. It's a shame the frog is often overlooked when restoring a plane; a poorly tuned frog is the leading cause of blade chatter.

For a frog to do its job well, it's imperative that its mating surfaces—the bottom where it contacts the sole, and the sloped face that holds the plane iron—be absolutely flat and square. For the sloped face, I use a diamond hone or a small stone and gently rub it on the surface. Check for flatness often with a straightedge. Because the bottom surface usually requires more work, I use a fine file. Here again, go slowly and check often.

With both surfaces flat and square, reattach the frog to the body with the screws you removed earlier. (Don't worry about positioning now, we'll fine tune this later

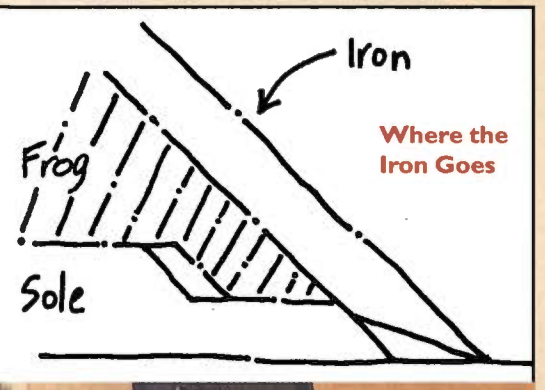


Illustrations by Kristi Cullen

in final adjustments.)

I can't tell you how many times I've seen a woodworker spin a depth adjustment knob, first one way, and then the other when trying to fine-tune the depth of cut. It doesn't have to be that way. All you need to do is remove the slack in the Y-shaped yoke that accepts the depth adjustment knob. The only thing to be careful about here is applying too much pressure as you remove slack. The yoke is cast, so it'll only bend so far without breaking. I've found steady pressure from a clamp or bench vise works best. Don't strike the arms of the yoke with a mallet unless you've got a replacement handy.

There's not much to do on the lateral adjustment lever; check for burrs on the cam and smooth any you find with a fine file or piece of emery cloth.



A small metal file works well to clean up the area where the frog meets the sole.

The sole of the plane, on the other hand, usually requires quite a bit of work—and it's worth it. Next to a solid frog and a sharp iron, the flatness of the sole will have a great impact on how well your plane performs. The easiest way to check a sole for flatness is with a straightedge. I've found that holding the plane up against a bright light will show any dips or high spots the best. It's also important to check the sole for twist. For this, I use winding sticks and sight down the length of the plane.

To flatten a sole, I affix a couple sheets of silicone carbide sandpaper to a flat surface with spray adhesive. For years I used the bed of my jointer. But a while back I picked up a piece of replacement glass for a jalousie window at the local hardware store—it's 4" wide, 30" long and ¼" thick. What's really nice about jalousie glass is the edges are rounded over for safety. I usually start with 80-grit and work my way up to 220-grit.

Before you begin, however, it's paramount that you re-install the iron, chip breaker and lever cap. Why? An installed blade puts tension on the sole. If you flatten it without this tension, and then install the iron, it won't be flat. Just make sure to back off the iron ⅛" or so before rubbing the sole on the silicon carbide paper. Use firm, steady strokes and flip the plane end-for-end occasionally to ensure even pressure over the entire length and width of the sole.

Check the sole often for progress. Although purists will flatten the entire sole, the only parts where it's critical that it be flat are the toe, heel and front of throat.

A side effect of flattening the sole is it often changes the shape of the throat opening. Take the time to check to make sure the throat is straight and square to the sides of the plane. A small engineer's square works great for this. If necessary, use a small file to square things up.

Just like the lateral adjustment, the lever cap doesn't require much attention. Check for smooth operation and a positive lock. Remove any burrs with emery cloth and lubricate the hinge with a drop of light machine oil.

REMOVING RUST WITH ELECTROLYSIS

I was surfin' the web recently and came across a great way to remove rust—using electrolysis. In a nutshell, electrolysis passes a small electrical current from a battery charger through a rusty tool that's submerged in an electrolyte solution. An exchange of ions takes place resulting in rust removal. Magic? I think not—just simple science. Here's how easy it is to do.

First, mix up an electrolyte solution (one tablespoon of baking powder per gallon of water) in a non-conductive, plastic container. Then, remove anything that's not metal from the tool. Next, clean the tool in warm sudsy water to remove any oil or grease. Now clamp the positive (red) lead of a 2-amp battery charger to the anode—this is just any large, flat piece of steel (like a kitchen pan lid)—stainless steel works best as it erodes slowly. And connect the negative (black) lead to the rusty tool.

A battery charger, some baking soda electrolyte and a scrap metal anode are all it takes to remove heavy rust with the power of science.

At this point you're ready to fire up your science experiment. Set the rusty tool and anode in the electrolyte solution so they're a couple inches apart. Make sure the tool is completely submerged and that the red clip that's attached to the anode is above the solution (this will prevent it from corroding). Turn on the battery charger and check that it's not drawing more current than it's rated for (this is where a built-in ammeter is indispensable). If it is drawing too much, or not enough current, simply move the tool father away or closer to the anode. (Safety note: make all adjustments with the charger unplugged!) You can tell it's working when you start to see bubbles forming on the surface of the tool.

The average tool will de-rust in about two hours, resulting in some fairly nasty-looking electrolyte. Turn off the charger, slip on some rubber gloves to remove the tool, and unfasten the clips. You'll notice a lot of black crud on the tool. The quickest and easiest way to remove this is with a non-metallic abrasive pad. Just scrub the surface with a pad dipped in warm, soapy water. If the rust is gone, you're done. If not, repeat the process until it is. A note of caution here. Prolonged electrolysis can remove the japanning (the black paint) on a tool—check the tool often and stop as soon as the rust is removed.

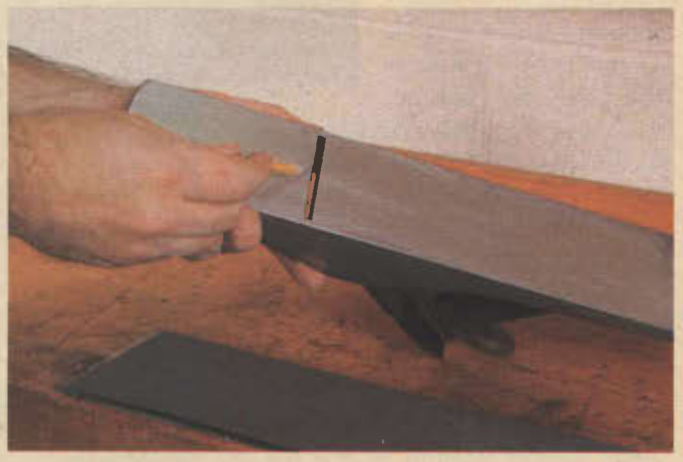
For a more in-depth discussion of removing rust with electrolysis, key in this URL on your computer: http://www2.interconnect.net/nlindsey/Electrolysis/electrolysis.htm#Introduction.

Don't put up with a sloppy yoke—remove the slack by applying gentle pressure to the yoke with a C-clamp.

Check the sole for flatness with a straightedge. A bright light in the background will make it easy to see any high or low spots (top). Winding sticks placed on each end of the plane will reveal any twist in the body of the plane when you sight along its length ***(inset)***.

The toe, heel, and front of the throat (shown) are the critical areas where the sole of the plane must be flat ***(near right)***.

To support the blade and prevent chips from jamming between the cap iron and blade, hone a bevel on the front edge of the cap iron ***(far right)***.



I mentioned earlier that an un-tuned frog is one of the main causes of blade chatter. Another culprit of this pesky problem is a sloppy cap iron. The job of the cap iron is twofold. First, it adds rigidity to the plane and prevents it from flexing during use. Second, the slight hump at its business end serves as a tiny wedge to break chips as the iron cuts into the wood. Neither of these jobs can be done properly if the cap iron doesn't come in full contact with the entire edge of the plane iron. To ensure this contact, flatten the front edge on a stone as shown. I also like to polish the chip breaker portion of the cap iron so chips will slide smoothly on and off of it.

Finally, you can turn your attention to the handle. If the screw bottoms out before the handle is tight, grind ⅛" off the screw. For stripped screws, re-tap at the next larger size. On handles that are cracked, you can fix them with epoxy, or make a new one. To make a new handle, use the old handle as a template. It's best to drill the hole for the handle screw before shaping the handle. Then cut out the shape, then smooth and sand the handle to fit your hand.

Even if there's nothing wrong with the handle (or front knob), I always suggest shaping them to fit your hand. The factory-made handle is designed to fit the masses, not your hand. You'd be surprised how much nicer a custom-fit handle feels.

Re-assembly and Adjustments

Now that we've tuned all the individual parts, it's time to tune them all together much like a symphony orchestra does before a performance.

Before you attach the cap iron to the iron, the iron needs to be sharpened. I start by hollow grinding the iron. Then flatten the back and hone a bevel on a waterstone.

Position the cap iron on the sharpened iron square to the front edge and set back about 1/16". Slip this assembly onto the frog, and lock it in place with the lever cap. Adjust the depth of cut and the lateral adjustment lever as necessary.

Although you re-attached the frog before flattening the sole, it still needs to be fine-tuned to fully support the blade. Start by loosening the frog screws so they're friction-tight. Then use the frog adjustment screw to slide the frog into perfect alignment with the sole at the throat opening, see the illustration on the previous page. (You'll most likely need to remove the handle to get to this screw.)

Now for the test. Secure a scrap of wood in your bench vise and take a few passes with the plane. Ahh... the joy of rescuing a fine old tool. And the sweet sound it makes as it glides over the wood, shearing off paper-thin, crisp shavings. **PW**

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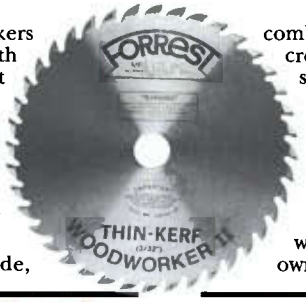

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2-4 Days Sharpening ON ALL MAKES OF CARBIDE BLADES

Little SHOP mark II

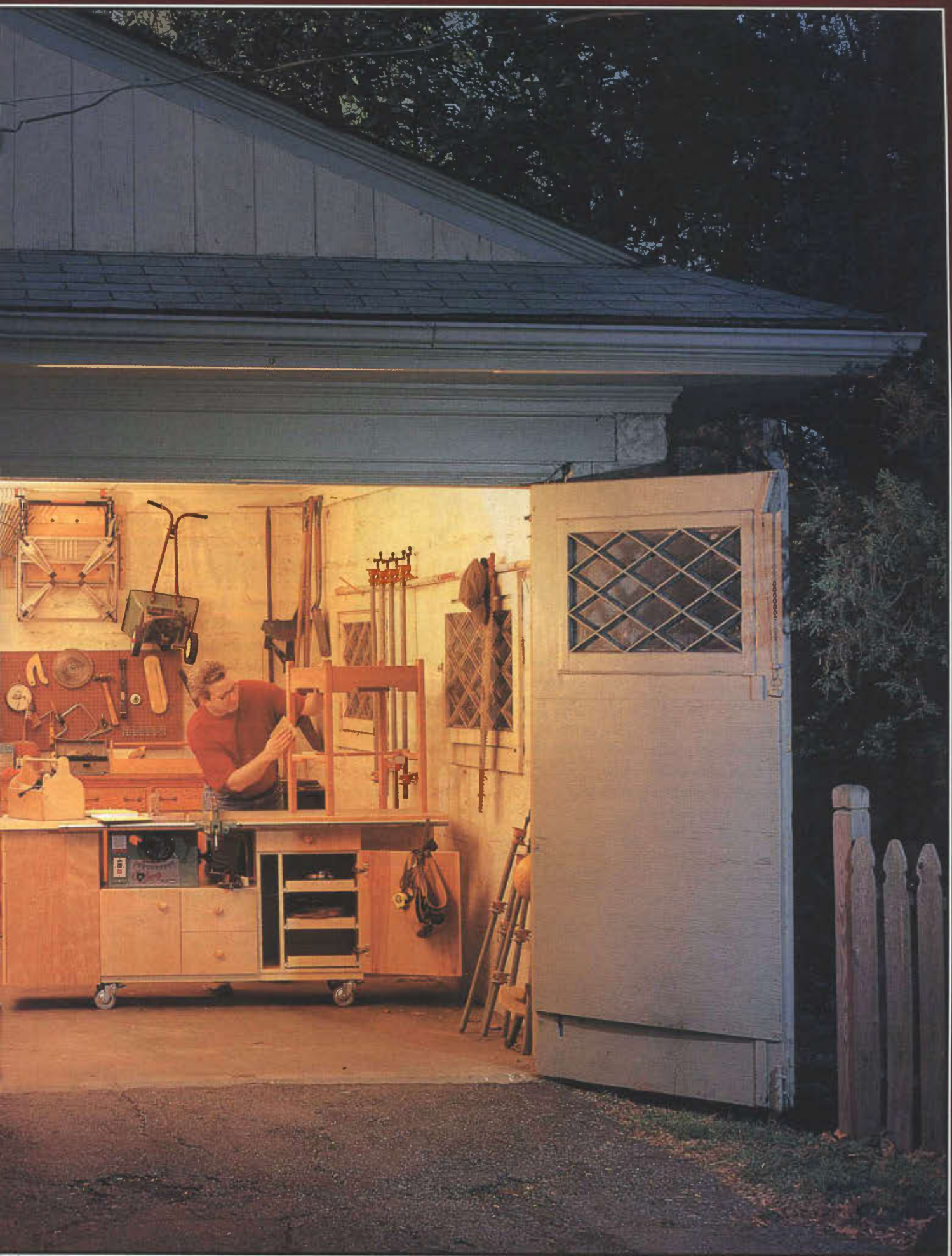
The original Little Shop from the July 1996 issue. The project was so popular that last year we sold out of copies of that issue.

If you have very little space but high ambitions for your woodworking, take a look at our redesigned and upgraded Little Shop That Could.

Three years ago we published plans for the Little Shop That Could, an economical, small yet functional portable workstation. Stocked with basic tools that cost less than $500, the concept was to get you in the door to woodworking. Editor Steve Shanesy, the father of the Little Shop, made some hard fiscal decisions about what equipment to buy, not always choosing what he preferred, but what was within budget. Since that time the Little Shop has produced 10 projects for the magazine, using only those tools. We decided it was time to upgrade the equipment. The result is the Little Shop Mark II. It's still designed for tight quarters, but we've spent a bit more on tools to allow more versatility and precision.

I tried to carry on the tradition of being as frugal as possible, without sacrificing quality. A budget of $1,000 was decided on as an acceptable amount to purchase everything needed, while keeping me from whining about not having "vital" tools. We also

by Jim Stuard



wanted to use parts and tools from the original Little Shop as a starting point.

I decided to use the two larger cabinets from the original Little Shop and simply add a new cabinet to support the new saw and some other power tool goodies. If you built the original Little Shop and want to build the Mark II version, simply substitute the new middle cabinet for the old one. For those of you who are visiting the Little Shop for the first time, there are drawings and schedules for all the cabinets. This center cabinet makeover took place because of an unforeseen design flaw. The height of the original center cabinet couldn't adequately support the entire Little Shop and it began to splay. I designed the new cabinet to hold more weight, to store more stuff and to roll around on some heavier-duty casters.

The first and most critical tool addressed was the table saw. While the original Skil benchtop saw was a star player, I wanted the advantages of a contractor saw. Namely more power, a longer arbor for dado heads and moulding cutters, a better fence and more cutting capacity. Before you start calling me a whiner like Steve did, consider this: I compare woodworking to my hobby, playing guitar. For years, I struggled on cut-rate, lousy instruments. My family will attest to the struggling part. That was until the day I dropped some serious coin on a Fender Telecaster. The doors of music making had suddenly been thrown wide, and I knew that I'd be making hits in no time. Seriously, on a better instrument, I began to practice more. My skills improved, and I acquired the ability to play without offending people.

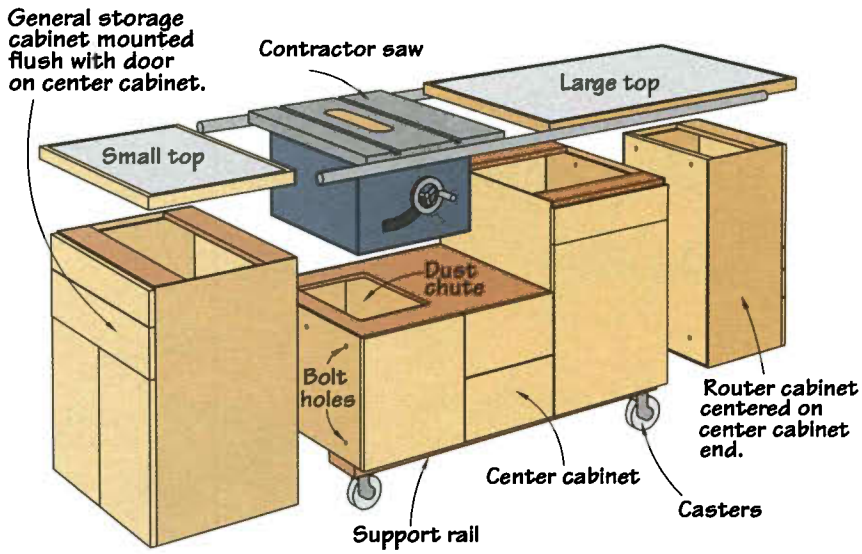
I searched high and low for a saw that would provide the right combo of price and capabilities. The Grizzly G1022 contractor saw ($375 + $60 shipping) fit the bill. I added the optional 70" fence extension tubes ($60) for wider cuts and to make room on the cabinet for a router table fence. The Ryobi plunge router from the first Little Shop also performed well, but it had a ¼" collet. The natural upgrade was the Porter Cable 693PK fixed/plunge base router kit ($179), which has both ¼" and ½" collets, and the fixed base will mount nicely in the router table section of the Mark II. Tired of cutting biscuits with my router, I decided to purchase the Freud JS102 ($117). The outfeed table on the original was a good idea, but Steve hadn't used a Black and Decker Workmate™ ($98 each) before then. The obvious utility provided by these ingenious sawhorse, clamp, tool-stand contraptions was hard to ignore. I added some torsion boxes to bring the height to that of the finished height on the Mark II, so I have two sturdy, folding outfeed tables. This gives a grand total of $987 before taxes. Not bad.

Measure the center locations of the existing holes on the saw table and the fence bars. There are five threaded insert locations per top. Next, drill the ⅜" receiving holes for the inserts. It helps to use a doweling jig, but it's not necessary. Make sure you measure every hole on both sides. They aren't located in exactly the same place.

Construction

The case construction is the same rabbeted-sides style as the original Little Shop except that instead of nailing the case together, I used screws and glue for added strength. The new table saw works fine sitting on one of the Workmates until the case is made.

Begin construction by cutting out all of the parts for the tops. I substituted these tops for the cast iron open wings on the saw because dust would inevitably settle through the holes in the wings. And cleaning it would be difficult in the confined spaces under the saw. Start the tops by nailing the buildup to the underside of the tops. Make sure to keep it flush and square. Cut plastic laminate (check your yellow pages for local cabinetmaker supply stores) 1" bigger than the tops in both dimensions. Attach the laminate with contact cement and rout flush. Using a sanding block, sand the edges to smooth out any irregularities, and begin cutting ¾" x 1½" stock to edge the tops. Use biscuits to align the edging then glue and clamp in place. Try to keep the edging as flush to the top as possible. When the glue dries, clean up any edging that sticks above the top with a block plane and sand the edges. Apply three coats of danish oil as a finish.



Use spacers to set the height of each slide accurately. Start with the highest drawer and work your way down. The easiest way to do this is to attach the drawer slide to the drawer. Lay out in the cabinet exactly where you want the drawers to go. Then place the cabinet part of the slide on the drawer. Measure where the bottom of the slide is in relationship to the bottom edge of the drawer. Subtract this from the drawer height inside the cabinet and that's the spacer height.

LITTLE SHOP MARK II • NEW CENTER CABINET

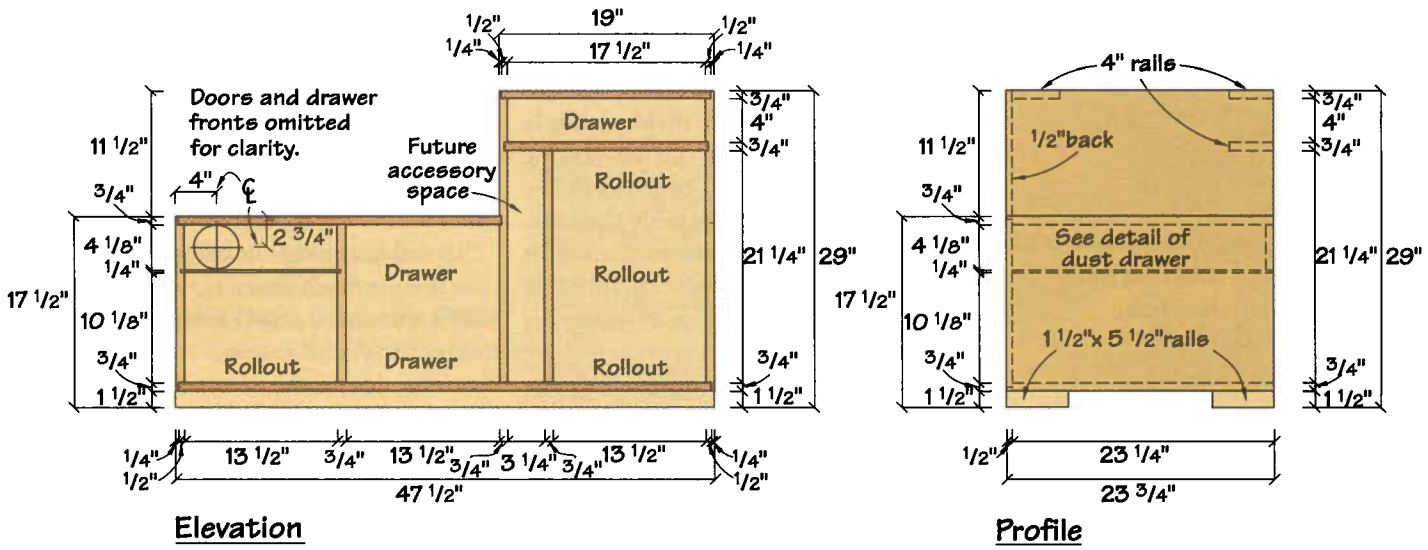
No.	Item	Dimensions T W L	Materia
	Center Case		
1	Large top	¾" x 25½" x 41½"	Plywood
1	Small top	¾" x 25½" x 17½"	Plywood
3	Buildup strips	¾" x 4" x 96"	Plywood
4	Solid edging strips	¾" x 1½" x 96"	Maple
	Center Case		
1	Small end	¾" x 23¾" x 16"	Plywood
1	Large end	¾" x 23¾" x 27½"	Plywood
1	Small partition	¾" x 23¼" x 14½"	Plywood
1	Large partition	¾" x 23¼" x 26¾"	Plywood
1	Vertical divider	¾" x 23¼" x 21¼"	Plywood
1	Dust shelf	¼" x 23" x 14"	Plywood
1	Top	¾" x 23¾" x 28½"	Plywood
1	Bottom	¾" x 23¾" x 47"	Plywood
1	Case back	½" x 27" x 47"	Plywood
2	Case rails	¾" x 4" x 18½"	Plywood
1	Drw. rail	¾" x 4" x 18"	Plywood
2	Support rails	1½" x 5½" x 47½"	Pine
1	Large door	¾" x 19" x 22½"	Plywood
1	Small door	¾" x 14½" x 15⅞"	Plywood
	Rollouts		
4	Backs	½" x 2" x 12"	Plywood
4	Fronts	½" x 2" x 12"	Maple
4	Bottoms	¼" x 12" x 22¼"	Plywood
8	Sides	½" x 2" x 22¾"	Plywood
	Lower drawers		
2	False fronts	¾" x 8" x 13¾"	Plywood
4	Fronts & backs	½" x 6" x 12"	Plywood
4	Sides	½" x 6" x 22½"	Plywood
2	Bottoms	¼" x 12" x 22"	Plywood
	Upper drawer		
1	False front	¾" x 4¼" x 19"	Plywood
2	Front & back	½" x 2¾" x 16"	Plywood
2	Sides	½" x 2¾" x 22¾"	Plywood
1	Bottom	¼" x 16" 22¼"	Plywood

Attach the tops

When unpacking the saw, one nice thing you'll realize is that the only assembly necessary is attaching the motor and fence bars. Grizzly sends a base with the saw, but it's not necessary for Mark II construction. You can't buy the unit without the base so consider it a bonus stand for some future machine in your shop.

To attach the tops, first install threaded inserts into the edge of the top. See the photo for details on this procedure. Use a board, on edge, of appropriate height to prop up the end of the top while bolting the top flush to the saw table. Repeat the same procedure for the small top.

The extra long fence bars require some modifications to keep the Mark II's large, right-side top sturdy. Drill two ¼" holes in each bar at 6" and 22" from the far end. Enlarge the outside holes in the bars to ½" to clear a screw bit holder. Use #10 x 1½" wood screws and spacers between the bar and the top to secure the large top at these four holes. Adjust the wooden spacers until the fence works smoothly.



TORSION BOXES

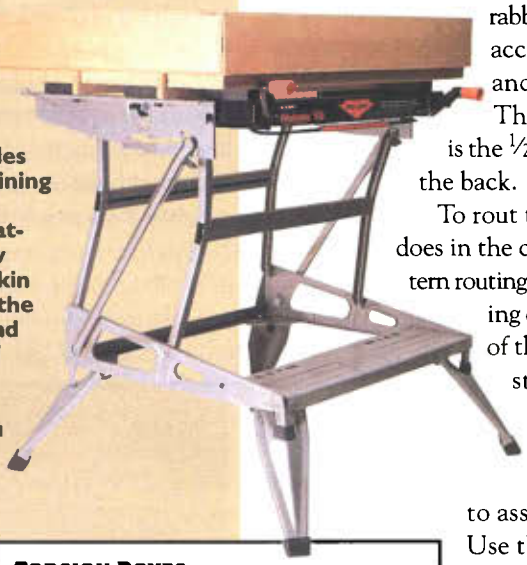
One decision that I made early on in the redesign was to eliminate the full-length outfeed table on the Little Shop. It was a little awkward to set up, and I would much rather have a work table for assembly at a lower height.

Using the Workmates, clutter is kept off the saw, and the clamping vises can be used during furniture assembly. With the addition of torsion boxes, they make adequate, lightweight, outfeed tables at the same level as the table saw top.

The boxes are made by nailing together a plywood frame like a stud frame in house construction. Offset stretchers are nailed in place between the studs, then plywood skins are nailed to the outsides.

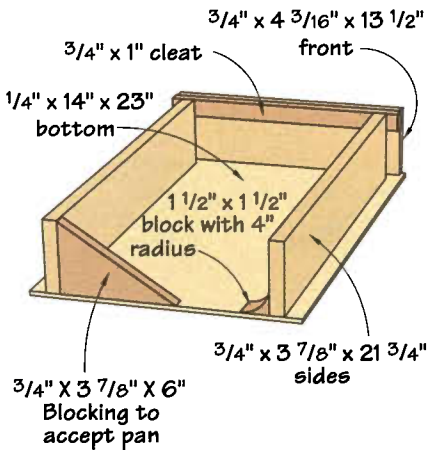
Begin construction by cutting out the parts listed in the Schedule below. Nail the frame together by standing the four short frame parts on end and nail the long frame part onto them. Use the stretchers as spacers for nailing. Next, nail the 1/4" plywood skin on one side. Clamp the two clamping rails into a Workmate using the Workmate's third spacer as well. Place the partially assembled box on the Workmate and flush the rails on one end. Leave 1/2" overhang on the side with the handles. Mark the locations of the rails on the 1/4" plywood and turn the box over. Drill pilot holes into the plywood lining the box up on the pencil marks and attach the rails. Now attach the other skin on the top side of the box. Finish sand and apply two coats of finish.

Depending on how loose a fit you want, you might have to take a 1/16" cut off of the width of the Workmate's middle spacer. As designed the riser boxes are 1/4" lower than the height of the saw table. This is so you can adjust for any irregularities in the floor and still have a surface level to the saw table.



TORSION BOXES

No.	Item	Dimensions T W L
2	Sides	3/4" x 3 1/2" x 30"
3	Stretchers	3/4" x 3 1/2" x 9"
4	Studs	3/4" x 3 1/2" x 22 1/2"
2	Skins	1/4" x 24" x 30"
2	Clamping rails	1/2" x 1 3/4" x 30"



Use the diagram above to lay out the support blocking for sheet metal in the dust diverter. When you've built the drawer, take an oversized piece of sheet metal and start by attaching it to the cleat on the back of the drawer front. Gently force the metal into the mold and screw in place. Tap the edge over with a hammer and screw this lip into place. Attach door weather stripping to the parts of the diverter that may leak dust when it's slid in or out of the case.

Case Construction

Once the tops are flush, cut out the case parts according to the Schedule of Materials. Cut 1/2" x 3/4" rabbets in the top and bottom edges of the case ends and the top of the large partition. Use the two-step table saw method for these rabbets, standing the part on its edge for the first cut, then laying it flat and cutting the rest of the rabbet. These rabbets accept the rails, top and bottom pieces. The last rabbet cut is the 1/2" x 1/2" rabbet for the back.

To rout the 1/4"-deep dadoes in the case, set up a pattern routing bit with the bearing on top, using one of the partitions as a straight edge. It's now a simple matter of using screws and glue to assemble the case. Use this sequence for the most trouble-free assembly. Assemble the large partition and the top, followed by the small end and small partition, the bottom, the large end and the rails. Keep the inside of the back rabbet flush during assembly. It's easier to flush up the front edges that way. Make sure to keep the case square as you go. Screw the back in last.

If you need to make the two outer cases, do so now using the schedule at right. Construction is the same as outlined for the new section, using 1/2" x 3/4" rabbets in the ends, otherwise continue on.

The next step is to apply iron-on edge banding to the front edges of the case. Finish the case by attaching the casters to the bottom support rails.

The Dust Diverter

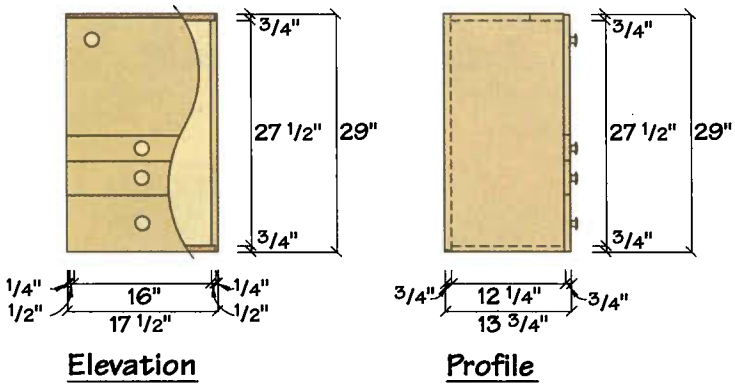
Dust collection can be accommodated by building a small diverter out of sheet metal and plywood. It's removable for cleaning for when (not if) you drop the arbor nut into the saw. See the photo and drawing above for details.

Drawers and Doors

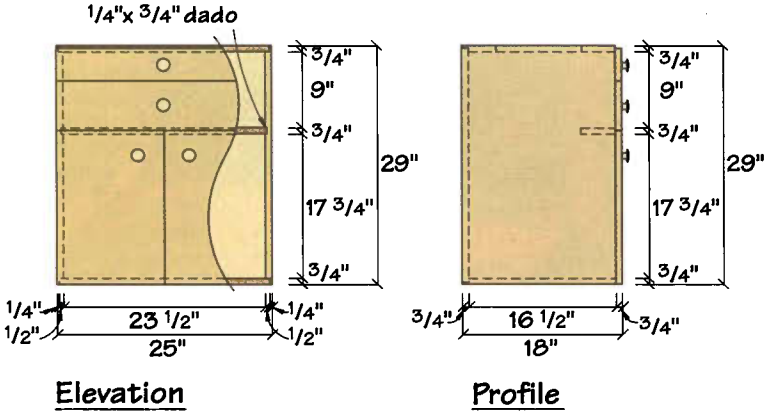
After leveling the case on a flat surface, make the drawers. (You'll notice that the drawer openings for the new section are all 13 1/2" wide, with one exception. This makes cutting out drawers and roll-out shelves much easier.) Use a 3/8" x 1/2" rabbet cut on the drawer fronts and backs, and use a 1/4" x 1/4" groove, 1/2" up from the bottom edge for the bottoms. Install the drawers with standard 1/2" x 22" drawer slides.

Next, edgeband the doors and drawer fronts, then hang the doors using European hinges. These are full overlay hinges, which means that the front of the door completely

Router cabinet



General storage cabinet



$500 SHOP • OLD CABINETS

No.	Item	Dimensions T W L
Router Cabinet		
2	Ends	3/4" x 13" x 29"
1	Back	3/4" x 17" x 28 3/4"
1	Bottom	3/4" x 13" x 17"
1	Top stretcher (front)	3/4" x 4" x 17"
1	Door	3/4" x 17 1/2" x 14 5/8"
1	Drawer front	3/4" x 17 1/2" x 3"
1	Drawer subfront	1/2" x 2 1/2" x 15 7/16"
1	Drawer back	1/2" x 2" x 15 7/16"
2	Drawer sides	1/2" x 2 1/2" x 12"
1	Drawer bottom	1/4" x 11 3/4" x 15 7/16"
1	Drawer front	3/4" x 17 1/2" x 3 7/8"
1	Drawer subfront	1/2" x 3 1/2 " x 14 1/2"
1	Drawer back	1/2" x 3" x 14 1/2"
2	Drawer sides	1/2" x 3 1/2" x 12"
1	Drawer bottom	1/4" x 11 3/4 " x 14 1/2"
1	Drawer front	3/4" x 17 1/2" x 7"
1	Drawer subfront	1/2" x 6" x 14 1/2"
1	Drawer back	1/2" x 5 1/2" x 14 1/2"
1	Drawer side	1/2" x 6" x 12"
1	Drawer bottom	1/4" x 11 3/4 " x 14 1/2"
General Storage Cabinet		
2	Ends	3/4" x 17 1/4" x 29"
1	Back	3/4" x 24 1/2" x 28 1/2"
1	Bottom	3/4" x 17 1/4" x 24 1/2"
2	Stretchers	3/4" x 4" x 24 1/2"
1	Rail	3/4" x 4" x 24 1/4"
1	Drawer front	3/4" x 25" x 4"
1	Drawer subfront	1/2" x 3" x 22"
1	Drawer back	1/2" x 2 1/2" x 22"
2	Drawer sides	1/2" x 3" x 16"
2	Drawer bottoms	1/4" x 15 3/4" x 22"
1	Drawer front	3/4" x 25" x 5 3/4"
1	Drawer subfront	1/2" x 4 1/2" x 22"
1	Back	1/2" x 4" x 22"
2	Sides	1/2" x 4 1/2" x 16"
2	Doors	3/4" x 12 7/16" x 18 3/4"

overhangs the edge of the cabinet. European hardware is designed to use a hole created by a 32mm Forstner bit. A 1 3/8" Forstner bit is close enough. The plate gets mounted to the inside of the cabinet per the manufacturer's instructions. Attach the drawer fronts with screws through the drawer boxes. Attach the drawer/door pulls and set the case on the floor.

Once you get everything fit, it's time for finishing the cabinet and innards with two coats of clear lacquer. Take all of the hardware off to do this as it might gum up the slides and hinges, and it leaves unfinished spots on the drawers and doors.

Making the Whole from the Parts

It's now time to attach the two outer cases to the center case. Attach the large case to the left end of the center case with the drawer/doors facing to the left. Attach the small case centered on the right end doors facing to the right. This will house the router table assembly which will be addressed in a future issue. Once you attach the top to the cases the whole unit is quite sturdy.

In the next issue, I'll show you how to trick out your saw with a versatile mitering sled that can be stored in the slot next to the rollout shelf unit. You can crosscut with it all day long. Next we'll construct the router table part of the shop that can be quickly set up to work as a jointer. Finally we'll get started on the reason we built the Mark II: building projects. **PW**

SUPPLIES

From Lee Valley 800-871-8158:
4- Casters - $10.95 ea.
Item #00K2001
10- Threaded inserts - $1.30
Item #00N1025

From Rockler 800-279-4441:
2 pr - Hinges - $13.29 pr.
Item #34595
7 pr - Drawer slides - $5.99 pr.
Item #34876

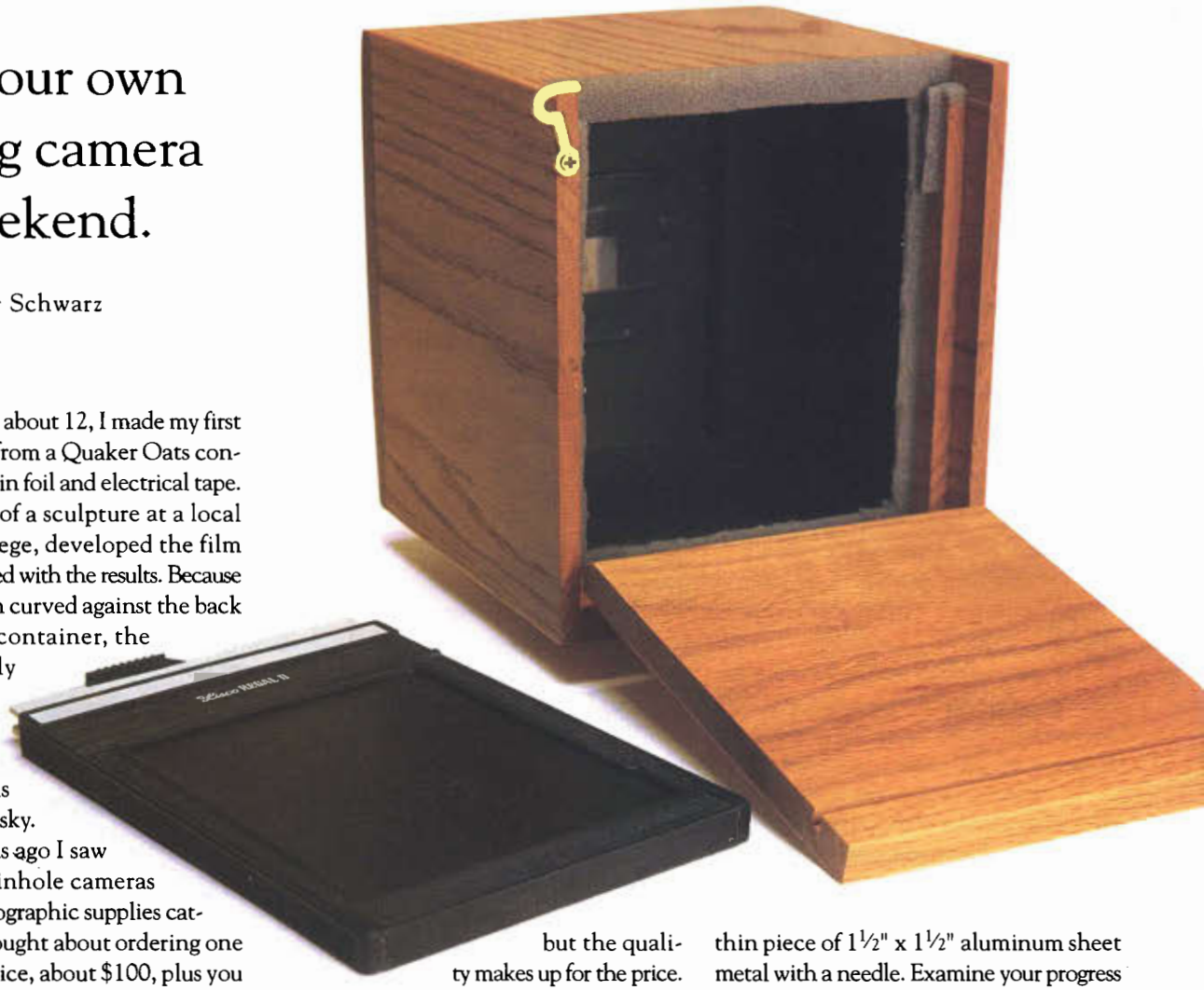
From Grizzly 800-523-4777:
G1022 Table Saw with 70" extension tubes (G1187) - $ 494.95

Use a European hinge that will allow the door to swing free of the rollout shelves and not hit the adjoining cabinets.

Pinhole CAMERA

Build your own working camera this weekend.

by Christopher Schwarz



When I was about 12, I made my first pinhole camera from a Quaker Oats container, a scrap of tin foil and electrical tape. I took a picture of a sculpture at a local community college, developed the film and was intoxicated with the results. Because the film had been curved against the back of the oatmeal container, the photo was wildly distorted—it looked like the sidewalk around the sculpture was leaping into the sky.

A few months ago I saw some wooden pinhole cameras for sale in a photographic supplies catalog. I briefly thought about ordering one until I saw the price, about $100, plus you had to buy the film back. Ouch. So I did what any self-respecting woodworker would do. I headed for the shop.

This pinhole camera is my fourth prototype. I first played around with trying to build one that would take Polaroid film (a messy disaster). Then I toyed with medium-format 120 film (too much engineering). Finally, I decided simplicity was best. This camera uses a 4" x 5" film back that holds two pieces of 4" x 5" sheet film. You load the film into the film back in a dark closet. Then you put the plastic film back into the camera. When you're ready to make a picture, you remove what's called a "dark slide," and this begins the exposure. To stop the exposure, you replace the dark slide. Then you take the film to the lab. The film isn't cheap (about $2 a shot), but the quality makes up for the price.

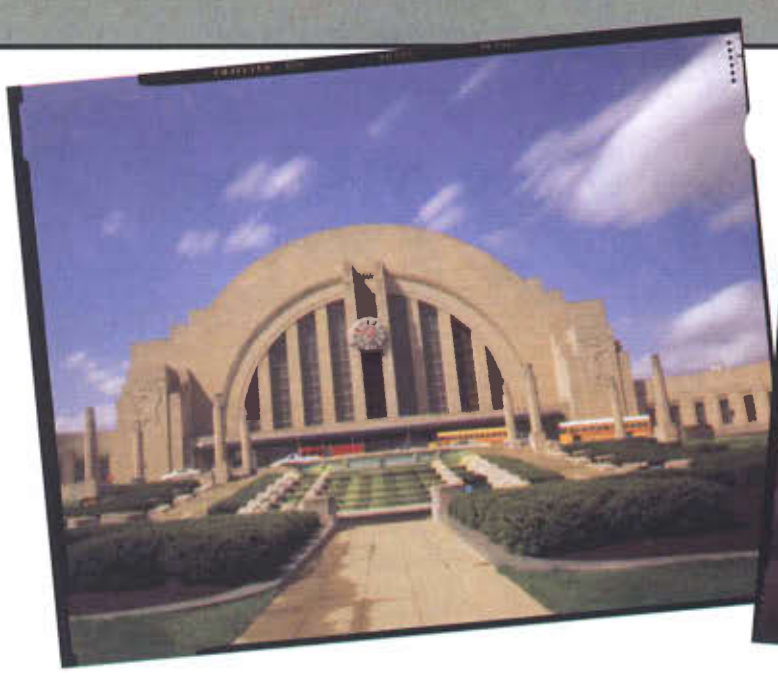
You can enlarge 4" x 5"s to an impressive size. Here's how to make your own camera:

Make the Pinhole

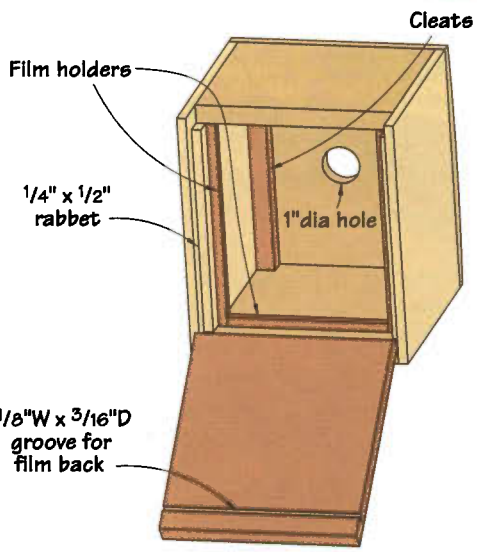
When building a pinhole camera, one of the most important things is the distance between the pinhole and the film. This is called the "focal length." For every size pinhole, there is an optimal focal length. If your focal length isn't correct, your image will be blurrier than it should be. This camera uses a pinhole that is .016" in diameter (about 1/64"). The focal length is (and I hate to do this to you) 120 millimeters. If you're not daring, you can order a set of a dozen pre-cut pinhole apertures from the company listed in the supplies box. Or make your own by poking a hole in a very thin piece of 1½" x 1½" aluminum sheet metal with a needle. Examine your progress with a magnifying glass. When your hole is 1/64", file the burr off the exit hole.

Build the Box

Simple stuff here. The top and bottom are glued into rabbets in the sides. The front is attached using cleats. The back is hinged and also rests in rabbets in the sides. Begin by cutting your pieces to size. Cut ½" x ¼" rabbets on three edges of both side pieces. Glue the top and bottom into the rabbets, clamp and let dry. Now put the film back in place and mark where the three "film holders" will go. These hold the film back in place when you shut the back of the camera. Glue the holders in place. Add lightweight foam weather-stripping to the holders and the back edge of the top. These will help seal out light and give you a tight



Cincinnati's Union Terminal—now the home to several museums—in full sunlight. This exposure was about 12 seconds with 50 ASA Fuji Velvia. Notice the clouds moving in the background ***(left).*** *The Roebling Suspension bridge (the prototype for the Brooklyn Bridge) seen from Covington, Kentucky, at sunset on 100 ASA Fuji Provia.* ***(right)***



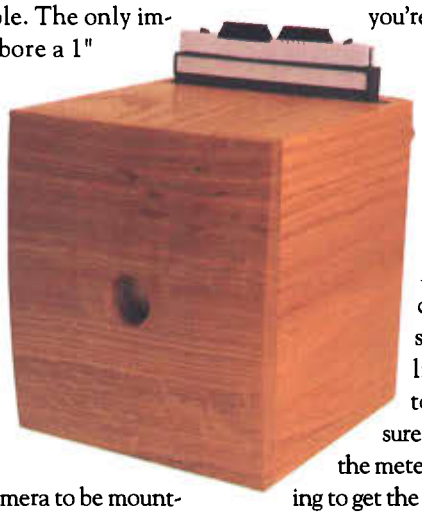
fit. Now fit the back of the camera. You might need to make a saw kerf cut on the back to accommodate a raised lip on the film back. Attach the hinges and add a shutter latch (the kind for shutters in your home) to the back to keep the camera's back shut. Glue the two cleats inside the camera flush to the front. These help keep the front in place. Paint the inside of the camera flat black.

PINHOLE CAMERA

No.	Item	Dimensions T W L
2	Sides	1/2" x 6 5/8" x 5 5/8"
1	Bottom	1/2" x 5 5/16" x 5 5/8"
1	Top	1/2" x 5 5/16" x 4 5/8"
1	Back	1/2" x 5 5/16" x 6 1/8"
1	Front	1/2" x 6 5/8" x 5 13/16"
2	Film holders	1/4" x 1/4" x 5 5/8"
1	Bot. film holder	1/4" x 1/4" x 4 5/16"
1	Tripod mount	1/2" x 2 1/4" x 3 1/4"
2	Cleats for front	1/2" x 1/2" x 5 5/8"

Note: All parts are White oak

The front is simple. The only important thing is to bore a 1" diameter hole in the dead center. I also cut a curve on my front with a band saw. Now attach your pinhole aperture with electrical tape. Measure your focal length and shim the aperture with electrical tape or thin slices of wood if necessary. Glue the front to the cleats on the case.



To allow your camera to be mounted to a tripod, install a 1/4" x 20 tpi threaded insert into the tripod mount piece. Glue and screw it to the bottom of the camera. Add a couple coats of clear finish, and you're ready to take pictures.

Test Drive

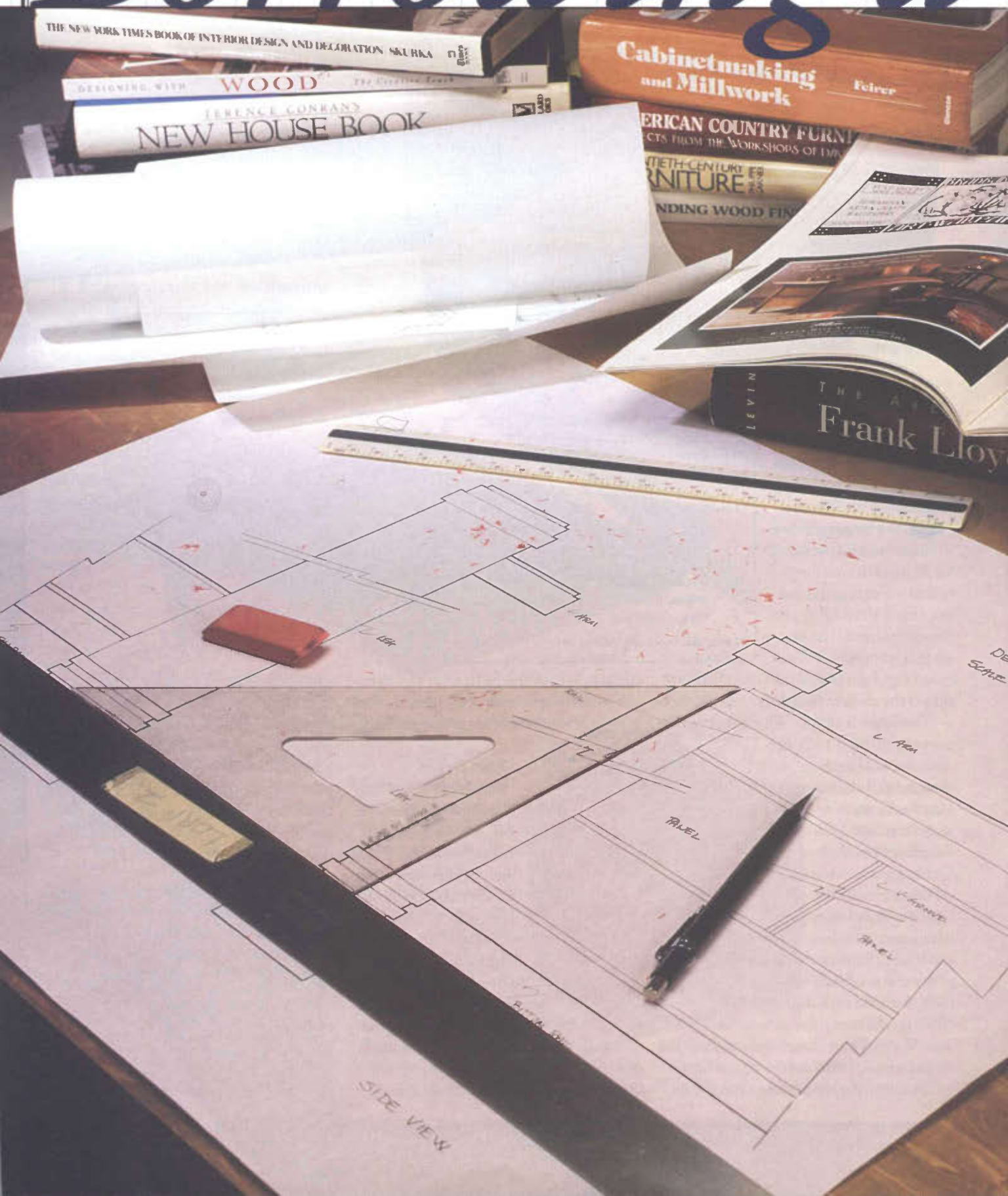
Exposure times are long for pinhole cameras. In full sun, this size pinhole needs about 10 seconds of exposure using 50 ASA film. On cloudy days, expect about 40 seconds. If you have a light meter, here's how to determine the exposure for this size pinhole. Set the meter to f64 and take a reading to get the exposure time. Multiply that time by 20. That's your exposure time. Before your exposure, make sure your camera isn't going to move. And keep in mind that this will be a wide-angle shot, so try to get close to your subject. Don't be afraid to experiment. For example, to make it look like a ghost is walking through your photo, have someone stand still in the frame for about half the exposure time. Shots with waves or water will look surreal with the long exposures. **PW**

SUPPLIES

Calumet • 888-888-9083
Lisco Regal II 4 x 5 film holder, item #LS4500, $18.95
Pinhole aperture set, item #PY3005, $29.95

Hardware
1" x 1" hinges (2)
Shutter latch (1)
1/4" x 20 tpi threaded insert (1)

Borrowing a


THE NEW YORK TIMES BOOK OF INTERIOR DESIGN AND DECORATION SKURKA
WOOD
TERENCE CONRAN'S
NEW HOUSE BOOK
Cabinetmaking
and Millwork
Feirer
SIDE VIEW

D·E·S·I·G·N

A little genteel larceny jump-starts diffident designers.

This striking "Cantilevered Couch" from Bexley Heath Ltd. (Grand Rapids, Mich.) provided inspiration for the settee I recently built for friends. Photo courtesy of Bexley Heath

Woodworkers are often passionate craftsmen and reluctant designers. We like the challenge and satisfaction of building things in the shop, but we struggle when we try to design them. Confronting that first clean sheet of paper on the drawing board, we find the only thing we can draw is a mental blank. Then, when ideas begin to take shape, not one of them seems to be original. Frustrated, we retreat to the bench and work from someone else's design or cobble things together as we go, convinced that real designers must have some sort of creative flair or innate gift that we too obviously lack.

Design is indeed a creative process, but it is not a mysterious one. No less than craftsmanship, it is a skill that can be learned. Like many woodworkers, I am not a particularly inspired designer, so over the years I've had to develop a design method that helps me overcome that initial "blank page" anxiety as well as my meager allotment of originality. I start by letting the basic physical requirements of the project itself generate the initial sketches. Then I sustain the process by engaging in a little genteel larceny that I call "borrowed design."

The method is a practical one, short on theory and principles, so I think the best way to explain it is with a practical demonstration. I'll walk you through the design process I followed for a settee I recently made for friends. The process is exactly the same whether you're designing for yourself, a member of your family, a friend or a paying customer.

Using What You're Given

The first step is to determine what I call the "givens;" the physical requirements imposed on the piece by its function and the desires of the person for whom it is made. Function is a powerful design determinant. And because most furniture must in some way accommodate it, the human body is the most powerful functional determinant. This is particularly true of seating. My settee, like every settee, had to be easy to sit down on, comfortable while seated upon, and easy to get up from. Fortunately, I didn't need to figure out how to satisfy these requirements on my own. My friends had found a settee they thought was comfortable, so I was able to take the seat height, depth and width dimensions from it. Basing critical dimensions on a personal "test drive" of a piece similar to the one you want to build is fairly reliable. If you think your piece would be even better if you adjusted this or that dimension, consider making a mock-up to test the effect. Small changes in the height of a dining table or writing desk

by Roger Holmes

Roger Holmes trained as a furniture maker in England and has been working wood professionally and for fun for 30 years. He lives in Lincoln, Nebraska.

ALL SHAPES AND SIZES

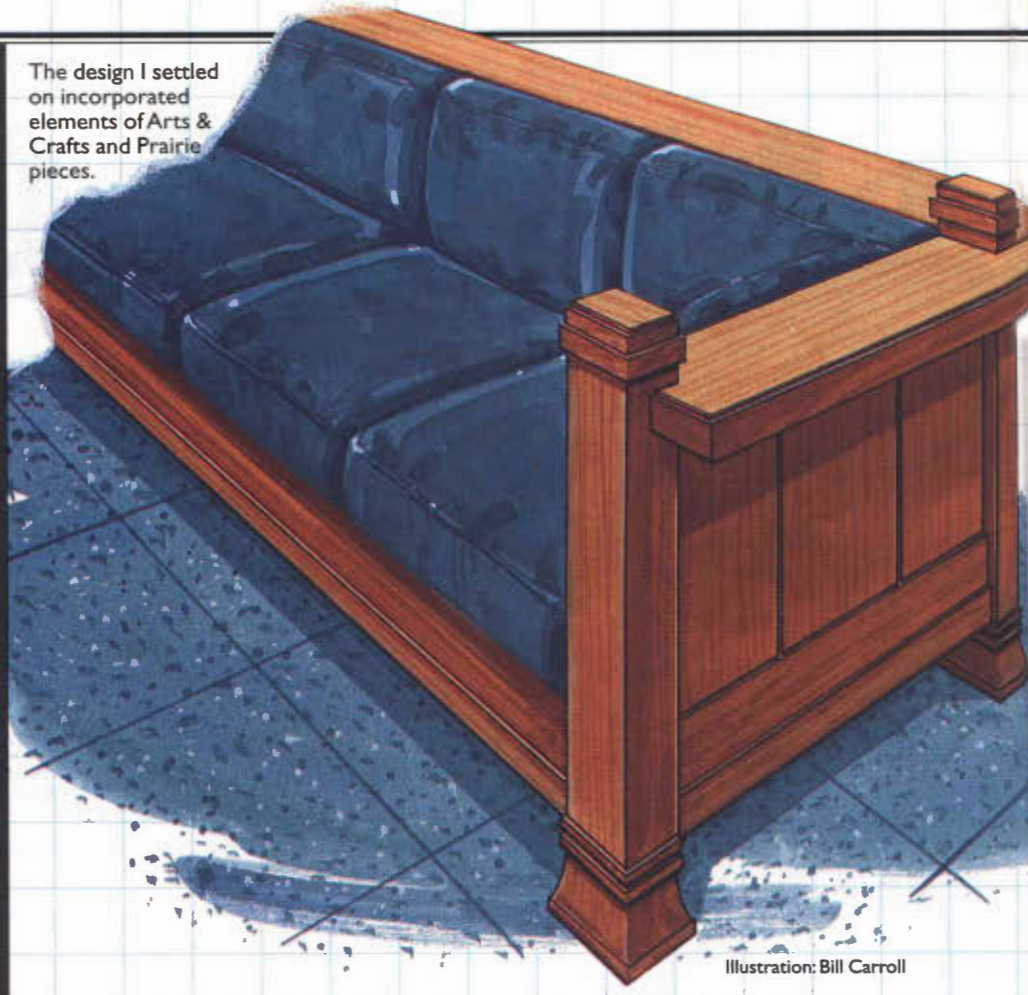
Given the marvelous variety we find in human beings, it is remarkable how little variation there is in the critical dimensions of the furniture most of us use. Dining tables and chairs, for example, vary a few inches at most in the height of tabletops and seats, yet there is seldom a complaint from dinner guests, whether they're 6 feet 6 inches or 5 feet 2 inches tall. The narrow range of furniture sizes may not always be ideal for this or that individual, but it is serviceable for most. And this is a blessing for anyone trying to design furniture to serve people in general or even groups of people as varied as a circle of friends.

Books on furniture design sometimes provide standard sizes for a range of common furniture — such information can be, in fact, a determining factor in whether to buy the book or not. I often refer to Seth Stem's Designing Furniture (The Taunton Press, 1989), which includes a very useful section devoted to standard or common dimensions for basic furniture types. As a bonus, the rest of the book is a thorough and practical guide to furniture design. (This book is out of print so you'll need to hunt for it.)

If "one size fits all" is too rough a guide for you, take a look at Humanscale 1/2/3, by Henry Dreyfuss Associates (MIT Press, 1974). Consisting of just three hard-plastic wheel charts and a slim booklet, Humanscale provides more than 20,000 pieces of anthropometric and ergonomic information. The faces of each chart depict human figures who are standing, seated or reaching. By turning the wheel or "selector" embedded in the chart, you can dial up hundreds of critical measurements visible in the appropriate spots through cutouts in the plastic. Selecting 76 inches on chart 1 "Body Measurements," for example, provides a wealth of data about a person of that height. A seated 76-inch tall person, for example, measures 20.2 inches from the floor to the top of the knee. (Metric measurements are also given.) Interestingly, a person 14 inches shorter, measures just a little more than 4 inches less from floor to knee (15.7 inches). This helps you understand why standard tabletop height and rail clearances work as well as they do.

The seating and table chart is particularly useful for furniture design. One side provides measurements for seven different adult body types (large male, average male/large female, and so on) on 14 different kinds of seating (including vehicles). The other side provides seat/table data for children by age and school grade and for adults by body type.

Over the years Dreyfuss Associates has added Humanscale 4/5/6 and Humanscale 7/8/9, presenting in the same format data related to different design problems. Each volume costs $60 — a lot for a book, but not bad for a useful tool.



The design I settled on incorporated elements of Arts & Crafts and Prairie pieces.

Illustration: Bill Carroll

or in the height or depth of a chair can be surprisingly noticeable. If you don't have "samples" to try out, you can find critical furniture dimensions in a number of books on design. (See the box at left.)

So far, the physical requirements for the settee were fairly standard — a seat height and depth for individual comfort and a length that accommodates three people with no crowding. But my friends were after something a little out of the ordinary, too: a wide shelf-like surface extending along both arms and along the settee's back. Both are avid readers who enjoy stretching out with a book, a drink and a snack, and they wanted to have all three right at hand as they reclined on the settee. Also, they wanted the settee, as the centerpiece of the room, to accommodate party guests looking for a spot to park drinks or food while they stood around chatting.

The arm/shelf imposed several physical requirements. It had to be at least 6" wide, preferably wider, to support plates and books without risk of their being easily knocked off. For convenience, it seemed that the height of the seat back and that of the arm would need to be the same. The challenge was to support a sitter's back comfortably while providing easy access to the arm/shelf for sitters and for people standing by the settee. The 13" height of the back cushions of the "test-drive" Arts and Crafts settee was within recommended dimensions in design guides I checked. Simple mock-ups I made using cushions, chairs and couches in my house confirmed that a sitter could comfortably reach things placed on an arm at the same height. And I knew that the height of the arm above the floor, 29", is a standard dining table height, so it would work well for people standing around the settee, too.

Translating all these "givens" to paper takes the anxiety out of making the first sketches. At this stage you don't need to consider style or ornamentation, you just establish critical dimensions. I use 11" by 17" sheets of graph paper with 1/8" squares for this sort of sketching. The squares make it easy to draw elevations and plan views in scale, and the lined grid eliminates the need for a straightedge. In a front view for the settee, three long horizontal lines established the floor plane, the height of the seat and of the back; two vertical lines indicated the length of the seat. An end elevation showed the seat and back height again and estab-

lished the seat depth; I slanted the line of the back cushions by eye to what seemed a comfortable angle. In both views I represented the arm/shelf with a horizontal line extending out about 6" from the top of the seat back. Simple as these sketches were, they represented the essence of the piece — no matter what sort of style and details I would add as the design process progressed, I could not stray too far from these lines or the piece wouldn't do what it was supposed to do.

Frank Lloyd Wright dining room in 1908. This is where I got inspiration for the legs

Reprinted with permission from David Phillips

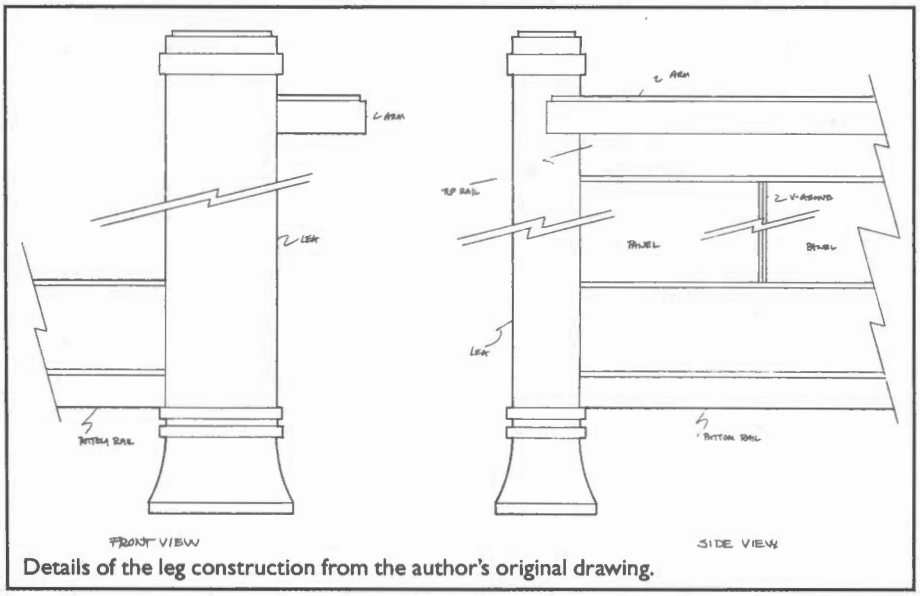
Seeking Inspiration

Sketches generated by the givens of a piece remind me of packing crates — they define the space within which the piece of furniture will exist, but they reveal little about what it will actually look like. Form, style and detail give life to a piece, and determining them is the most daunting part of the design process for many woodworkers. We do not brim over with ideas as we sit with sketch book in hand. Being a washout at originating my own ideas used to frustrate me greatly. Then it occurred to me that in addition to a love of making things by hand, I had been attracted to woodworking by things other people had made. A vast amount of interesting furniture has been produced over the centuries. Why not incorporate bits and pieces of what I liked into my own designs?

"Borrowed" design is not, of course, an invention of mine. Through the ages, truly original, never-seen-before design has been extremely rare. Most designers swipe, adapt or are "inspired by" (depending on the degree of larceny) ideas of other practitioners. The cabriole leg had been around a long time before designers of the American colonial period gave it their own distinctive treatment. Designers seldom introduce something really new; instead, they transform something that already exists into something else, something more interesting or unusual perhaps, or just something slightly different. For my part, I don't expect to improve on what I borrow or make it newly distinctive; I'm thrilled if I can just meld the various elements I've borrowed into a workable, pleasing unity.

Part of the fun of borrowed design is amassing a library of inspirational examples. The miracle of photography allows you to fit into a modest bookcase a vast collection of woodworking from around the world and through the centuries. Books provide the big picture or the in-depth look. Magazine articles and advertisements lay out an up-to-the-minute smorgasbord of current work; tear out and file what you like and toss the rest away. Whether it's a small detail or an entire room that appeals to you, make a habit of squirreling these ideas away. Books and magazines aren't cheap, but the cost is easier to bear when you think of them as providing raw material for your own designs.

Good as they have become, photographs can't compete with the real thing. When you get the opportunity to see pieces first hand, study them closely, from a variety of vantage points — unlike photos, face-to-face encounters allow you to explore a piece in three dimensions. Snapshots, if you're allowed to take them, are records of your observa-

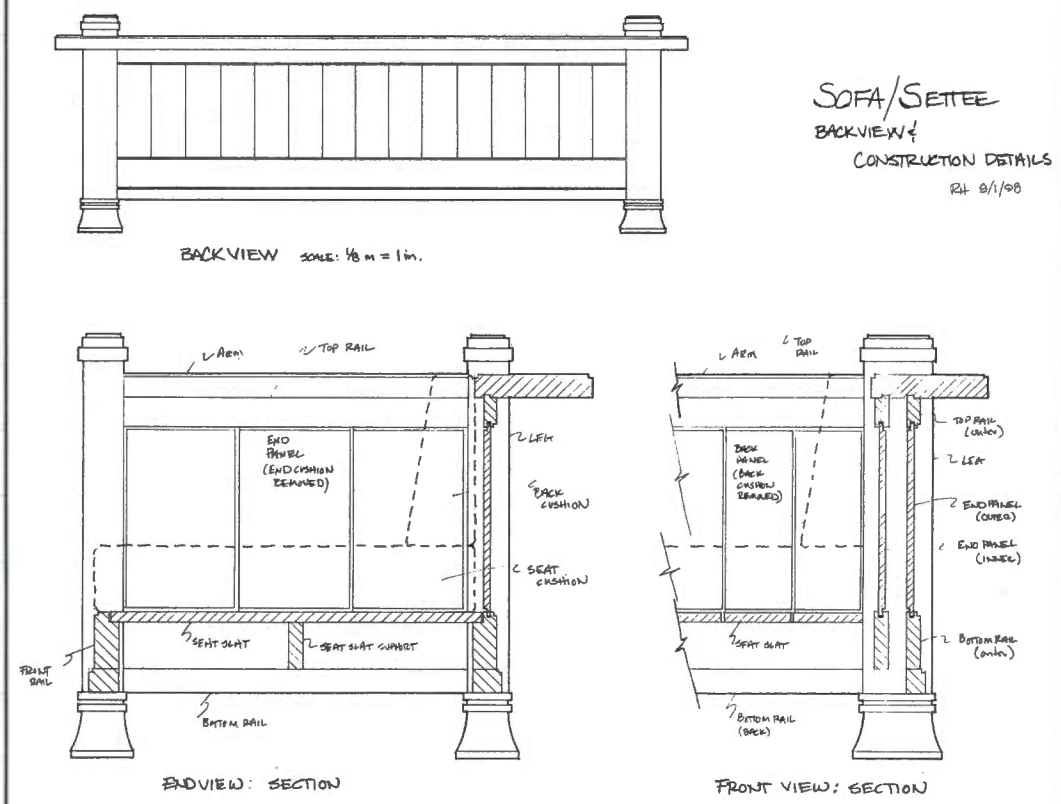


Details of the leg construction from the author's original drawing.

tions for later use. Even better are sketches. There's no surer way of truly understanding a design element than drawing it yourself.

Borrowing in Practice

To start putting flesh on the bare bones of the settee, I asked my friends about the kinds of furniture they liked. The simplicity of American Arts & Crafts furniture appealed to them, and they produced photos of several Arts & Crafts-style settees they had considered. (Including the one shown at right, which they had tried out and found comfortable, and from which I took the seating dimensions). They also admired Frank Lloyd Wright's work. They showed me a photo of a Wright sofa (see the Bexley Heath couch on page 53) with a broad, cantilevered arm wrapping around its back and ends; it was the source of the shelf-like arm they wanted.



Profile and elevation views of the settee

So, right away I had a stylistic direction and several specific examples to work from. The borrowed design process doesn't always narrow itself down so quickly. You may thumb through books, clippings and sketches for hours before you find a place to start. Or you may find yourself coming to the project with a detail or specific example already in mind, one you've been itching to work with if only the right project turned up.

My first sketches took a predictable course — I tried to graft a wide arm/shelf to an Arts & Crafts-style settee, with its simple, unadorned slatted frame ends and back. Two problems arose. The 8"-wide arm I had decided was necessary to support the books, plates and drinks, was out of proportion with the 3"-square legs supporting it. The legs, in turn, seemed too spindly when viewed from the front of the 7'-long settee; any thicker, however, and they would be too hefty when viewed from the narrower ends. Second, the Arts & Crafts style seemed somehow wrong. It appeared too simple or spare to succeed as the centerpiece of a large room. And it seemed inappropriate for the cherry that my friends had set their hearts on. The simple lines and narrow slats of dark-stained oak appear just right in Arts & Crafts examples, but it seemed a shame not to provide some broad surfaces to display the color and pattern of cherry.

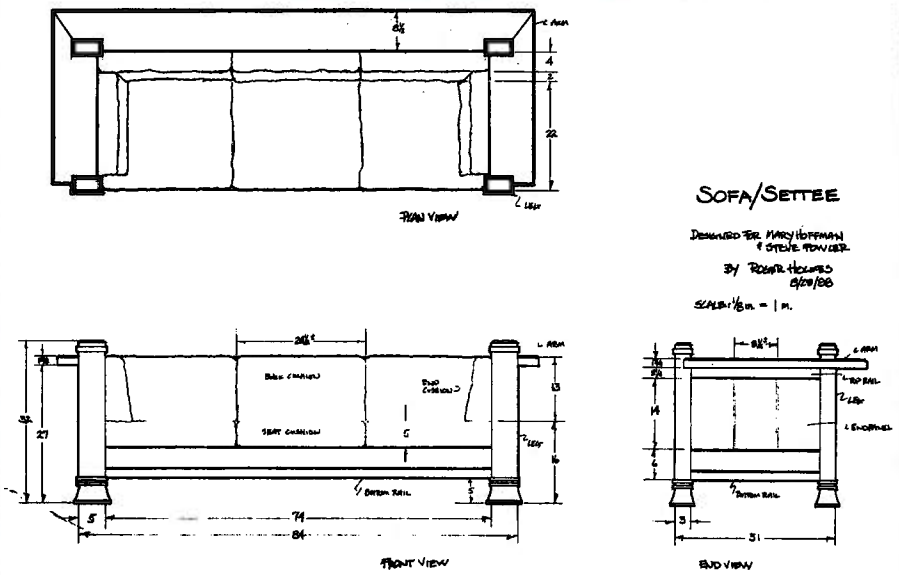
Since my friends liked Frank Lloyd Wright, I decided to look in his direction for a solution to these problems. The furniture Wright designed around the turn of the century shares some of the simple, direct character of Arts & Crafts pieces but is generally more refined and has a more commanding presence. The cantilevered sofa had presence, certainly, but the piece reminded me a bit too much of an aircraft carrier — I wanted something a little less strident. Paging through a book of Wright's work, I came upon the photo shown on the previous page, of a dining room designed in 1908. Bingo. The detail of the table leg and top struck me as just what I needed for the leg and arm of the settee. The leg is rectangular in section. Its wider face would be nicely proportioned with the length of the settee when viewed from the front, while its narrower face would be equally well proportioned with the narrower end of the settee. Like Wright's tabletop, a thick arm would be nicely proportioned to the substantial leg, and its width wouldn't overpower the leg. I also liked the way Wright extended the leg and notched the top into it, but figured that for the settee, raising the leg just a few inches above the arm would be more attractive — and less of an obstacle.

Wright's table details solved my problem very directly — I hardly altered them in the final settee version. Borrowed design isn't always so literal; sometimes what you borrow is the "feel" of a piece, rather than any specific detail. This is what happened when I turned to the rest of the settee's structure. When I sketched the legs and arms in place on the elevations, I knew I needed to complement their "presence", and I wanted to show off the cherry. I decided that solid panels in the end and back frames would do both. But rather than use wide, fielded panels, I chose narrow, upright panels, V-grooved on their edges, which have something of the same "feel" as the vertical slats in an Arts & Crafts piece.

Doting on Details

Determining the major elements is a big part of designing a piece, but attending to the smaller details is just as important to the success of a design; sometimes more so. Like Wright, I added rectilinear moulding details on the legs and a small rabbet around the

My friends liked these comfortable Arts & Crafts couches made by the Michaels Co. of Sacramento, Calif., that were designed by Michael Vermillion



Plan, elevation and profile drawings of the settee

edge of the arm. I echoed this rabbet on the top and bottom rails of the end and back frames. These mouldings and rabbets, along with the series of slightly offset planes formed by the faces of the legs, rails and panels reinforce the solidity of the piece by giving it depth. And the play of light and shadow on their surfaces adds interest. The importance of small details was brought home to me when I added the gentle flare to the bottom of the legs. I started with straight legs, but they were somehow awkward, appearing to rise through the floor. A closer inspection of the Wright photo indicated a slight flare at the bottom of the legs, so I tried the same and liked the result. The flare creates a small plinth for each leg, settling them comfortably on top of the floor. (Plinths are a staple of borrowed design, dating from classical architecture, where they were employed to join buildings gracefully to their sites.) Small as they are, the flare's curves somehow relieve the monotony of the otherwise strictly rectilinear forms of the piece — at least it seems that way to me. It is often difficult to put your finger on the effect of this or that detail. Sometimes the best (and most honest) explanation is just that it "looks right."

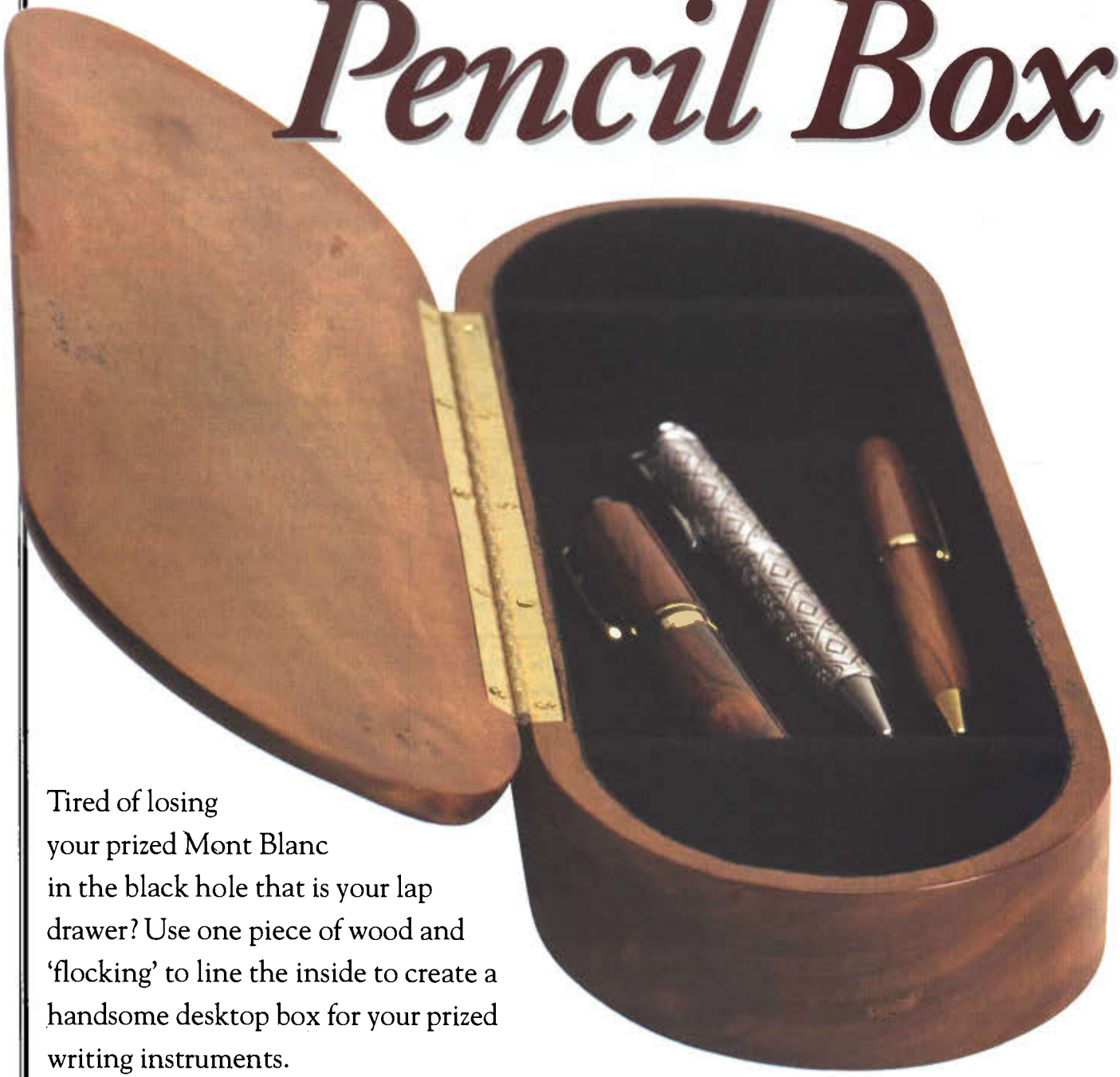
Of course, practical matters of strength and methods of construction require attention throughout the design process. A poorly engineered or poorly functioning piece is an unsuccessful design no matter how handsome it might be. And unnecessarily complicated joinery or assembly can sap the fun (and profit) out of the work altogether. Woodworkers who take pleasure in joinery usually have no difficulty remembering to consider construction details as they design. Joinery is frequently a decorative element itself, but through dovetails or keyed tenons should fit with the overall design, not just demonstrate your skill with a backsaw. Decorative joinery — most often through tenons — is frequently employed on Arts & Crafts pieces, but it didn't seem appropriate for this settee.

Joinery and strength, however, were never far from my mind as the design developed. The settee's front and back bottom rails are the most important structural element; they must be strong enough to support the weight of three hefty sitters over a span of almost 7'. The Arts & Crafts settee my friends liked included a short leg in the center of these rails for support. This didn't suit the look of my settee, so I had to beef up the width and thickness of the rails to provide the same strength. In addition, I joined the rails to the legs with a long, wide tenon to counter the end-to-end racking forces that would work, in particular, on the front rail.

As the design progresses, I move back and forth between sketches on ruled graph paper and scale drawings made at a drafting table. Precisely drawn elevations or details, often at half or full size are invaluable for working out exactly what something will look like and how best to construct it. (Beginners in particular shouldn't hesitate to draw all the joinery in a piece — this can save headache and heartbreak at the workbench later.) Isometric or perspective drawings take time to make, but are helpful for imagining the piece in three dimensions. But drawings, no matter how accurate or detailed, have their limits and sometimes a mock-up is the only way to resolve a design or part of a design. Small-scale mock-ups allow you to see three-dimensional relationships that even the best perspective drawing can only approximate. Full-scale mock-ups are useful in determining proportions, exploring the subtleties of a moulding detail, or figuring out a knotty construction problem.

Design, like any other skill, is acquired by practice. If you've shied away from designing your own pieces, I hope the "method" I've outlined here will get you started. There's a lot of satisfaction to be had in designing something yourself — even if you've done it with parts supplied by others. **PW**

Pencil Box



Tired of losing your prized Mont Blanc in the black hole that is your lap drawer? Use one piece of wood and 'flocking' to line the inside to create a handsome desktop box for your prized writing instruments.

by Jim Stuard

I am a certifiable pen collecting nut. When I was younger, my mom worked in a doctor's office and would get pens from all the salesmen that came to her office. I never quite got over getting those cheesy pens that looked like hipbones and surgical replacement parts. Now, my tastes run toward the more classic writing instruments. This box is a great way to store my prized pens and mechanical pencils.

The box starts out as one slab of canary wood. This wood is highly figured, and you have to choose your stock carefully to avoid making a box that will blow apart on you. A piece roughly $1\frac{5}{8}$" x $3\frac{1}{2}$" x $13\frac{1}{4}$" will yield a lid and box.

Begin by band sawing the lid from the slab. The lid might warp when you cut it as tension is released in the wood, so leave a little extra thickness for restraightening. Plane the larger part of the slab to $1\frac{1}{8}$" thick. Affix the full-size pattern at right to the wood. This is the best time to mortise the piano hinge. Fold the hinge back on itself and place it, centered, on the back edge of the box. Draw an outline of the hinge and rout a mortise that is a little less than half the thickness of the hinge when closed. Place the lid on the box and transfer the ends of the mortise to the lid. Repeat

the mortising process. Cut out the ellipses on the ends of the box and sand smooth. Mount the lid to the box. Turn the box over and cut the ellipses on the lid. Sand flush with the box and remove the lid.

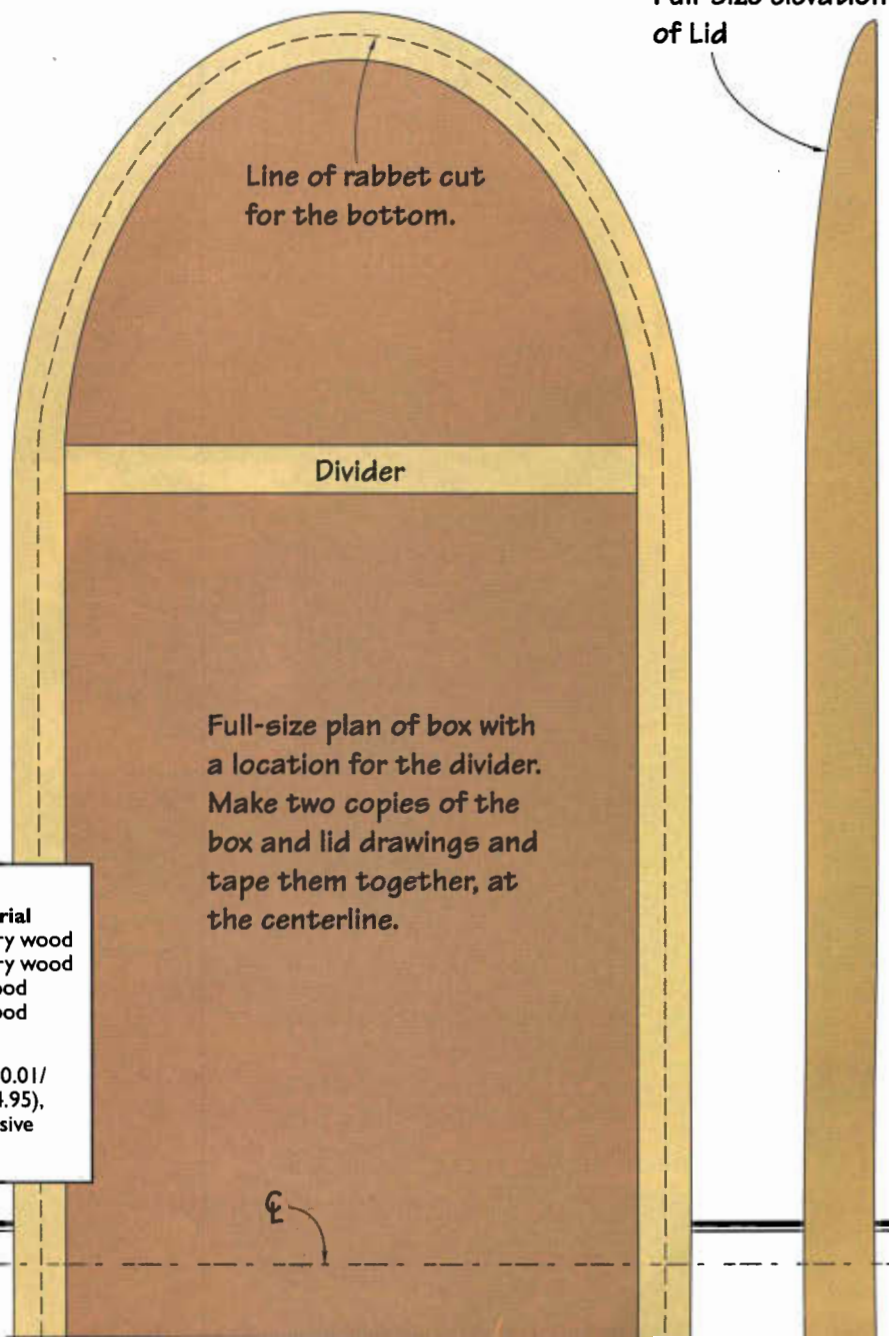
Drill holes on what will be the inside of the box. Cut out the inside using a scroll saw. Sand the inside of the box using a spindle sander. At this point, rout a 1/8" x 1/8" rabbet in the bottom edge of the box. It helps to do this on a router table.

Rip a piece of Baltic birch for the bottom that is the correct width for the rabbet but is a little long. Place it over the box's rabbet and draw the outline of the ellipse. Band saw out the bottom and fit it into the rabbet. Glue the bottom in place with wood glue. Use masking tape to hold it until dry. Fit two 1/4"-thick dividers in place in the box. Use the lines left from the glued-down pattern as a guide. Glue them in place.

Begin shaping the lid by cutting the profile on the top as shown in the diagram. Use a plane and sandpaper to shape the right profile. It's arbitrary as to when you're finished with the profile. Just make sure that the transition from the front angle to the end ellipses is smooth. As a finishing touch, use a rotary tool to grind a small notch in the underside of the lid front for a finger pull. After finish sanding, spray three coats of laquer on all surfaces. It's important to seal the inside of the box. This will give the flocking adhesive a smooth surface to stick to.

Follow the instructions on the flocking kit and line the inside of the box. Try a sample piece before tackling the box. Make sure to put masking tape on the top edge of the box so you will have a sharp transition from liner to wood.

After drying overnight, assemble the lid and box. When it's all said and done, it may take you longer to find your good pens in that lap drawer than it took to make this box. **PW**



PENCIL BOX

No.	Item	Dimensions T W L	Material
1	Lid	3/8" x 3 1/2" x 13"	Canary wood
1	Box	1 1/8" x 3 1/2" x 13"	Canary wood
1	Bottom	1/4" x 3 1/4" x 12 3/4"	Plywood
1	Dividers	1/4" x 7/8" x 3"	Plywood

Supplies: Lee Valley 800-871-8158

Hinge (#00D50.09/$3.70). #0 Screws(#91Z00.01/ $2.40 box of 100). Flocking gun (98k10.02/$4.95), black flocking (#98K08.33/$6.95), black adhesive (#98K06.53/$6.95). Shipping not included.

tall clock

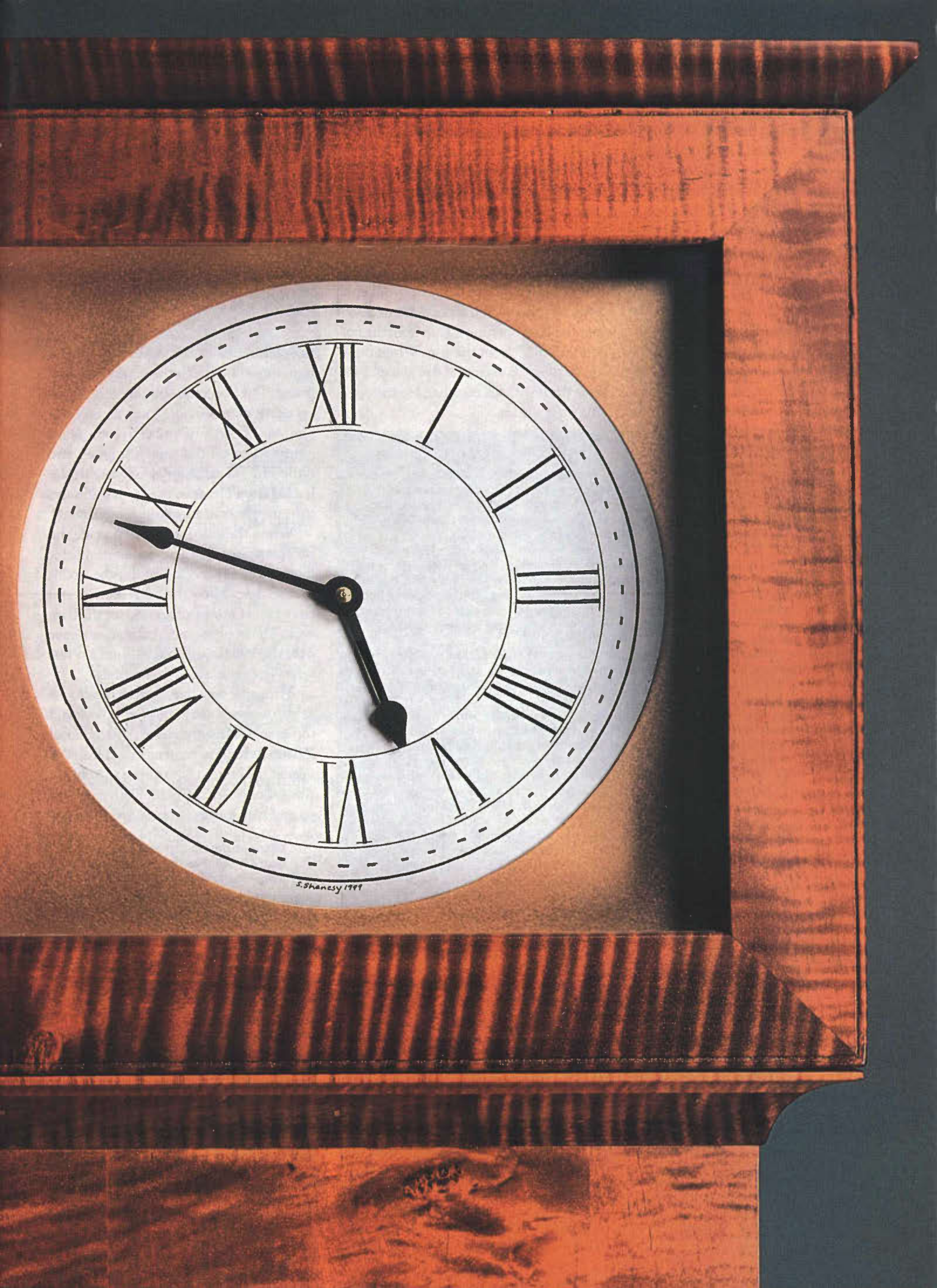
Brother Benjamin Youngs' clock is an exquisite example of how a simple Shaker design can carry across the ages, and still have a foot firmly planted in two centuries.

My great-grandfather's drawing tools

You'd never guess what the most inspiring aspect of building this clock was. Not the awesome curly maple or rich-looking finish, but something altogether plain—the clock's paper face.

Nice, but what's so special about it, you ask? It was hand-drawn and lettered using 100-year old drawing instruments passed down from my great-grandfather, a draftsman, who laid out track beds for the railroads. The set, lovingly stored in a velvet- and satin-lined walnut box, contains calipers, two delicately turned ivory handled inkers and finely tooled and incredibly machined compasses, and was made in Manchester, England, by A. G. Thornton & Co.

by Steve Shanesy


S. Shanesy 1999

After experimenting with these special tools I was ready to put pen to parchment. As I did so I was amazed with the tool's ability to guide the drawing tip, rendering the precise lines. In making my clock face I imagined for a brief moment looking over my great-grandfather's shoulder as he sat at his drawing board.

Using this old way of drawing was infinitely more simple to figure out than assembling the various parts that made up the clock's works. Most parts were obvious as to their function: the works, pendulum, weights, chain, etc. But how they mounted, attached or were oriented to each other was a complete mystery. They arrived in a kit without the first hint of instruction, and left me scratching my head. Thank goodness building the clock's case was easier than figuring out the works.

Easier, because I had the help of three books referencing this famous clock made by Brother Benjamin, so determining overall dimensions was relatively easy, save for the fact none of them agreed exactly.

The original Shaker clock was built from poplar, but I had just enough curly maple to do the job. One board was even wide enough to make the 12"-wide front, which is where I began construction. To keep the look of a single-board front, cut the board to length then rip from each edge the "stiles" at the door opening. Cut out the door opening 30" up from the bottom, then 9" from the top. When done, mark the orientation of the pieces. Now glue the front back together, less the opening for the door.

The bonnet, glazing compound, face, copper surround and cleats for attachment.

Next, cut a ½" x ¾" rabbet along the inside back edge and top edge of the two side pieces. Mill the same rabbet on the top of the front piece, and on the back edge of the top as well. While working on the top, also make the cutout to accommodate the swinging pendulum and the hanging chains from the works (see diagram). The front and sides are then glued up using a simple butt joint to take advantage of the long-grain to long-grain connection, while the top is glued and nailed in place. Before screwing in the back, fasten cleats to the front and sides to be used later to attach the bottom panel.

When the case is complete, make the two-part base using a ½"-radius profile bit for the wider piece and ¼" for the smaller base shoe. Miter the front corners and cut a rabbet on the other end for the base back. The front and sides of the base sleeve over the lower case about 1" and are fastened from the inside of the case.

The upper case that shrouds the clock's works uses the same joints for the back and top as in the lower case. A ⅜"-thick rail is haunch tenoned and mortised into the sides at the bottom of the front to hold the sides square and in place. When glued up and still in the clamps, pin the tenons

Gluing up the top case was made a lot easier by these 90-degree clamps. Getting things square was a real snap.

HOROLOGY 101

I didn't know what "horology" meant when I received the big box full of clock parts for this project. Fortunately, I had a dictionary, so I quickly learned it means "the art of making time pieces." Too bad there wasn't a reference for identifying and assembling the clock parts. I'm still a long way from being an expert, but for this project at least, I think I can talk you through.

The "works" are the gears and movements that are sandwiched between a front and back plate. The works for this project are made by Hermle, are weight-driven, require resetting the chains every eight days, strike a bell once on the half hour and ring the hour with the number of rings for the hour struck.

The works have the stem for the hands facing front, of course, and the pendulum faces rear. The pendulum attaches to the works with a narrow, metal part called a leader.

The works require two weights suspended on two chains. One weight drives the time-keeping job of the works, the other provides the energy to make the chimes work. The weights use equal lengths of chain and so are reset at the same time.

When facing the works, the chains go over the sprockets with the weights on the outside of each sprocket. (When you set the chains on the sprockets make sure they are not twisted and are seated properly.) The weights are attached to the chains with an "S" hook.

Each lead weight goes inside a brass tube called a shell. Each tube has two end caps with holes where a rod with threaded ends go through which keeps the whole thing together, with a nut on the bottom and hook on the top.

The hands of the clock fit on the stem, which consists of two parts, one inside the other. The hour hand goes on first and sleeves over the outside part of the stem. It is a tight press fit slipped on in the appropriate direction of the given hour.

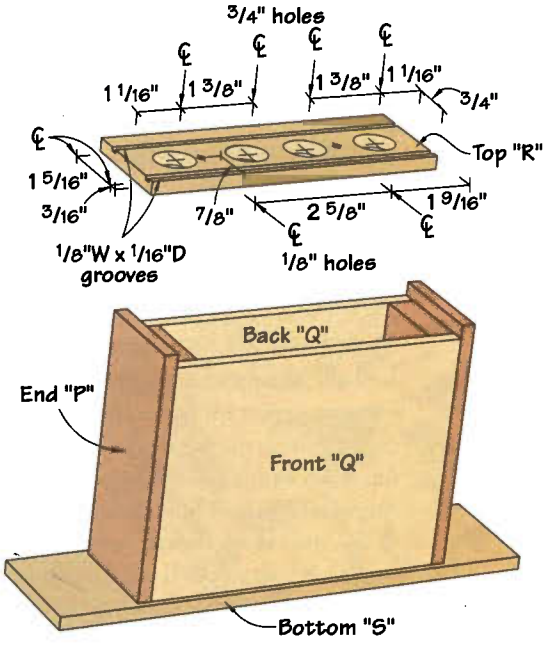
The minute hand, on the other hand (sorry!), has a square bushing and sleeves onto the inner part of the stem. It must be adjusted by turning the bushing that's pressed into the hand. A decorative brass nut holds the minute hand in place.

The pendulum helps regulate the speed of the clock. If it's running fast, you adjust the brass-colored circle down making the travel of the swing longer. Moving it up shortens the travel, making the clock faster if it's running slow.

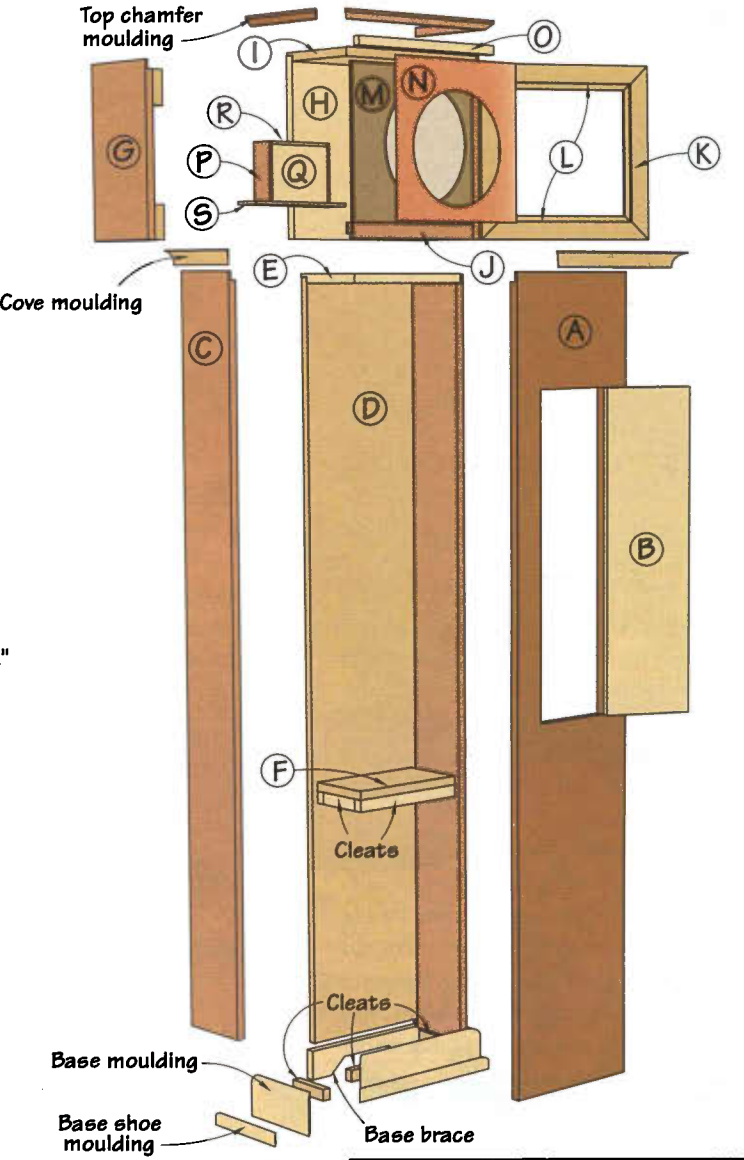
The beat of the clock—that's the rhythm of the tick/tock sound, is also important. Like your heart, it wants to be regular. Tap your finger to each tick/tock sound. The time between taps should be equal. Adjust the beat by moving the escapement ever so slightly. The escapement is the "C" shaped metal part in the center upper back of the works. It regulates the gear that's connected by a rod to the top of the leader from which the pendulum hangs.

The works are attached to the top of the box on which it mounts using two long, thin machine screws. They thread into tapped holes in the lower bars, which hold the front and back metal plates of the works together.

The works are mounted to a plywood box that rests on the lower case.



Detail of hole locations in riser box



using 3/16" dowel stock. After the upper case is assembled, add a filler strip to the front upper edge that's as long as the front is wide and 3/4" square. This build-up accommodates the thickness of the door so that the top chamfered moulding is correctly positioned.

The upper door has a cockbead detail on its outside edge. To create the detail, take 10 minutes to make a simple scratch stock using a flat-head screw. Simply insert the screw in the end of a block that fits comfortably in your hand. Let the head project out about 1/4". With a hacksaw, cut the projecting screw head in half from top to bottom. Dress the cutting edge (the face) with a file, and use a small triangular file to relieve the back.

Cut the cockbead on the milled stock for the door frame, then cut a 1/2"-square rabbet on the back inside edge of the stock to let in the glass. Now cut the parts to length and glue up.

The homemade 10-minute cockbeading tool in use.

Now, make the last mouldings you'll need. The chamfer at the top is easy. Run it, miter the corners and judiciously nail it in place. I only used a dab of polyurethane glue at the center of the moulding because

TALL CLOCK

No.	Let.	Item	Dimensions T W L	
Lower Case				
1	A	Front	3/4" x 12" x 65"	P
1	B	Door	3/4" x 6 7/8" x 25 7/8"	P
2	C	Sides	3/4" x 6 1/4" x 65"	P
1	D	Back	3/4" x 11 1/2" x 64 3/4"	PL
1	E	Top	3/4" x 6 3/4" x 11 1/2"	PL
1	F	Bottom	3/4" x 5 1/2" x 11 1/2"	PL
Upper Case				
2	G	Sides	3/4" x 7 1/2" x 15"	P
1	H	Back	3/4" x 14" x 14 3/4"	P
1	I	Top	3/4" x 7 1/2" x 14"	PL
1	J	Frt rail	3/8" x 1 1/4" x 13 3/4"	P
2	K	Dr stiles	3/4" x 2" x 14 3/16"	P
2	L	Dr rails	3/4" x 2" x 14 9/16"	P
1	M	Face pnl	1/4" x 13" x 12 13/16"	H
1	N	Face cvr	13" x 12 13/16"	C
1	O	Buildup	3/4" x 3/4" x 14 1/2"	P
Clock Works Stand				
2	P	Sides	3/4" x 2" x 4 3/16"	S
2	Q	Frnt/bk	1/4" x 4 7/16" x 5 1/2"	PL
1	R	Top	1/4" x 2" x 5 1/2"	PL
1	S	Bottom	1/4" x 2 3/8" x 9"	PL

Mouldings
Top chamfer 36" of 3/4" sq. • Cove 36" of 2 1/8" sq. • Base 36" of 3/4" x 3 1/2". • Base shoe 1/2" x 1".
P=primary wood, maple • PL= plywood • S=secondary wood, poplar • H=hardboard • C=copper

its grain runs contrary to that of the sides.

The cove moulding is more difficult to produce and is made from a triangular-shaped length of wood using the table saw. By clamping an auxiliary fence at a severe, oblique angle to the blade, the part is then run with the blade just above the table, raising it slightly after each pass. Thank goodness only about three lineal feet are required because this method requires a lot of sanding to remove the mill marks from the blade. When finished sanding, cut the miters and attach it just like the chamfer moulding.

You may be wondering how the top case attaches to the lower. It doesn't. It simply rests on top and lifts off to access the works (after removing the hands).

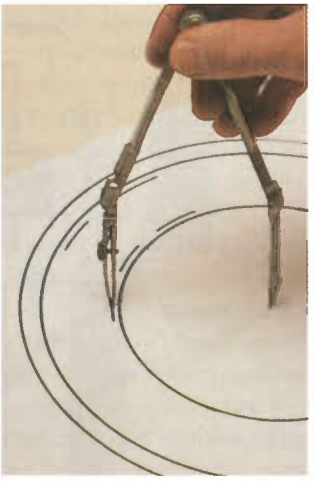
I used the clock face supplied in the clock works package as a guide to lay out my paper face. Construction need not change if you use the painted aluminum face in the kit. In either case, fix the clock face to 1/4" tempered hardboard using spray adhesive. Then drill a 5/16" hole in the center of the face.

I'm sure Brother Youngs didn't use copper sheetmetal to surround the face outside the clock face proper, but I did. I made the round cutout using a router mounted on a circle cutting jig. It's a very simple process. When done, I used a random orbit sander and 220 grit paper to put a satin-

Here you can see the cutouts to accommodate the swinging pendulum and the hanging chains from the works.

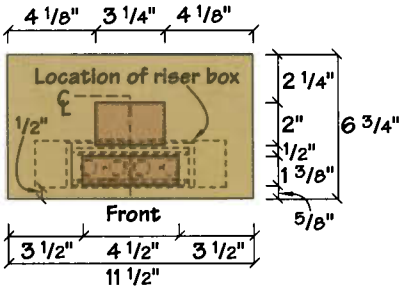
like sheen on the copper, followed by a coat of shellac to retard tarnishing. The hardboard and copper are mounted inside the upper case on cleats positioned to coincide with the mounting location of the works (see diagram).

The last bit of building is the small box on which the works sit. Its height is especially critical because that determines



It's simple work to ink the lines for the paper face. After you make the three circles, use a compass to ink the top and bottom of the roman numerals ***(far left).*** *Then ink the straight lines to fill in the numerals. It's not calligraphy, so you don't have to worry about curving lines* ***(left).***

the height at which the stem protrudes through the hole in the face. Make the box using 3/4" solid poplar sides and 1/4" Baltic birch top and bottom. Note that the bottom is wider and longer. Use the extra length to screw it down. Follow the dia-



Detail of case top cutouts

gram to position the holes in the top of the box where the chains run through.

Before the upper door can be hung, install the glass. I used glass from stock I salvage from old houses. This old material has imperfections in the thickness which cause ever-so-slight distortions and adds to the authentic look of the piece. Regardless of the glass you use, install it using glazing points and glazing compound.

Now the upper door is ready to hang. The hinges in the clock kit don't require mortising so attach them directly. The lower door is the same. However, before hanging the door, run a 1/4"-radius profile on the outside edges. Then attach the hinges to allow it to set 1/4" proud of the case.

It goes without saying that I was just itching to set up the works and check everything out. It's a good idea to do this before sanding and finishing anyway. Set it up and let it run overnight.

Thoroughly sand all the surfaces starting with 100 grit and progress up to 180 using a random orbit sander. Break all the edges by hand with 120 grit. After removing the dust, color the wood using water-based aniline dye called Golden Amber made by J.E. Moser (available through Woodworker's Supply). Because the water raises the grain, very carefully and lightly hand sand the flat surfaces with 360-grit paper. Be extremely cautious near edges. Don't sand through the color. Dust again, then apply a light coat of boiled linseed oil. As a penetrating finish, this step plays an important factor in making the curly figure on the wood pop. When done, rub down with a clean rag to remove any excess oil. Wait 24 hours to allow the oil to dry, then brush on four coats of amber shellac in a two-pound cut. Lightly sand between coats to produce a smooth finish.

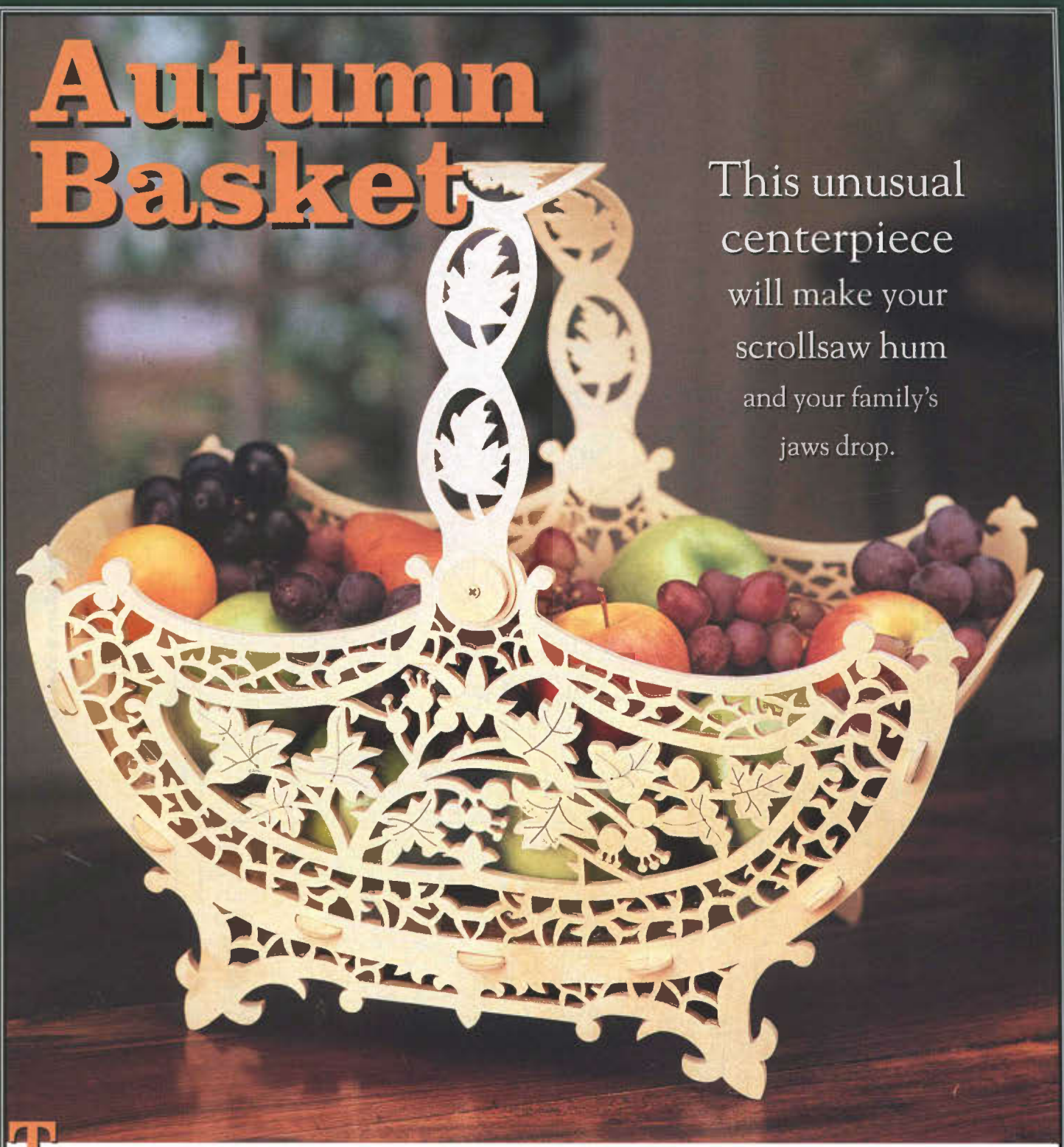
The unusual experiences of learning how to set up a mechanical-works clock and creating the clock face from my heirloom drawing set added a new dimension to the satisfaction I always find at the conclusion of a project. I felt in touch with a distant branch of my family tree, rather than merely reproducing an artifact from the past. Some day, should my tall clock find its way into one of my children's homes, I hope my name, scrawled on the clock face, will imbue a similar sentiment. **PW**

SUPPLIES

S. LaRose Inc.
336-621-1936

- **Hermle movement #084124, $89**
- **Roman numeral dial #087172, $4.25**
- **Upper door hinges (2) #085263, $1.25 a pair**
- **Lower door hinges (2) #085264, 75 cents each**
- **Hands #083666, free with purchase of movement**

Autumn Basket



This unusual centerpiece will make your scrollsaw hum and your family's jaws drop.

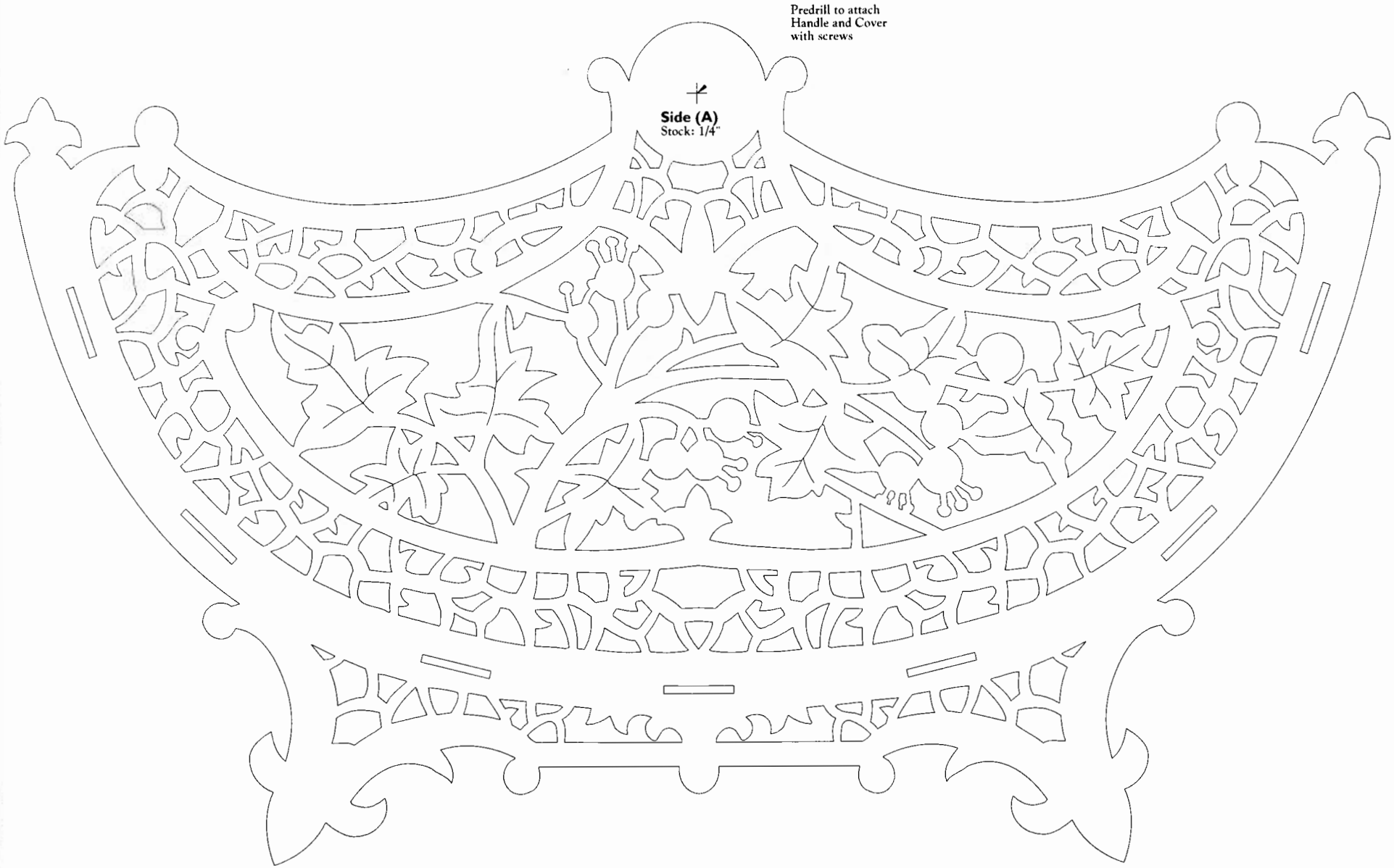
This stunning centerpiece holds fruit, flowers and the attention of every visitor to your home. Construction is simple if you follow the plans provided on the next two pages.

First take the diagrams to your local photocopy store and enlarge them to full size. Then select your materials from either hardwoods or plywood. I used 1/4" Baltic birch for the sides and 1/16" solid-core ply for the bottom and handle. Measure each pattern and cut out the stock you need. Now sand it up to 220 grit. Attach the patterns to the wood with a repositionable spray adhesive (you can stack-cut the two sides to save time). Drill holes for the inside cuts.

Now cut the outer shape and the interior designs on your scrollsaw. Sand as needed. Assemble the basket by first attaching the bottom to one side. Secure it with glue. Then glue the other side to the bottom. Finally, attach the handle and handle covers and finish as desired. **PW**

by Rick Longabaugh

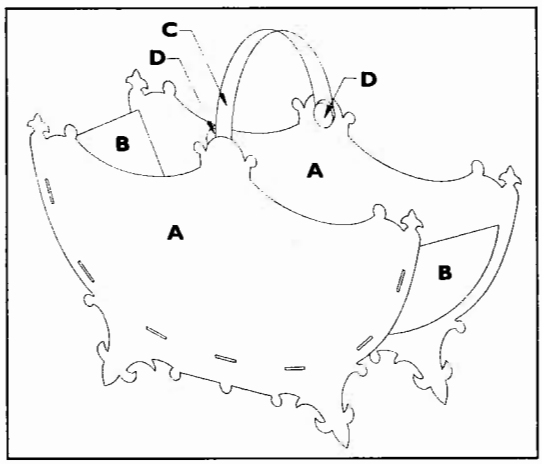
If you like this plan, you can find many others like it by contacting Rick Longabaugh's company, the Berry Basket, at 800-206-9009 or at www.berrybasket.com.



Set your photocopier to 155 percent to enlarge to full size

You can purchase 1/16" plywood from Lee Valley (800-871-8158) A 25" x 25" sheet is $12.50 (item #03A10.04)

Bottom (B)
Stock: 1/16"



Pattern overlap line

Handle (C)
Stock: 1/16"

Predrill to attach Handle and Cover with screws

Pattern overlap line

Predrill to attach Handle and Cover with screws

Handle (C)
Stock: 1/16"

Pattern overlap line

AUTUMN BASKET

Description	item	Qty
Side	A	2
Bottom	B	1
Handle	C	1
Cover	D	2

Cover (D)
Stock: 1/4"

Predrill for a #4 x 1/2" flathead wood screw to attach to inside of handle.

Clamp Rack

Stop making a mangled mess of clamps in the corner of your shop. Scrap plywood and a lazy day in the shop is all you need.

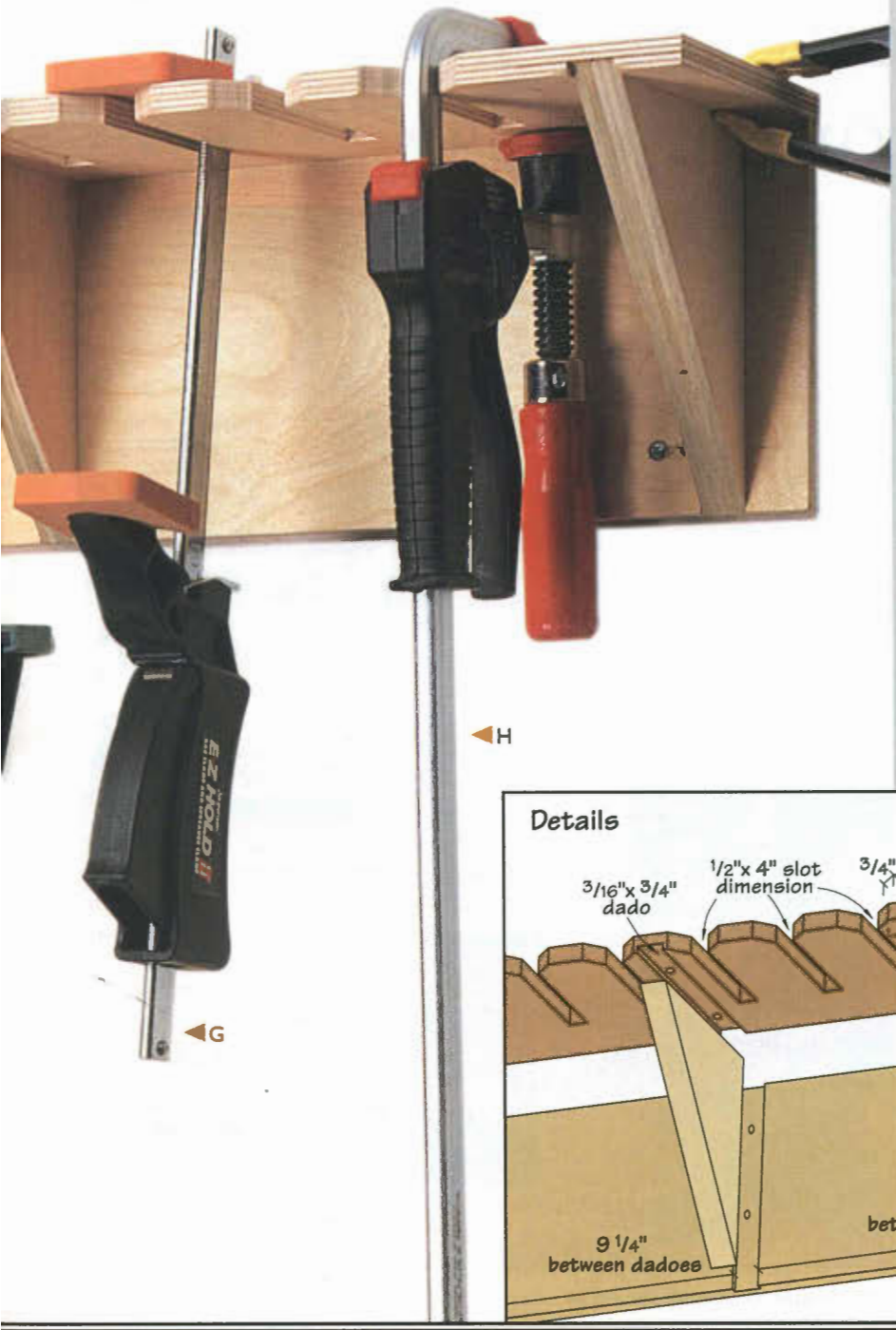
by David Thiel

You may never have enough clamps, but those you have are always in need of a handy place to call home. This can be as simple as a 2x4 nailed to your wall, or as complicated as a rolling clamp rack as offered in September 1998 (#104). We found ourselves looking for a happy medium that would be versatile enough to handle a number of clamp designs, and we came up with this simple six-piece wall-hung clamp rack.

Construction is simple. We chose ½" birch plywood for the top and back because it offers enough support and strength without looking clunky. The triangular braces are made from ¾" plywood rather than ½"—primarily to make it easier to get screws into the brace.

Start by cutting a piece of ½" plywood to 12⅛" x 36", then cut the four dadoes as shown in the diagram. If you change the length of the clamp rack, make sure there are no more than four clamp slots between braces to ensure adequate support. I used a stack dado in my table saw to make the dadoes. When complete, remove the dado stack, reset the saw's rip fence for 6" and rip the piece in half, forming the top and back pieces.

Next, mark the top piece for the slots,



KNOW YOUR CLAMPS*

PARALLEL CLAMPS

Parallel clamps are designed to maintain the same spacing between the jaws along the entire depth of the jaw. Beneficial for panel and box work, as well as general use, these clamps are heavy duty—and so are the prices.

A - Gross Stabil Parallel - $32.99
B - Bessey K-Body - $34.95

F-STYLE BAR CLAMPS

These steel bar clamps have been the industry standard for years in a number of different duty ratings. With the introduction of parallel clamps, bar clamps have become more popular as a light- or medium-weight clamp.

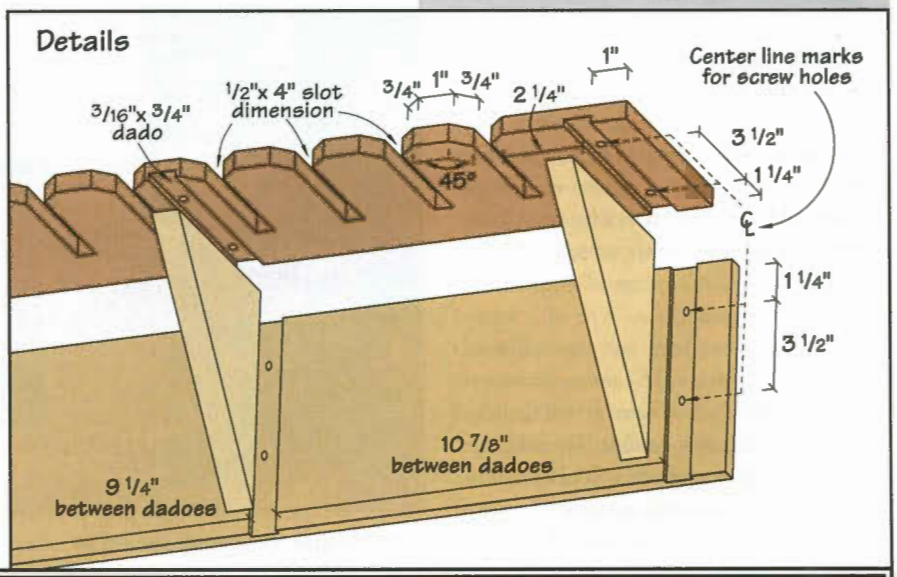
C - Jorgensen Light Duty - $9.95
D - Bessey Tradesman - $12.95

ONE-HANDED CLAMPS

Fast-adjust, or one-handed clamps are relatively new in the market, but have gained a strong following. Rated from light-duty to heavy-duty, they offer rapid one-handed tightening and release for complicated glue-ups or for quick clamping during assembly. Some also convert to spreader clamps.

E - Quick Grip - $21.95
F - Wolfcraft - $15
G - Jorgensen E-Z Hold II - $14.99
H - Bessey Power Grip - $22.95

***All prices are average retail for a 24" clamp.**



again as shown on the diagram. The ½" x 4" slot holds the majority of clamps on the market today. Your clamp rack might perform better with a different size slot, so check your clamps and adjust the dimensions if necessary.

The clipped corners at the entrance to the slots guide the clamp bar into the slot without banging up the slot. Unless you have a band saw with a very deep throat you will not be able to cut all the slots on your band saw. You may choose to use a jigsaw on all the slots, or use your band saw on some and finish the rest with a jigsaw.

With the slots cut, move on to the braces. The finished brace is a triangle measuring $5^{11}/_{16}$" x $6^{3}/_{16}$" on the two legs. You can save material by interlocking the brackets. Cut the four braces and sand the leading edge to avoid sharp edges.

Mark the top and back pieces for clearance holes used to screw the braces in place. Then drill the 3/16" clearance holes and countersink for a flat-head screw. I nailed the top onto the back to hold the rack's "corner" flush while pilot drilling into the braces. Now glue and screw the entire rack together.

Sand all the sharp edges, then go find some studs to hang your rack. **PW**

Oil Finishes: Their History and Use

Here's how to cut through all the confusion about oil, tung oil and wiping varnish.

By Bob Flexner

Finishing is a mystery to most woodworkers, but it's not because finishes are difficult to apply. All that's involved in applying a finish is transferring a liquid to wood using one of three really easy-to-use tools: a rag, a brush or a spray gun.

Finishing is a mystery largely because of the confusion created by manufacturers in their labeling, and there's no better example of this than the mislabeling of various "oil" finishes.

The Background

Before the growth of the consumer market in the 1960s and 1970s there was little confusion about finishes. There were fewer products available and most were bought and used by professionals who were fairly knowledgeable about them. Manufacturers helped by listing ingredients, something few do today.

Boiled linseed oil was available, of course, and was used by many amateurs who sometimes added varnish to it to make the oil a little more durable. To make the mixture easier to apply, they thinned it with turpentine or mineral spirits so the proportions were about one-third linseed oil, one-third varnish and one-third thinner.

Linseed oil (which is from the seeds of flax plants) and blends of linseed oil and varnish are both easy to apply. Wipe, brush or spray the finish onto the wood; keep the wood wet with the finish for 5 to 10 minutes, or until it stops soaking in; then wipe off the excess and allow the finish to cure overnight at room temperature.

Next day, sand lightly to smooth the raised grain. Then apply one or two more coats, allowing overnight for each coat to cure. Be sure to wipe off the excess after each coat, and leave your rags spread out to dry so they don't heat up and spontaneously combust.

This top group of finishing products are oil and varnish blends. They are easy to apply, but they cure soft. As a result, the necessarily thin coats don't provide much protection.

This bottom group of finishing products are actually wiping varnishes. They are thinned down varnishes, and are as easy to apply as the above oil and varnish blends. However, they offer more protection and can be built up thicker.

Although boiled linseed oil and oil/varnish blends are easy to apply, they cure soft, so they have to be left too thin on the wood to be protective or durable. The growing consumer market created a need for something better. Shellac, varnish and lacquer were, of course, available at every paint store, but these finishes don't have the mystique of oil, and they require brushing or spraying, which makes them more difficult to apply than oil.

Oil/Varnish Blend

One replacement was prepackaged oil/varnish blend. This didn't add anything to what was already being used, but manufacturers made consumers think it did by labeling their products with enigmatic names like Danish oil (made by squeezing Danes?), antique oil (just for antiques?), Velvit oil and Salad Bowl Finish.

Then they attached misleading mar-

keting phrases to the product such as "contains resin," "protects the wood from the inside" or "makes the wood 25 percent harder" to make consumers think they were buying something more than simply a repackaged oil/varnish blend.

Tung Oil

A second replacement was a product labeled "tung oil." This oil, which is pressed from the nuts of a tung tree, was introduced to the West from China about 1900. It was useful for making superior, water-resistant varnishes, especially for outdoor use.

But tung oil is too difficult for most people to use by itself as a finish. You apply tung oil just like linseed oil or oil/varnish blend, but you have to sand tung oil after every coat, not just after the first, and it takes five to seven coats, allowing two to three days drying time between each, to achieve a smooth, attractive sheen.

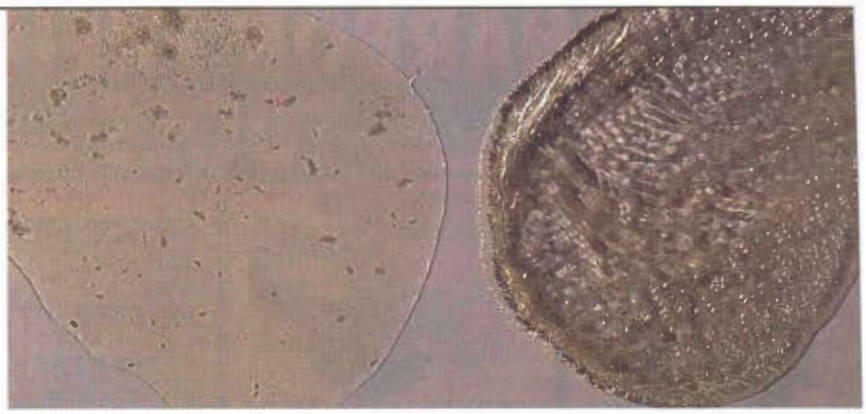
Tung oil comes from China, however, so it has a certain mystique. Because few people really knew what tung oil was anyway, many manufacturers began packaging varnish thinned about half with paint thinner and labeling it "tung oil," "tung oil finish," or "tung oil varnish." Others further muddied the waters by calling their thinned varnish Val-Oil, Waterlox, Seal-a-Cell or ProFin.

Thinned varnish (more properly called "wiping varnish") can be applied like boiled linseed oil or oil/varnish blend, or it can be applied with a brush like regular varnish. It makes an excellent finish because it looks good after only two or three coats, cures rapidly, and can be built up to a thicker, more protective film because it cures hard.

Wiping varnish is an improvement in protection and durability over boiled linseed oil and oil/varnish blend, but the only thing new about it is the misleading name on the can. Anyone can make their own wiping varnish by thinning any oil-base varnish or polyurethane enough so it is easy to wipe on the wood.

The Difference Between Oil and Varnish

To help understand the differences in these products, you need to know the difference between oil and varnish.



When wiping varnishes dry on a non-porous substance, such as this piece of glass, they are smooth and hard.

Oil and varnish blends, on the other hand, will cure soft and wrinkly on a non-porous surface, as shown above.

WHAT THE FINISHING MANUFACTURERS DON'T TELL YOU

COMMON BRANDS OF FINISH THAT ARE WIPING VARNISH:

Formby's Tung Oil Finish
Zar Wipe-on Tung Oil
Val-Oil
Hope's Tung Oil Varnish
Gillespie Tung Oil
Waterlox
General Finishes' Sealacell
General Finishes' Arm R Seal
Daly's ProFin
Jasco Tung Oil

COMMON BRANDS OF FINISH THAT ARE OIL/VARNISH BLENDS:

Watco Danish Oil
Deft Danish Oil
Behlen Danish Oil
Maloof Finish
Behr Scandinavian Tung Oil Finish
Minwax Tung Oil Finish
Minwax Antique Oil Finish
Velvit Oil
Behlen Salad Bowl Finish
Behlen Teak Oil
Watco Teak Oil

Oil is a natural product. Some oils, such as linseed oil and tung oil, turn from a liquid to a solid when exposed to oxygen, so they make effective finishes. But these oils cure slowly to a soft, wrinkled film if applied thick, and this makes it necessary for you to remove all the excess after each coat. You can't build oil finishes to a thicker, more protective coating.

Varnish is a synthetic product made by cooking a drying oil, such as linseed oil, tung oil, or modified soybean (soya) oil, with a resin, such as polyurethane, alkyd or phenolic. Varnish cures relatively rapidly to a hard, smooth film if it is applied thick, so you can leave the excess if you want to achieve a more protective coating.

Varnish is as different from oil as bread is from yeast (an ingredient in bread). It makes no more sense to call a varnish "oil" then it would to call bread "yeast," and manufacturers do everyone a great disservice by doing so.

How to Tell Which You Have

Because you can't trust the labeling, you have to know how to determine the difference between these products yourself.

Linseed oil is always labeled linseed oil, so far as I know. There are two types: raw and boiled. Raw linseed oil takes weeks to cure. Boiled linseed oil has driers added to make it cure in about a day with the excess removed. I know of no interior use for raw linseed oil.

Real tung oil has a distinct smell that clearly separates it from wiping varnish and oil/varnish blends, both of which have a varnish-like smell. Only if you are willing to go through the extra work for the increased water resistance you get in a non-building finish should you use real tung oil.

Linseed oil and tung oil are always sold full strength, so if "petroleum distillate" or "mineral spirits" is listed as an ingredient, this is a clue that the finish is either wiping varnish or oil/varnish blend. To tell the difference between these two you'll have to pour some of the finish onto a non-porous surface, such as glass or Formica, and let the finish cure for a couple of days at room temperature. If it cures fairly hard and smooth, it is wiping varnish. If it wrinkles badly and is soft, it is a blend of oil and varnish. **PW**

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

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- 5-1/8" working distance
- 10-1/8" x 9-1/8" feed table
- 19" x 16-5/8" x 16" overall dimensions
- 10-1/8" blade size
- 2-blade cutter head
- 61 lbs. shipping weight
- Stand sold separately

~~$239.99~~ $199.99

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- Shipping weight: 20 lbs.
- 20" x 10" x 27"

ITEM 32969-3SNA $29.99

REPLACEMENT BLADE SETS (2 PC.)

STEEL	ITEM	PRICE
SPRING	32970-0SNA	$19.99
HIGH SPEED	36068-1SNA	$29.99

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- Capacities: 16" throat, 2" thickness, 7/8" stroke
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- Spring holds down work
- Uses standard scroll saw blades
- Built-in air blower keeps cutting line free of nuisance dust
- Predrilled holes for easy bench mounting

~~$129.99~~ $99.99

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- 4 lbs. tool weight

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18 VOLT CORDLESS, VSR DRILL/ DRIVER KIT WITH 3/8" KEYLESS CHUCK

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~~$72.99~~ $59.99

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~~$109.99~~ $69.99

ITEM 37412-7SNA

18 VOLT REPLACEMENT BATTERY

ITEM 37145-4SNA $37.99

HEAVY DUTY 18 VOLT CORDLESS RECIPROCATING SAW KIT (NOT SHOWN)

~~$119.99~~ $89.99

Includes quick charger, battery, 1 blade, & blow mold case. 18 Volt; 1.7 amp-hr. battery cells; 7/8" stroke; 2800 FPM

ITEM 38834-2SNA

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ITEM 38954-1SNA $39.99

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~~$299.99~~ $259.99

ITEM 00867-2SNA

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We're just glad you didn't buy him an acetylene torch

From the time my son was old enough to hold a hammer he loved to accompany me to the shop and drive nails. One upright post in the shop was soon full of nails nearly as high as he could reach. Some were bent, others were driven all the way in. I thought he needed a greater challenge.

So that Christmas we bought him his own tool box, complete with a little hammer, saw, square and level. It also had a few wrenches and a screwdriver.

That Christmas evening, I leaned back in my recliner, resting my eyes, with Jim Jr. pretending to fix everything in sight. It was then that his real talent became evident, for upon awakening from my early evening snooze and leaning forward, the recliner fell apart. Every nut in his reach had been removed.

Jim Ellis
Creswell, Oregon

Giving Until it Hurts

Hello, my name is Daniel L. Dole. A few months ago something happened that ... well let's just say that it took some time before I could laugh about it.

I am in the military, and my family and I move every three to four years. Our furniture does not always make it.

We had an old dresser that needed help, to say the least. It was about 15 years old and we had received it from some friends about five years ago. I had fixed it up and it had been braced several times, yet the Navy movers seemed to break it every time. So we called the local charity because it was good for holding clothes but my wife wanted something new.

So my wife finally allowed me to make a dresser (when you are on a tight budget purchasing quality wood is considered a luxury). So I collected all the materials I needed and began.

I am a beginner when it comes to woodworking, and usually my plans come out better then the finished product. This time was different. I was taking it slow and easy. Once it was together I must admit it looked great, even store quality.

I put the old one on our back porch so it could be picked up if we were not home. I also had just applied the final coat of finish and all I had left was to lightly sand and wax. You see my porch is my shop. I had placed a note on the old dresser saying "This One." When we came home I found a note on the front door saying, "Thank you for the gracious gift. It will make someone very happy, and if you wish to ever donate any more items please let us know."

With a good feeling in my heart I went to the back porch to finish my work of art, and to my astonishment the old dresser was gone and — you guessed it — so was mine. So needless to say I need a work shop.

Dan Dole
Ewa Beach, Hawaii

When Tools Hide in Plain Sight

My only comfort in writing this is in knowing that the only way people will read about it is if I win.

My wife asked me to make some curtain brackets to hold a hardwood rod. I had a set of end caps to hang them inside a door frame, but these had to hang on the wall and come out from it to hold the rod. Because the caps were round, I decided to make the brackets semi-circles. They would have to made up from 1" stock glued up to double thickness. There were two windows needing curtain rods, each having two brackets, each of those made of two 1" semi-circles.

Just one problem. How do I make eight identical half-moon shapes? I figured I would just find an object (a coffee can, paint can, etc.) with the right size diameter, draw my circle, cut it out with my jigsaw, then cut the circle in half. Having found the best way to get my shapes, I switched off my brain and set about finding the right size template to draw my circles.

Then I remembered a large hole saw for a drill that I got a while ago. The size was just about right, so I set about cutting everything as described above. It wasn't until I was midway through the long process of sanding my edges to clean up the jigsaw cuts that it hit me. I realized what I did wrong, so simple and right in front of me the whole time. USE THE HOLE SAW AS A HOLE SAW!!! I was so devastated at my own stupidity I could hardly stand it.

Fortunately my wife, a constant source of encouragement, assured me that the only thing that mattered was the final product.

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Turn your favorite tale from the woodshop into a $150 gift certificate from Lee Valley Tools in Popular Woodworking's "Tales from the Wood" contest. We're looking for your funniest, most embarrassing or incredible story. And if we can learn something from your yarn —even better.

Each issue, our editors choose the best tale and print it here. Runners-up receive a Veritas Marking Gauge (shown at right) from Lee Valley Tools, the catalog company that features an impressive array of quality woodworking tools, supplies and accessories. One final rule: Please, no stories about people getting hurt. That's not funny.

To make things easier, you can e-mail your tale and daytime phone number to us at PopWood@FWPubs.com or mail it to: Tales from the Wood • *Popular Woodworking* • 1507 Dana Ave. • Cincinnati, OH 45207. All entries become the property of *Popular Woodworking*.

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Not really believing her I grudgingly accepted the idea that it wasn't that big of a deal. Every once in a while you need to step back and get a little perspective on the project.

Tim Carmody
Lake Mary, Florida

My First Table Was Built For Fine China With Bent Nails

When I was 6 years old in the mid-twenties, my sister got a real china set with four cups, four saucers, four plates and a set of silverware. During warm summer weather she would play outside and had to play with the set on the ground. So I decided that she needed a table.

Next to our house was a furniture warehouse, and I would go there and see the man uncrate the furniture. I asked if I could have the wood, and he would say, "take it." It was oak, about 4 inches wide, and I took some boards and cut them for the legs of the table. I took the nails out and straightened them on a brick with my father's hammer.

Next, I found a box and took it apart, and joined the ends together, batten to batten, so there was a space between for a make-believe drawer. When I tried to nail the oak legs on, the nails kept bending. I then decided that if I used the ends of the pieces with the holes that were already there, I could nail the legs on. I had no ruler to measure with, so everything was guess work. I think the table was about 16 inches square and about the same height.

My sister was very pleased, and we would kneel by it and pretend we were having lunch. I think that was my introduction to woodworking.

James W. Mahon
Chesterfield, Virginia

Outside Dimensions vs. Inside Dimensions. What's the Difference?

Last summer, my wife asked if I could make a box to hold the mail that usually sits in a pile on the counter top. Knowing that this would be a great weekend project, I was more than happy to oblige.

I proceeded to measure various envelopes to make sure that I had the proper size box. I then made a box that was truly a work of art. I took my time and picked out the perfect piece of walnut, practiced my joinery with dovetail joints, then sanded and finished the box to a gloss finish.

I returned from my workshop with this work of art in hand and a head as big as Alaska. Expecting my wife to spend hours telling me what a beautiful box it was, the first thing she said was, "It looks small." My response was, "It is not too small! Do I have to show you everything?" I then proceeded to prove her wrong. I put an envelope into the box—only to find out that it didn't fit! My mistake was I made the outside of the box to the inside dimensions I had measured from the envelopes.

The box now sits on my workbench as a humble reminder of two lessons learned. The first is to measure twice, cut once. The second is that my wife is always right. **PW**

John Bloemer
Sun Prairie, Wisconsin

Resource Directory

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Bur Oak

For Sam Sherrill, this huge old tree had one more lesson to give at the end of its life.

By Sam Sherrill

Michael Romanos and I had received hundreds of calls after an article had appeared in the *Cincinnati Enquirer* about our efforts to turn downed urban trees into lumber for woodworking. So when local attorney Lewis Gatch called about a large bur oak that had been blown over in a recent storm, I thought, "One more yard, one more fallen tree."

I have seen large trees in northern California's Muir Woods. And my wife and I once spent most of a Sunday in the Loire Valley in France searching out the largest and oldest oak tree in France (about 350 years old). Even so, I wasn't prepared for what I saw when we visited the Gatch family farm to see the fallen bur oak.

Though most of the giant tree was lying on the ground, I was still awed by the size of the stump and the limbs. The trunk was roughly 10' in diameter. The largest limbs were between 3' and 4' in diameter, the size of the trunks of mature oaks growing in this area. This was the largest tree I had ever seen outside northern California. It was much larger than the oldest oak in France.

What had taken some five centuries to grow was destroyed in a matter of minutes by a storm in the spring of 1996. Countless storms and tornadoes had passed by this tree in five centuries, and the tree had survived them all. So why had the wind knocked it down now? During the past half century, the heartwood had slowly rotted out, and the void had been filled with concrete. Finally, the tree's thin layer of sapwood and what was left of its heartwood could no longer support the weight of massive limbs that reached out over 100 feet from the trunk. In the midst of fallen limbs and pieces of shattered trunk, the concrete that had been poured into it stood like a headstone.

Gatch beneath the tree on the farm in Milford, Ohio. At his request, his funeral service was held beneath the tree, the eulogy delivered by Ohio Governor John M. Pattison ***(above)***.

The author with the table, which sits in the basement of the Gatch farmhouse. Norm Abram visited the farm last year, and the table, tree and process the author went through to harvest the wood was featured this year on "The New Yankee Workshop" ***(left)***.

For the Gatch family, this was not the loss of just another tree but more like the death of one of their own. The bur oak had been a silent participant in family gatherings and events since 1849. In that year, the land where it stood and the nearby

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stone house, built in 1826, had been purchased by "Black Jack" John Gatch. Children had climbed the tree's trunk and swung from its limbs, successive generations of the family had picnicked beneath it on summer days, and had even been married beneath its green canopy. At his own request, Black Jack's funeral service was held beneath the tree.

The Trouble Begins

Because the trunk was hollowed out, we cut all the lumber from the limbs of the tree and took it to a large sawmill and kiln. When my wife, Pat, and I drove up to take delivery, the mill owner told me that the wood was not very good, more suited he thought for pallets or firewood, noting that lumber from tree limbs is considered stress wood and difficult to work.

Only after we got home and began unloading it did I understand the mill owner's comment and the challenge ahead. The lumber had cupped, bowed, warped and checked. In short, it had contorted itself in every possible way during drying. The first project I had planned was a 9' trestle table adapted from plans from "The New Yankee Workshop." I wanted to finish this table by late November so the Gatch family could have its traditional Thanksgiving meal on it at the old stone house on the family farm.

My first challenge was to find four boards at least 8' long and 8" to 10" wide for the table top. Out of almost 200 boards totaling about 1,100 board feet, only four met my requirements.

The grain was unique and beautiful. Bookmatched pieces created Rorshach patterns that looked like animal faces from one angle and devilish human faces from another. The price for this beautiful figure was tearout, which led to frustration and groping for new combinations of old expletives.

At this point, the boards had been in my basement workshop for several weeks. In coming to their equilibrium moisture content, they bowed a bit more. Using oak splines the full length of each board, I clamped the one bending up to the one bending down in hopes of a zero net bow. Once all four were glued, each one-at-a-time with every clamp I own, I had finally finished constructing the top. It weighed in at about 80 pounds. Tearout was removed at a local millwork company that ran the top through its 48" drum sander.

The two trestles and the stretcher that holds them together were easier to build. I managed to complete constructing the table by early November. I applied four coats of semi-gloss polyurethane in time for delivery before Thanksgiving.

Later, Gatch told me that he and his family were grateful for my effort and though they missed the bur oak, having the table there meant that the oldest member of their family was once again in their midst. At our own dinner on Thanksgiving Day, I was simply thankful that I had been able to finish the table on time. But I also realized that I had created something of deep personal value for the Gatch family from a tree that was a sapling about the time Columbus set sail for the New World. The wood had resisted me as the tree had withstood the passage of nearly 500 years. In that light, I accepted the challenge it posed then and continues to pose as I am commissioned to build more pieces of furniture for other members of the Gatch family. **PW**

Sam Sherrill is a professor at the University of Cincinnati and a founder of the Trees to Furniture program.

WHAT IS TREES TO FURNITURE?

A few years ago, Sam Sherrill and Michael Romanos started harvesting downed urban lumber and turning it into wood for their woodworking projects. We thought it was such a good idea that we now try to hook up like-minded woodworkers across the country to keep these downed trees out of the landfill and provide lumber for projects (at about 50 to 60 cents a board foot). If you would like more information on the program, write to: Trees to Furniture • 1507 Dana Ave. • Cincinnati, OH 45207. Or you can visit WoodMizer's website at: www.woodmizer.com or the site at: oz.uc.edu/trees

BUR OAK

Quercus macrocarpa

OTHER COMMON NAMES: Blue oak, Cucharillo, Encino, Mamecillo, Mossy overcup oak, Roble, Scrub oak

GROWING REGIONS: Throughout North America. According to Woods of the World, bur oak is often found on dry uplands, limestone and gravelly ridges, sandy plains, and loamy slopes to moist flood plains of streams.

CHARACTERISTICS OF TREE: Bur oaks attain a height of 50 to 80 feet and diameters of 24 to 48 inches.

CHARACTERISTICS OF WOOD: The sapwood is whitish to light brown in color, and the heartwood varies from light tan or pale yellow-brown to a dark brown. The wood may also have a pinkish tinge. Like other oaks, the grain is open. Rays are typically longer than those in red oak. Crotches, swirls and burls are occasionally present, and plainsawn boards have a plumed or flare-grained appearance. The grain pattern is tighter, and figuring is usually lower in riftsawn lumber. Quartersawn materials often have a flake pattern that is sometimes referred to as tiger rays or butterflies.

FINISHING CHARACTERISTICS: Like other oaks, bur oak has a high tannin content, so some finishing products, especially those that are mostly water, may turn the wood green or brown.

WORKABILITY: Individual pieces of wood can vary from being easy to work to quite difficult. The wood glues well, but you should pilot drill for nailing to avoid splits. Bur oak sands well and is easy to manipulate while steam-bending.

COMMON USES: Flooring, mine timbers, railroad ties, veneer, stakes, sub-flooring, utility poles

AVAILABILITY: Rare in some regions.

SPECIAL FEATURES: According to Woods of the World, bur oak's working properties depend to a large extent on the rate of growth of the individual trees. Slow-grown Appalachian trees cut more easily. Faster-grown southern species are harder.

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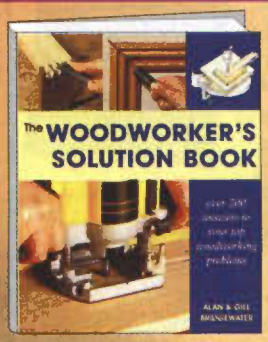

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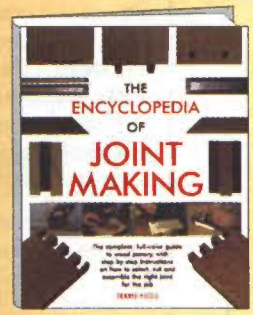

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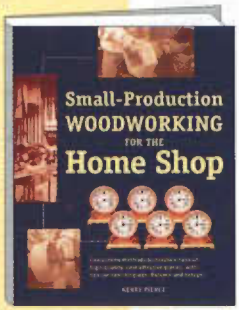

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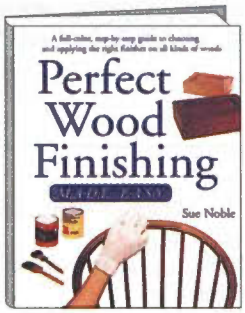

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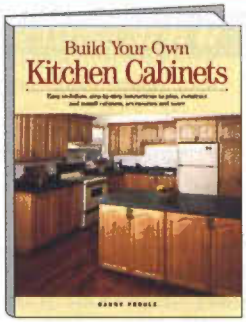

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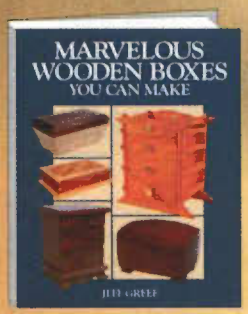

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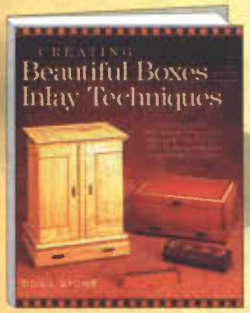

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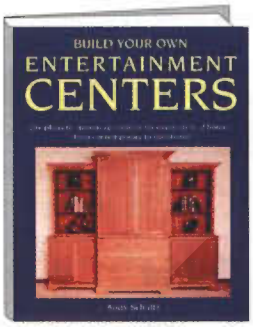

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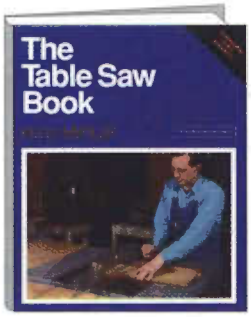

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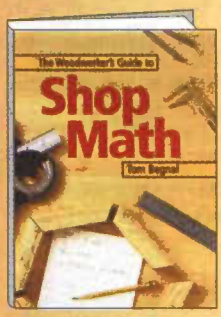

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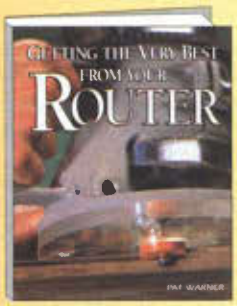

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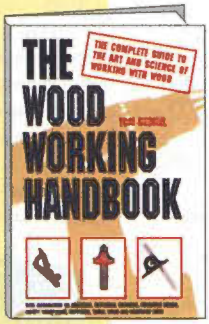

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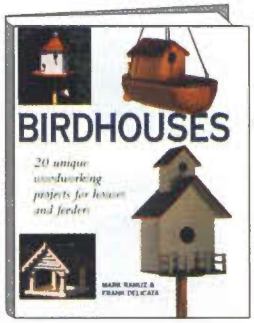

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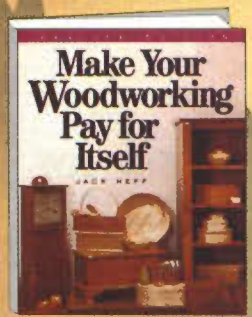

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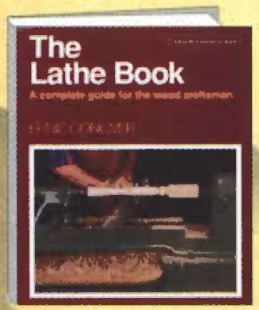

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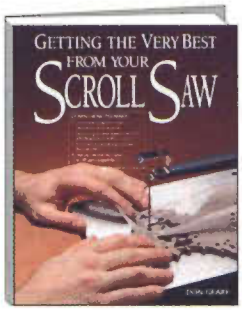

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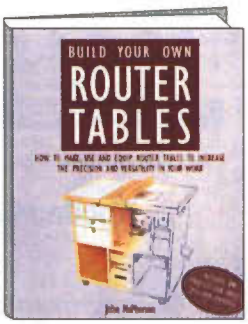

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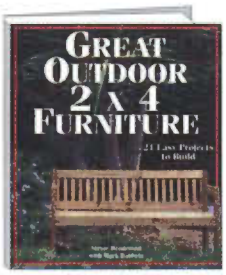

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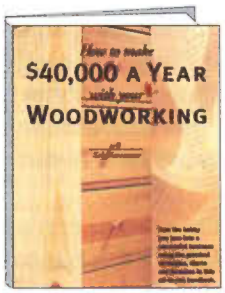

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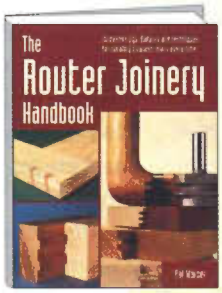

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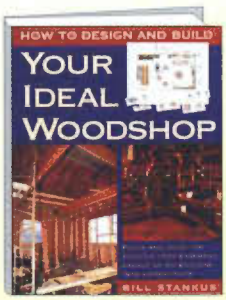

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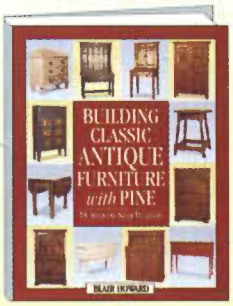

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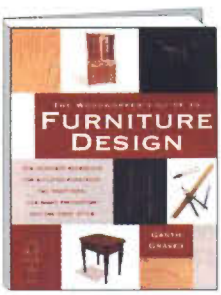

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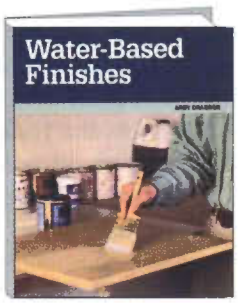

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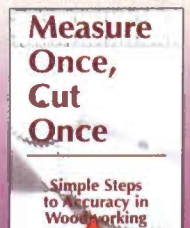

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There are wood schools you can attend, of course. But few woodworkers have the hundreds or thousands of dollars to invest in the training. Most of us would rather buy a new tool with that money.

That's why *Popular Woodworking* is rolling out its "*Popular Woodworking* Boot Camp" contest. One lucky woodworker and a friend will win an all-expenses-paid trip to our magazine's headquarters in Cincinnati, Ohio. Here you'll work with our editors in our huge cabinet shop and get the training that will take your woodworking to the next level — whether you're a rank amateur or a seasoned home-shop veteran. You'll build a project that will be published in a future edition of *Popular Woodworking*, and you'll take home a Jet contractor saw and dust collector for your home shop.

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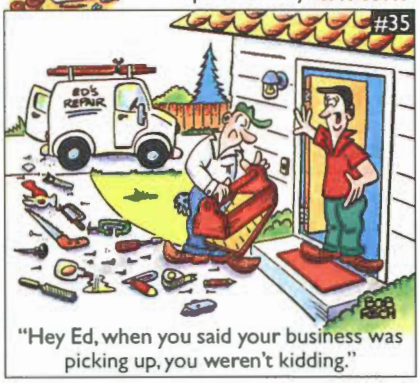

"Hey Ed, when you said your business was picking up, you weren't kidding."

Nick Mihalic, from Munster, Indiana, is the winner of our "Caption the Cartoon Contest #35" from the March issue and recipient of the Makita 14.4-volt cordless drill. ***Congratulations Nick!***

The runners-up each receive a one-year subscription to *Popular Woodworking*:

"Boy Ed, you really meant it when you said you'd drop everything and be right over." ***Mark Harwood, from Gaylord, Michigan***

"My floor is squeakin', but your tools are leakin'!" ***Andrew Kirk, from Georgetown, Texas***

"That's quite a litter box you've got there." ***Armin A. Hagen, from Pittsboro, North Carolina***

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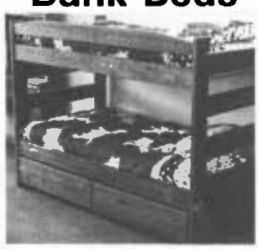

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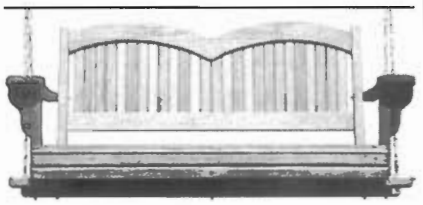

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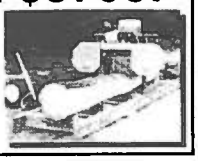

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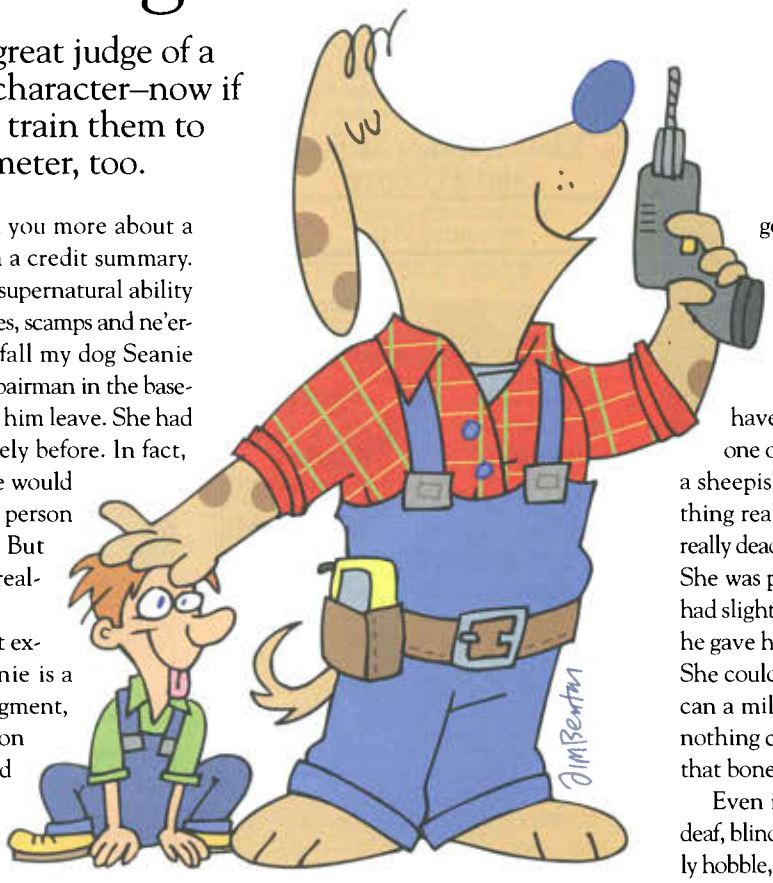

Shop dogs can tell you more about a woodworker than a credit summary. They have an almost supernatural ability to sniff out all the rogues, scamps and ne'er-do-wells of life. Last fall my dog Seanie trapped the furnace repairman in the basement and wouldn't let him leave. She had never acted aggressively before. In fact, we'd always feared she would take off with the first person to offer her a treat. But when I got the bill, I realized I'd been robbed.

And that's my point exactly. Although Seanie is a smart dog, it's her judgment, her infallible perception of absolute good and evil that I really trust and need. And in this photo- and telegenic world where everyone looks tan and fit and healthy and smart, I need a canine to separate the beefcake from the BS.

Of course, not every dog is a saint, but even the rascals can be instructive. If, when you enter someone's house, rhe dog attacks you with more fervor than a telemarketer whose rent is coming due, it's a bad sign because you know that the dog is only mimicking behavior it has seen in its owner.

I find this weather vane of goodness to be particularly instructive in the world of woodworking. I used to be a book editor for *Fine Woodworking* magazine. After a few years of traveling the country and looking in the shops of some of the best woodworkers, I came to believe that the mere presence of a dog in a shop was all I really needed to see to know whether to enter or keep walking. Invariably, if there was a dog, I was welcomed into the shop and could look forward to an evening of fine food, good humor and remarkable conversation. No dog, and the resident artiste was likely to be a prima donna who would scarcely deign to acknowledge my presence.

The way I look at it, merely having a dog willing to share space with you in a workshop is a testament to the woodworker's character. Frankly, workshops are dirty, noisy places, filled with sneezy stuff, bad smells and lots of opportunities to get whacked with a board or to pick up a nail in a paw. Most are virtually unheated, there's never a sofa or wall-to-wall carpeting to lounge on, and the eats are poor to nonexistent. Yet, if a decent human being worked there, there was always a friendly, polite, happy-to-meet-you dog thumping his tail against the door to herald you in.

Much to my chagrin, I've never actually been able to entice a dog to stay with me in my shop, and I suspect this reveals deep and significant character flaws. Well, I guess I did have one dog, Sappho, who stayed in the shop with me, but she was never what you'd call a real smart dog.

Sappho never learned that skunks weren't just striped cats. On a weekly basis, she'd sight a skunk, catch the darn thing, get sprayed, and return home with her eyes streaming tears and her mouth foaming, grinning like she was some kind of idiot savant specializing in skunk.

Grinning? Yes, Sappho did have a few redeeming qualities, and one of them was her smile. She smiled a sheepish grin whenever she did something really awful, like roll in something really dead. But her real talent was smelling. She was part Brittany spaniel, and if God had slighted her in the brains department, he gave her a nose that just wouldn't quit. She could smell a chicken bone in a trash can a mile and a half away, and virtually nothing could prevent her from acquiring that bone once she'd smelled it.

Even in her latter years when she was deaf, blind and so arthritic she could scarcely hobble, that nose never betrayed her. Our neighbor bought a special burglar proof garbage can just to defeat Sappho, but it gave her no pause. I saw her sneak off one day shortly after he bought the garbage can and then bowl it over like a Greco-Roman wrestler doing a takedown. Then she sprang the lid off with a nonchalant flip of her nose and was in the bones in a matter of seconds.

You can see she was an extraordinary dog, and her case is probably an exception on the otherwise perfect predictive relationship between man in the workplace and dog. As a further demonstration of the reliability of dogs as predictors of quality in people, let me cite one last example: 10 or 15 years ago in my more idealistic youth, I used to prowl the halls of state and federal legislatures looking for support for educational legislation. Not a single representative had a dog in his office, not even a stuffed one, and these offices were much more comfortable than any drafty old workshop I'd ever been in. **PW**

Andrew Schultz is a woodworker living in Lincoln, Nebraska.


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