

BONUS!
ANNUAL
PROJECT INDEX

Woodworker's Journal

Vol. 19, No. 1 January/February 1995

Early American WALL CLOCK *A Treasure For The Making*

■ Miniature Dresser

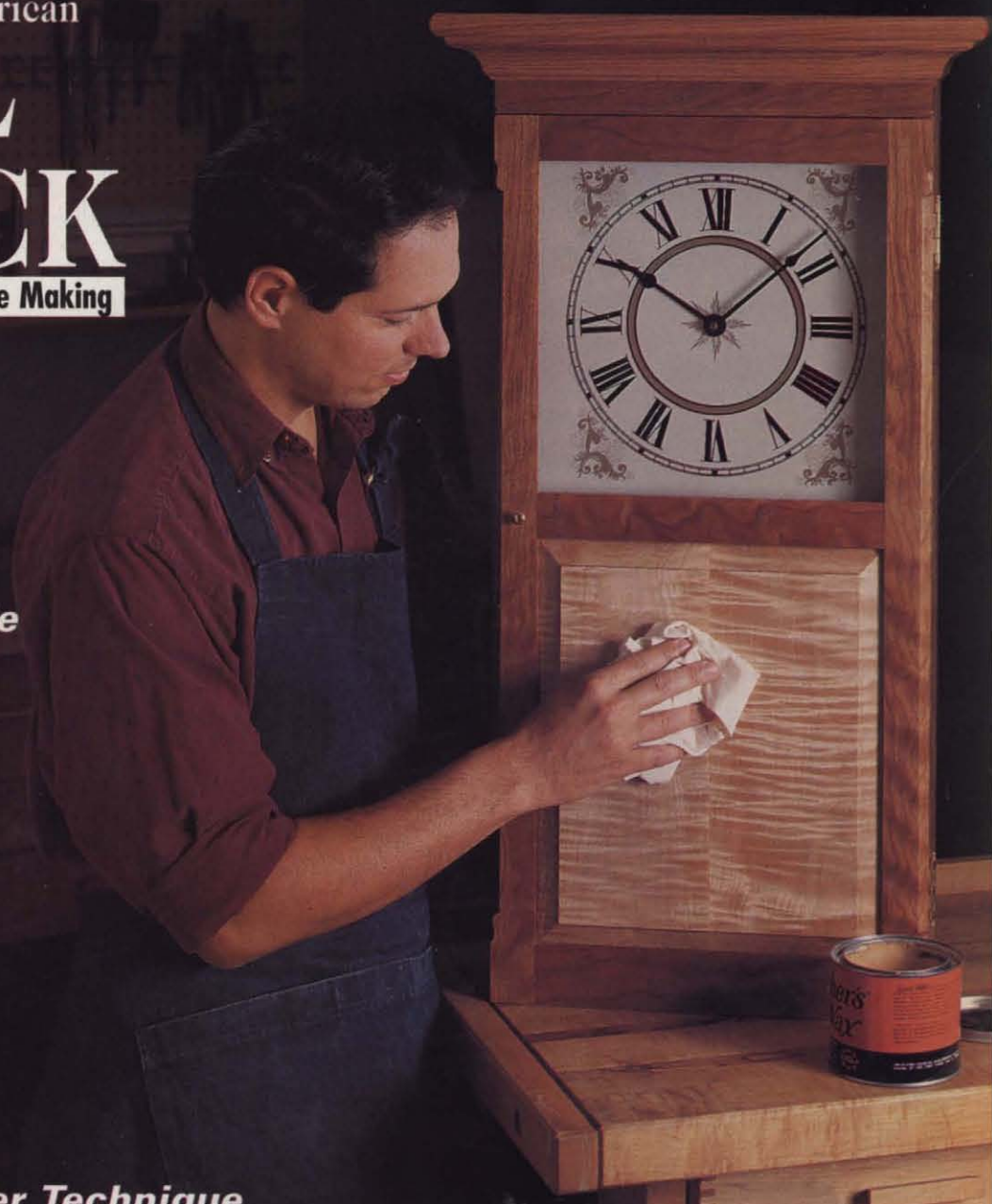
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■ Intarsia Deer

*You Can Make
This Woodland
Masterpiece*

■ Plus!

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- Shop Test: Preformax Sander
- Pierced-Tin Colonial Cabinet
- Child's Easel
- Mastering A Cabinet Scraper
- 4 Anti-Kickback Devices



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SPK-040	2	Ryobi AH-115 & AH-125	\$60.80
SPK-045	2	Makita 2030N planer	\$42.70
SPK-055*	2	Delta 22-540	\$30.20
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SJK-020	8" Knives for old Delta & Rockwell (3)	\$28.90
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SJK-030	12" Knives for Powermatic (3)	\$41.90
SJK-035	12-1/2" Knives for RBT 612 & 812 (2)	\$29.90
SJK-040	12-1/2" Knives for Grizzly & other (2)	\$30.90
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SCK-055	15" Knives for Grizzly & other imports (3)	\$179.00
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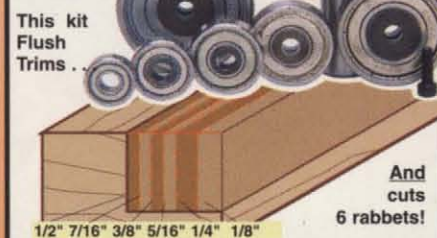
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BSB-935	3/8"	4 TPI	Skip	\$10.00

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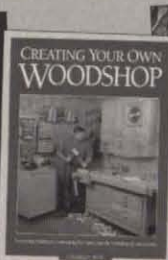
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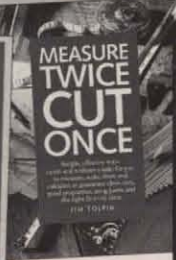
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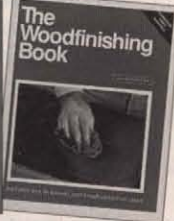
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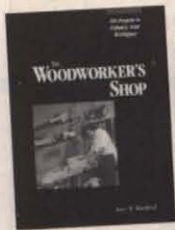
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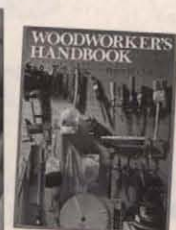
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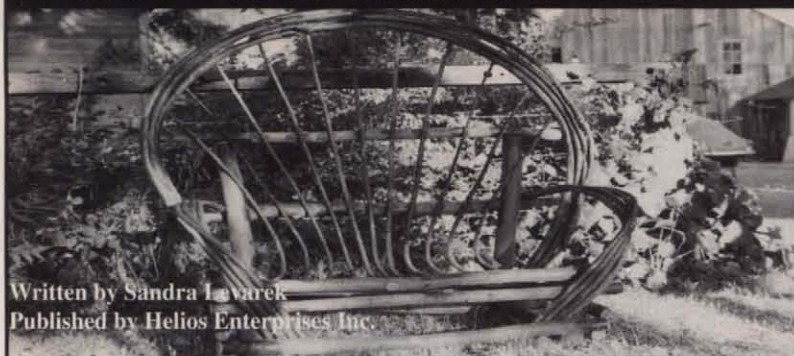
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Holmes' Dovetailed Drawer Unit

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About the Author & Book

Mother of three, Sandra Levarek discovered at home the beauty and rewards of making traditional willow furniture. She collected and documented the various techniques of willow making from woodworking artists across the country. Amazed by how challenging and rewarding it was to make willow furniture, she began to share her knowledge with fellow woodworkers:

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SHOP TALK

I may not be Marco Polo or Meriwether Lewis, but I've learned a few things on my magazine-related travels. In Eureka Springs, Arkansas, I discovered nothing less than the true meaning of woodworking. This didn't altogether surprise me; the Greek *heurēka*, after all, means "I have found (it)."

I had flogged a rental car up a mile of Ozark hillside in search of Doug Stowe, a professional woodworker whose designs we'll be bringing you in upcoming issues. I wanted to photograph Doug in his natural habitat, an enviable hideaway cloistered among white oaks and limestone outcroppings. I also thought I'd ask his opinion of the newly redesigned *Woodworker's*



Journal. As it happened, we swiftly departed from anything practical and headed straight for the philosophical stratosphere. *What do woodworkers get from woodworking?* we wondered.

Doug and I had both noticed that amateur woodworkers tend to belittle their efforts in the shop. "Oh, I just make silly little things for around the house," or "I never get around to building anything major—most of it just ends up as shavings or firewood." If we don't draw a full-time paycheck for woodworking, then we dismiss our favorite pastime as a *hobby*,

or worse, as *play*. We discuss the subject guardedly, because often we get more obsessed with our little projects than we like to let on in mixed company.

And then there's our "serious" work. Recent surveys report that most Americans—when they're not disparaging their incumbent politicians—express dissatisfaction with their "real" jobs. Either the policies or the people in the workplace (or both) hobble our creativity, if not flat out stymie our forward progress. What usually defines the "seriousness" of a job is the lack of exploratory space it allows. Few of us are granted the license to stumble onto new ground or solve problems according to our own style. Since we're busy following a program not our own, we don't get that personal *eureka* experience ("I've solved it myself!" or "I've found a better design!")

Child psychologists insist that play, on the other hand, is serious stuff. Children who are deprived of unconstrained play miss out on some crucial cognitive and emotional development. They tend to become passive and subdued. No one has yet figured out at what age—if ever—we outgrow the need for serious, exploratory play. Isn't this, in fact, what we get from woodworking? A chance to explore a little territory on our own terms? An occasion for the personal *eureka*?

Once we'd settled that issue, Doug and I never really got around to the changes in *Woodworker's Journal*. So, I'll put the question to you: What do you think of this, our first fully redesigned issue? What about our new approach to how-to writing? Our computerized drawings? Our page layouts? Our project selection? Please write me at the address on the masthead, and don't be bashful. We're trawling for candid opinions, not merely fishing for compliments.

Doug Cantwell

Woodworker's Journal

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READER LETTERS

Enclosed are pictures of several intarsia eagles that I made from your eagle pattern in the October 1993 issue. Note I made some changes, making some of them more 3-dimensional.

Peter Laflan,
Oklawaha,
Fla.

Peter Laflan's
intarsia eagle

My 21-year old daughter Sharon came home from college for the summer and shocked me when she said she wanted to make something in the shop.

After looking through my file cabinet and magazines, she picked out a Tony Lydgate-designed jewelry box from your Nov./Dec. 1989 issue. With a little help it came out great! That's Sharon using my tenon jig to cut the lid's beveled edge.

Herb Heitner, Wickatunk, N.J.

As you can see from the enclosed

photo, a little of your magazine does rub off. I made the Governor Winthrop slant front desk from the plans in your Nov./Dec. 1992 issue. The walnut came from a small mill that makes mine props. I had the logs rough sawed and dried locally.



Sharon Heitner in her father's shop

Usually I make things in threes because of the family, but this time I only made one. One granddaughter asked "Who are you going to give this to, Grandpa?" I said, "Kelly, this one is for me."

Charles O. Groves, Woodlawn, Ill.

I recently added a deck to our house, so we needed something to sit on. I remembered seeing plans for Adirondack furniture in previous issues of *Woodworker's Journal* so I looked them up. I found the settee in the Mar./Apr. 1989 issue and the chair in the Jul./Aug. 1986 issue.

I ended up integrating the curved back from the chair into the settee and ended up with a very comfortable seat for two. Instead of 3/4"-thick stock, I used 5/4 treated deck boards for the settee. Because we were having a beautiful summer, I decided to build it outdoors, and used power hand tools instead of my larger, stationary power shop tools.

Lee Appleton, Stanford, Ill.

Thanks and congratulations to all of you who have written and shared photos of your woodworking efforts. Your results inspire all of us to pursue our fun and rewarding hobby.

I want to tell you how much I enjoyed the article "Woodworking

in the Year 2000" by Jim Barrett. This article exemplified an excellent

future scenario in terms of sustainable forests and tool technology. I found it to be very informative.

I have been a journeyman cabinetmaker for 25 years and

am currently working on a degree in vocational

education. I hope to teach woodworking in a vocational program.

Technology seems to be doubling about every three to four years. Unfortunately, many of the wood-working classrooms and shops I've visited still use "1950s" technology.

Thinking in terms of the year



Adirondack settee built by Lee Appleton

2000, I would like to see wood technology classrooms outfitted with computer-aided drafting systems and state-of-the-art woodworking machinery such as computerized horizontal saws and edge banders that are relevant to today's industry. I'd also like to see more use of aids such as the "information superhighway." Can you imagine the impact communicating with experts and technicians on the cutting edge around the world comparing and sharing woodworking techniques would have for students?

Dennis Delhousay, Downey, Calif.

continued on page 27

Here's How to Turn Your Woodworking Skills into Cash!

"My woodshop makes me \$300 a week, part time. Your's can, too!"

by Rick Gundaker

You've heard of "the woodworker who was a real butcher."

It's true, for many years I was a meat cutter in a butcher shop in Erie, Pennsylvania. But several years ago the poor economy in the Erie area forced me to look for a new job.

After four months, I found a new job, but it paid less and had fewer benefits. I desperately needed a second income.

I was sitting at the kitchen table very late one snowy night in December. I couldn't sleep. My checkbook was overdrawn, bills were piling up and the bank was threatening to foreclose on our home. Then it came to me.

For many years I had been making woodcrafts. I had made many unique items for our home. Everybody raved about them, so I started making them for gifts.

My wife, Amy, always said, "Rick, you should start selling your woodcrafts." But I would just laugh. Well, I wasn't laughing that night. Maybe Amy was right. Maybe I could sell them!

I took what little money we had, borrowed some from my Mom, and turned to my hobby with serious determination.

At first my income was small, \$60.00 to \$90.00 a week. But time and experience helped me develop many easy-to-make woodcrafts and a very successful method for selling them. My income grew beyond my greatest dreams.

Today, Amy and I live in a nice country home on ten acres of land and it's paid for! That's a great feeling, *but the best feeling of all is the self satisfaction I have of being able to make the extra money I need whenever I need it.*

You, too, can make the extra money you need while enjoying your hobby. Using your basic woodworking skills, you can create great gifts and turn your woodshop into a part-time money maker. I know it can be done because

I did it, and I've helped many other woodworkers make money, too!

The following are excerpts from letters I've received from woodcrafters I've helped.

"You sure know what sells! The items I made from your plans have been on display at the local bank in St. Joseph. In less than 30 days I have sold \$1,700 of my woodcrafts! I'm enclosing a news story our local paper did on my work."

W.F.H. of St. Joseph, MN

"My wife is a school teacher. I made her one of your cute designs to set on her desk. Other teachers saw it and she sold eleven of them before the day was over. Keep up the good work."

C.M. of Baltimore, MD

"You're doing good. I've made several of your plans and the response to buy has been great. Every year I sell my crafts at our church fair and donate all the proceeds to the church. In 3 days I made over \$600!"

C.R. of Chalmelle, LA

"Your patterns are simple and very easy to follow. I'm fairly new to woodworking and it's great to see full-size patterns with enough information so that even a beginner with limited woodworking knowledge can complete a project on their own. I'm really having fun with woodworking. Thanks for sharing your knowledge and experience, it's invaluable to the novice."

C.L. of Houston, TX

If these woodworkers can do it, you can, too!

There's plenty of room for everyone in woodcrafting. I won't be competing with you and you won't be competing with me. That's why I would enjoy showing you how you can start your own profitable craft business using your basic woodworking skills. You can go as far as you want... *profits are virtually unlimited!*

Here is what I'll send you:

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PRODUCT NEWS

Plunge Router Features Variable Speed and Micro-Fine Depth Adjustment

The EVS designation on Bosch's model 1614 stands for electronic variable-speed circuitry, a new feature that gives this 1¼-hp, 7.8-amp tool soft-start operation and constant speed control while under load. A six-position switch allows adjusting motor speed incrementally from 12,000 to 23,000 rpm. There's also a new micro-fine bit depth adjustment that enables setting bit depth in any position. Other features include ball-bearing construction, double-insulated housing, a quick-release template guide system, covered plunge posts, and a self-extracting ¼" collet. For additional information, contact S-B Power Tool Company, 4300 W. Peterson Avenue, Chicago, IL 60646, telephone 312/286-7330.

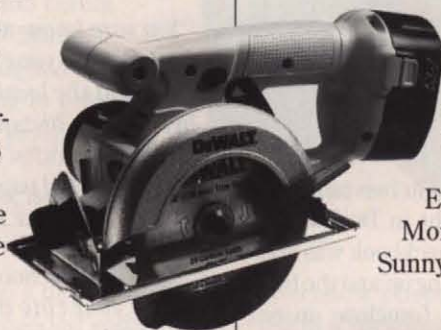


Cordless Circular Saws For Cutting Anywhere

The selection of cordless circular saws increased considerably when DeWALT added two new cordless units to their line. The 14.4-volt DW935K and the 12-volt DW930K incorporate a special 5⅝" thin-kerf carbide blade, giving both saws the capacity to cut through 2x4 stock in a single pass. According to the manufacturer, the 12-volt unit can cut 13 feet of ½"-thick plywood per

minute and crosscut 50 2x4s per charge. The 14.4-volt unit cuts 25 feet per minute in the same material and up to 75 2x4s per charge.

Both saws incorporate DeWALT's new XR PACK extended run-time batteries, the same used in the firm's cordless driver/drills, screw-driver, hammer drill, and impact wrench. The two saws will be offered both individually and in kits that include the tool, blade, battery, charger, and steel carrying case. For more information, contact DeWALT Industrial Tool Company, P.O. Box 158, 626 Hanover Pike, Hampstead, MD 21074, telephone 800/433-9258.



Fast-Acting Clamp Gains Plenty Of Leverage

The adaptability of this new clamping concept appears to be limited only by one's imagination—the more you use it, the more uses you'll find for it on your table or radial-arm saw, drill press, router table, and workbench. In operation, the lever transfers clamping force to an arm or jaw. Lifting the lever releases the pressure; lowering the lever applies pressure on the jaw. The jaw may be permanently set or allowed to slide, permitting a

clamping range of 0" to 4¼" with pressure adjustable to 300 lbs. The Leverclamp mounts with any standard ⅝" bolt. A radiused hard-maple jaw tip helps minimize wood marring. The manufacturer also sells Clamprax, a track system that works with the Leverclamp, making it even more versatile. For more information, contact MapleTek Engineering, 1016 Morse Ave. #5, Sunnyvale, CA 94089.



Oscillating Spindle Sander Handles Multitude Of Sanding Jobs

For sanding inside radii on projects, you can't beat a spindle sander, and Powermatic's new model 14 will fill the bill without flattening your bank account. The unit features a ½-hp motor and brass and steel drive gears. The ¼", ½", and ¾" spindles and 1½" and 2" rubber sanding drums with four matching table inserts come as standard equipment. A 3" rubber sanding drum is optional. The cast-iron table tilts and locks in any position between 0 and



45° for sanding beveled edges. You'll also find an integral dust-collecting shroud for connecting with a vacuum. For more information, contact Powermatic, 607 Morrison Street, McMinnville, TN 37110, telephone 615/473-5551.

Hammer Drill Now Cord-Free

Milwaukee claims that its new 12-volt model is currently the most powerful on the market, operating at 0 to 6,000 rpm and hammering at a rate of 0 to 32,000 bpm. The Super Tough 1.7-amp battery pack reportedly delivers 25 percent more run time between charges than previous units. Other features include variable speed with electronic brake, machined steel gearing, a 3/8" keyless chuck, and a fully serviceable motor with replaceable brushes. The drill will be marketed by itself and also in kits that include the battery, charger, and steel carrying case. For more information, contact Milwaukee Electric Tool Corporation, 13135 W. Lisbon Road, Brookfield, WI 53005, telephone 414/781-3600. **NEW**

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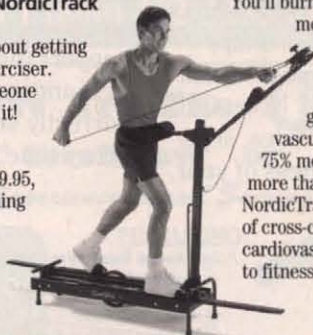
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SHOP TIPS

Simple Overlapping Lid For Boxes

Boxes with lipped or overlapping lids, such as illustrated in *figure 1*, can be made easily and accurately using this approach:

1: Decide on the final height of the box and the lid overlap depth you want. Add these two dimensions plus the thickness of your saw blade to determine the starting size for the box sides and ends.

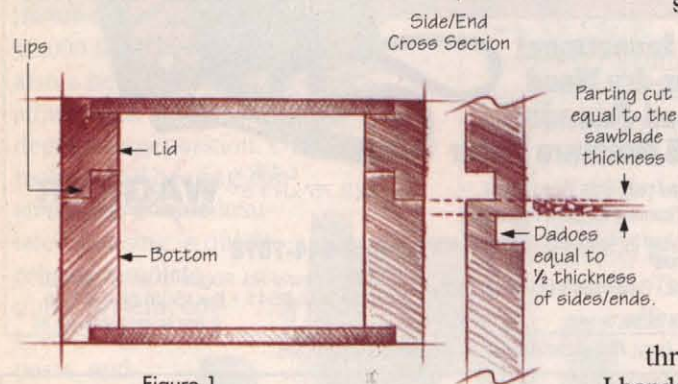


Figure 1

2: Cut the dados (as wide as the desired lid overlap) into the sides and ends where shown in *figure 1*. Make the dado depth equal to one-half the thickness of the sides/ends. For example, for a $\frac{3}{8}$ " lid overlap, cut $\frac{3}{8}$ "-wide dados, and make them $\frac{1}{4}$ " deep in $\frac{1}{2}$ "-thick stock. Note: Cut the dados into opposite sides, separating them by the thickness of your saw blade.

3: Assemble the box.

4: Saw around the box to separate the box and lid. Note: Set the saw's rip fence so you make the parting saw cut between the two dados where shown in *figure 1*.

Manuel Brown,
Tullahoma, Tenn.

Cutting Short Dowels By The Dozen The Easy Way

Recently I needed a large number of $\frac{3}{4}$ "-long dowels. Realizing what a chore it would be to cut them, I decided to make the simple jig shown (*figure 2*).

Since I was working with $\frac{1}{4}$ " dowel stock, I first cut a piece of scrap wood to $1 \times 3 \times 4$ ", then drilled a hole one step larger than the dowel ($\frac{5}{16}$ ")

through it. Next, I bandsawed a kerf $\frac{3}{4}$ " from the end.

To cut the dowels, you simply feed the dowel rod through the hole, align the end flush with the edge, and then using the miter gauge to support the block, saw through the kerf and cut the dowel. You'll get a correctly sized, sliver-free dowel every time.

John Swarey, Meyersdale, Penn.

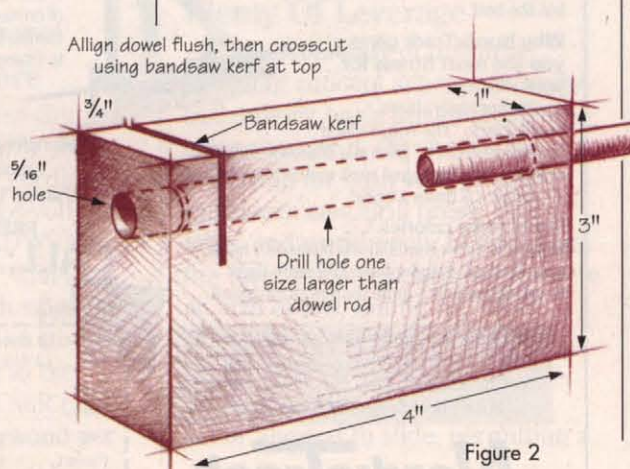


Figure 2

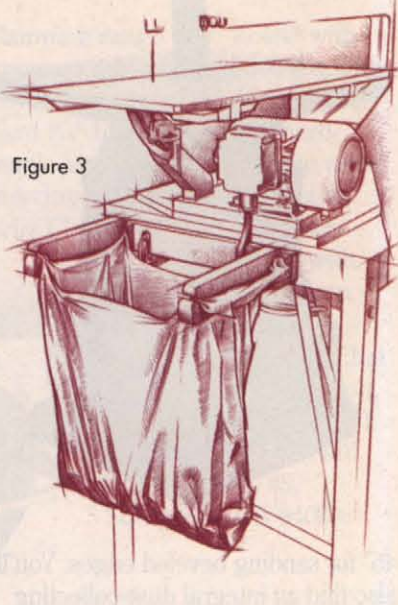


Figure 3

Handy, Inexpensive Sawdust Collector

After purchasing my new scroll-saw, it became apparent that I needed some sort of collection device to stop the constant rain of dust on my feet and shop floor. Remembering the Plastic Bag Recycler by Jim Ballow in the Nov./Dec. 1991 issue of *Woodworker's Journal*, I decided to see if I could adapt it. I made my collector out of scrap pine and clamped it to the front of my saw (*figure 3*). Now, I have a handy receptacle for sawdust, scraps, paper, and other shop trash. I suggest that others modify the recycler to fit their particular saw. For mine, slightly longer arms spaced wider apart would be ideal.

Jim Penkala, Calistoga, Calif.

Woodworker's Journal pays \$25-\$100 for reader-submitted shop tips that are published. Send your ideas (including sketch if necessary) to: *Woodworker's Journal*, News Plaza, P.O. Box 1790, Peoria, IL 61656, Attn: Shop Tips Editor. We redraw all sketches, so they need only be clear and complete. If you would like the material returned, please include a self-addressed stamped envelope.

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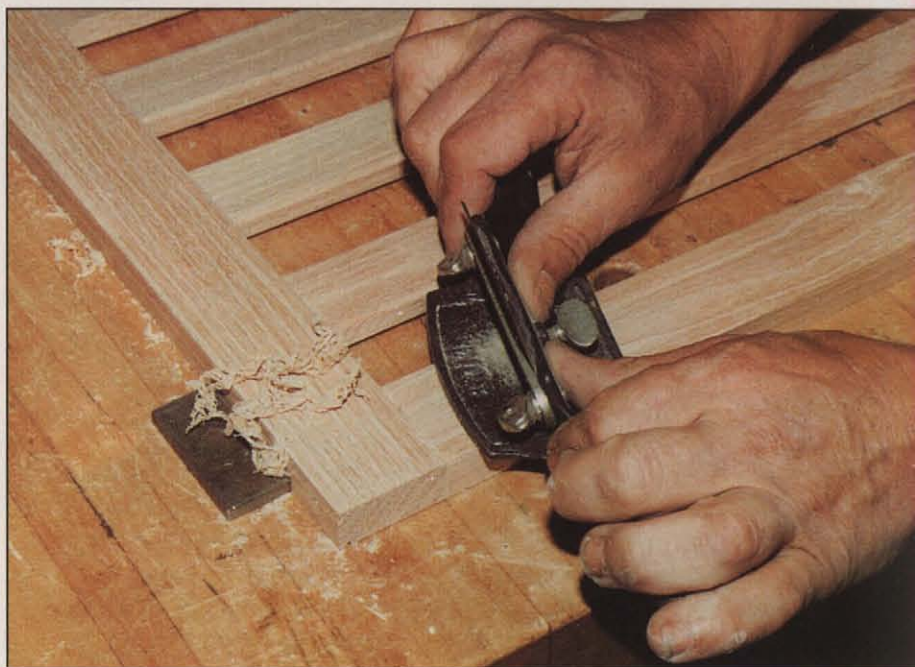
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USING TOOLS: Back To The Basics

A tool from
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Cabinet scrapers work effectively, either with the grain or across it.

Mastering the Cabinet Scraper

by Bob Colpetzer

As woodworkers, we often get caught up in the hype of the new, exciting tools and products being introduced, and we forget some of the old standbys that have proved themselves through the years. That's certainly the case with the lowly cabinet scraper. In fact, we've ignored it to the point that few of us

know what it can do, how it actually works, or how to make it work.

Could It Be Your Next "Must Have" Tool?

If the cabinet scraper were to be introduced for the first time today, we'd probably herald it as a "must

have" tool. Cordless, compact, dustless, inexpensive—it fits the requirements for today's tools to a tee. There's probably no other single tool that can handle as many tough jobs so well. With a scraper and a bit of practice, you can work wild and reverse grain in highly figured woods to a silky smoothness, scrape dried glue

continued on page 16



Photo A

Push the scraper across the surface, then lift for the return stroke. Remaining pencil marks show areas still needing to be scraped.



Photo B

Starting with a square blade and using a mill file or similar flat file, work the blade's cutting edge to a uniform 45° angle.



Photo C

A few strokes with the file held flat to the back side of the blade remove any burr created during the angle filing.

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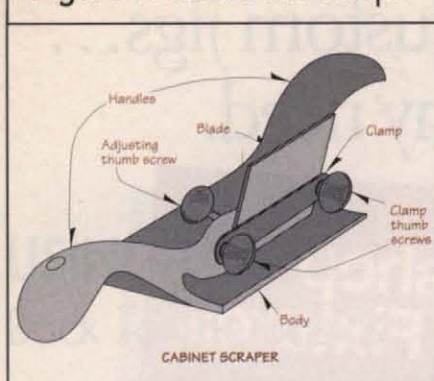
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Figure 1: The Cabinet Scraper

from glued panels, remove paints and varnishes from flat surfaces, erase machine marks from planed stock, or work across wood grains, even on paper-thin veneer.

How and Why It Works

You'll find the answer unbelievably simple: it scrapes rather than cuts. Like a piece of broken glass, the scraper blade's sharp, hook-like edge removes extremely fine amounts of material from wood surfaces. Made of hardened spring tool steel, the blade mounts in a two-handled carrier or frame (*figure 1*). The handle gives you better grip and control of the tool, enabling you to apply more working pressure. (Blades made for handheld scraping typically are larger and must be prepared differently.)

To set up a scraper, first place the blade in the carrier, aligning the cutting edge flush with the scraper bottom, and clamp it tight. To set the blade for cutting, you turn the adjusting thumb screw on the front. This flexes or arches the blade slightly,

exposing the burnished edge, which does the scraping. A small deflection of the blade produces fine cuts, while increasing the arch produces coarser cuts.

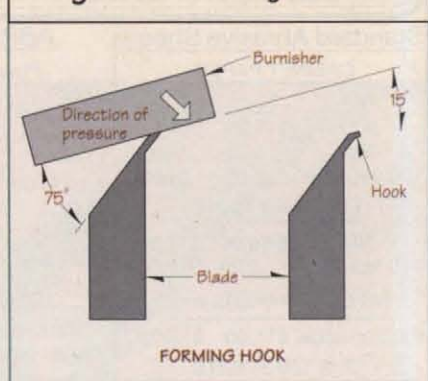
To work a cabinet scraper, you push the tool over the wood surface, then lift it for the return stroke (*photo A*). Scribe pencil lines across the workpiece to ensure that you scrape the board's surface uniformly and that no areas get missed.

When scraping, stroke progressively across the stock, overlapping each stroke about 50% to achieve a uniformly flat surface. When you've effaced all pencil lines, the surface should be smooth. If you're just learning to use the tool, adjust the blade so it produces fine shavings (little or no arch on the blade). Then, as you become more familiar with the action, tighten the adjusting screw to increase the cutting depth to suit your needs.

Sharpening Makes All the Difference

To sharpen a blade, first file the edge to a 45° angle. Then, working a hardened, rounded steel along the sharp edge, burnish the edge to 15° to form a burr or hook (*figure 2*). However, the exact procedure to use depends on the kind of scraping you want to do.

For general work, such as removing machine marks, scraping off glue, leveling boards in a glue-up, or removing paint or varnish, first file the edge to 45° (*photo B*). Next, remove the small burr you formed earlier while filing the 45° angle by

Figure 2: Forming the Hook

running the file flat across the blade face (*photo C*). Next, using a burnisher (*photo D*), roll a 15° hook or burr on the sharpened edge by holding the burnisher at an angle of 75° to the edge.

For fine work, such as scraping highly figured or reverse-grain woods to maximum smoothness, or preparing stock for finishing, you need a very smooth, nick-free burr. To form such a high-quality burr, file the blade to 45° as before. Then, before you burnish, hone the blade edge to remove any nicks (*photo E*). Also hone the back of the blade flat. Then, carefully burnish the cutting edge to produce the burr.

After you've prepared the blade, place the cabinet scraper body on a flat surface, insert the blade, and tighten the clamp thumb screws to hold it in place (*photo F*).

Because of the time and effort it takes to form the extra-smooth hook, many craftsmen keep two blades, reserving the specially honed one for fine, delicate work and using the other for general scraping chores. 



Photo D
Applying uniform pressure, make several strokes across the edge with a burnisher held at a 75° angle to form the necessary 15° hook.



Photo E
For fine work, carefully hone the edge and back of the blade after filing the edge. Then, burnish the edge to form the hook.



Photo F
Insert the blade into the scraper body and tighten the clamp thumb screws. Turn the front thumb screw to adjust cutting action.

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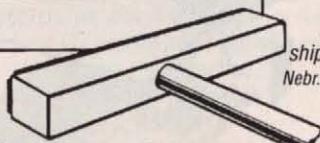
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SHOP TEST

Performax 16-32 Benchtop Drum Sander

by Bob Colpetzer

We Performance-Test A Benchtop Sander With Wide-Belt Capabilities

For years I've looked longingly—as I'm sure many of you have—at wide-belt sanders. The ability to uniformly finish-sand tabletops, cabinet door frames, and other large, flat assemblies has been high on my wish list. Unfortunately, the cost and space requirements of available sanders kept me from taking the plunge.

When Performax Products introduced their first drum sander as a radial-arm saw sidewheeler, my interest in wide-belt sanding got a booster shot. When they added the 16-32 model to their line, I threw caution to the wind and bought one. At \$799.00 plus shipping, the unit fell (barely) within my budget, and with its small 18x23x32" footprint, it easily found a home in my shop.

Let's Look At Its Specs First

The 16-32 benchtop drum sander uses a single, 5"-diameter, 16"-long aluminum drum. Because of its cantilevered design, you can—by rotating the pieces 180° and feeding them through a second time—sand items up to 32" wide. It effectively handles stock ranging from 1/64" on up to 3" thick, and from 2 1/4" long to as long as you can feasibly handle.

Like other Performax sanders, the 16-32 incorporates a patented, self-cooling aluminum drum engineered to dissipate heat generated during operation. A 1-hp, 115-volt single-phase TEFC direct-drive motor

powers the drum. Instead of belts or sleeves, the drum uses 3x92" strips of cloth-backed sandpaper, which you wind onto the drum spiral-fashion. Spring-loaded clips keep the sandpaper flat and tight across the drum at all times.

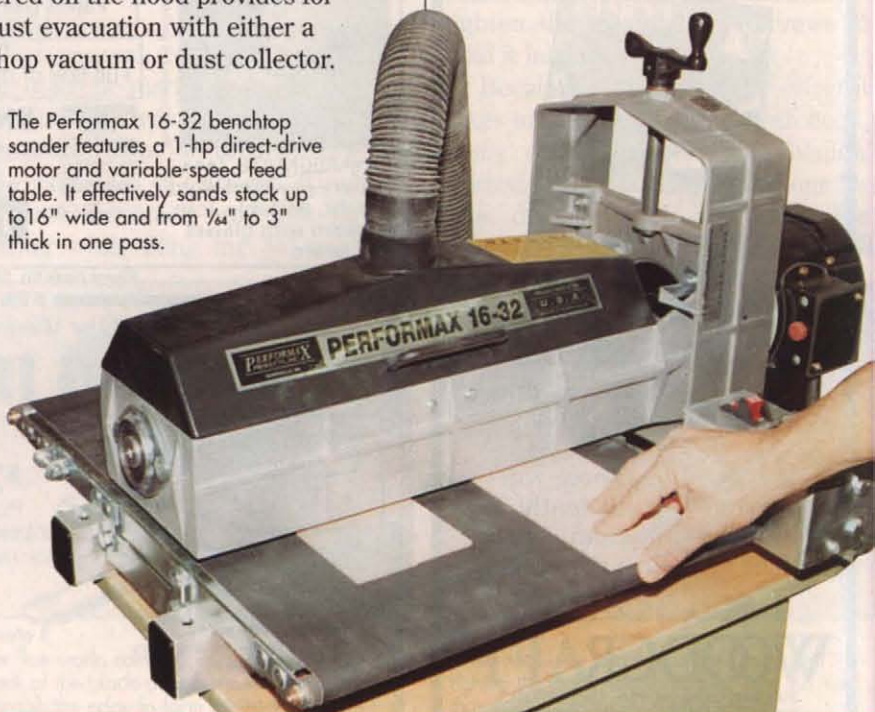
In operation, you feed the stock under the drum on a powered conveyor belt. The belt, belt platen, and infeed and outfeed tension rollers keep the workpiece firmly in position. An electronically controlled, variable-speed motor drives the belt. You can set feed speeds at anywhere from 0 to 10 feet per minute. A height-adjustment handle allows you to set drum height, and an integrated thickness gauge indicates drum operating height above the conveyor belt. One full counterclockwise turn of the handle lowers the sanding drum 1/16". A 2 1/2"-diameter port centered on the hood provides for dust evacuation with either a shop vacuum or dust collector.

The Performax 16-32 benchtop sander features a 1-hp direct-drive motor and variable-speed feed table. It effectively sands stock up to 16" wide and from 1/64" to 3" thick in one pass.

How It Performed For Me

After using the unit for over six months, I feel pleased with the sander's overall performance. I've found making abrasive changes to be fairly simple and fast, machine adjustments and alignments easy to make, and it doesn't seem to go out of adjustment with use. For example, you can take off and reinstall the cloth-backed abrasives any number of times. Changing from one grit to another takes me about a minute.

I'm especially impressed with how the 16-32 performs on thinner stock. Surfacing material thinner than 1/4" on a thickness planer is difficult without special setups, and even then you are likely to ruin a few pieces. The unit handles this type of work with ease. I've never ruined a single piece, and all stock comes out a uniform thickness and free of snipe. The same was true when I made veneer from some highly figured stock. The resawn panels easily sanded to a uniform 1/32" thickness. Wide and long stock



can be processed with the same results, but I found that longer, wider, and heavier panels need additional support. I now routinely place supporting roller stands at both the inboard and outboard sides of the machine when I work stock of these proportions.

The 16-32 ships in two separate cartons, so you have some assembly and adjustment to do. This wasn't a problem—the instructions and illustrations in the manual are clear and easy to understand. I would recommend, however, that after you've used the sander for a while and become familiar with it, you go back and fine-tune the alignments for best results. For example, by retuning the infeed and outfeed tension rollers, I managed to eliminate all sander snipe marks.

I did have trouble adjusting the pointer on the thickness gauge. Every time I zeroed the pointer and tightened the bolt, the pointer moved. I eventually placed a washer between the bolt head, then bent the pointer into final alignment.

Having used the machine for a variety of sanding tasks, I've concluded that an operator needs to get some experience with the 16-32 in order to obtain optimal performance from it. This has nothing to do with the machine; it's simply a matter of learning how to work *with* a new tool rather than *against* it.

If you expect a drum sander to remove stock with the same speed as a thickness planer, then you need to reprogram your thinking. Variables such as wood type, sandpaper grit, feed rate, and the width of the workpiece all influence how much material will be removed in one pass. The most common mistake I made at first was forcing it to remove too much material too fast. Once I got a better feel for how all

these variables affected one another, I was able to get the sander to perform well. Now, I routinely set it to remove no more than $\frac{1}{128}$ " to $\frac{1}{64}$ " per pass, using 150-grit sandpaper and moderate feed speed. And, it has one big advantage over a thickness planer—it won't tear out knots, cross-grain, or highly figured woods.

Dust is usually a problem with any sanding, but connecting a vacuum to the hood effectively removes the airborne dust created by the sander, eliminating any respiratory hazard. Because the hood also covers the drum, exposure and safety concerns are minimal. However, one should still observe the customary rules for operating power tools.

The Bottom Line

I feel that the 16-32 is well built and has plenty of power and capacity for most home or small woodworking shops. Set up and operated properly, it performs as advertised. Its ability to sand wide items perfectly flat repeatedly is a very real advantage for me. At its current price, it's obviously a major-ticket item for most of us. As with any major tool purchase, one needs to thoughtfully evaluate what type of work one wants to do and what equipment one needs to accomplish that work.

Although I didn't find any variation in price between suppliers, I did find that shipping costs varied considerably. So, you may want to check several suppliers before ordering. 

The Tool

Performax 16-32 Benchtop Drum Sander, \$799.00 plus shipping. Available from tool suppliers, woodworking catalogs, or the manufacturer. For additional information, contact:

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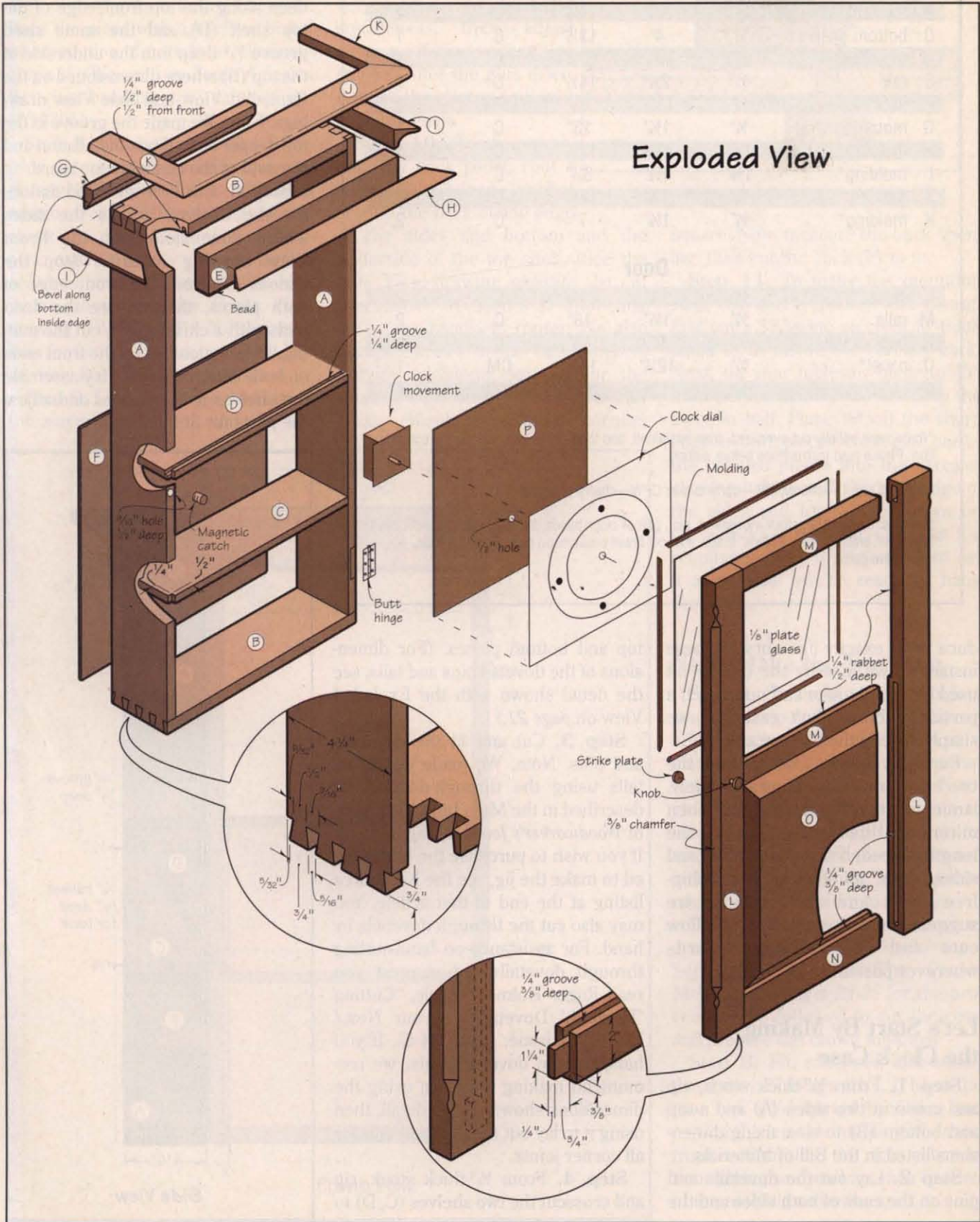
Before You Start

We sized the clock case to fit the clock dial listed under Sources at the end of the article. If you use a different dial, you may need to adjust the

case and door dimensions. The dial, clock movement, and hands may be mail-ordered from the firm listed in Sources. We suggest you purchase all of the clock parts before you start

building. The remaining hardware and the glass can be purchased at most hardware stores.

For several operations, you'll need specific tools and router bits to pro-



Bill Of Materials

Clock case

Part	T	W	L	Mat.	Qty.
A sides	¾"	4¼"	32"	C	2
B top/bottom	¾"	4¼"	14½"	C	2
C bottom shelf	½"	4"	13½"	C	1
D top shelf	½"	4¼"	13½"	C	1
E rail	¾"	2½"	14½"	C	1
F back	¼"	13½"	16"	CPW	1
G mounting strip	¾"	1¾"	13"	C	1
H molding*	1⅝"	1⅝"	17⅞"	C	1
I molding*	1⅝"	1⅝"	6½"	C	2
J molding*	¾"	1⅝"	18¼"	C	1
K molding*	¾"	1⅝"	7"	C	2

Door

L stiles	¾"	1½"	29½"	C	2
M rails	¾"	1½"	13"	C	2
N bottom rail	¾"	2"	13"	C	1
O panel*	¾"	12¼"	14¼"	CM	1
P clock mount	¼"	13"	15"	CPW	1

*Parts were initially cut oversized, then laminated, and then cut to final size during construction. Please read instructions before cutting.

Materials key: C—cherry; CM—curly maple; CPW—cherry plywood

Supplies: Brass knob, clock movement, dial, pair of clock hands, ⅝"-diameter magnetic catch, 2—2x1½" brass hinges, #18x¾" brads, #18x½" brass escutcheon pins, 6d finish nails, ⅝"-thick plate glass.

duce parts exactly like ours. In these instances, we identify the tool or bit used by brand name and number. If a particular brand isn't essential, we simply specify the bit type and size.

For convenience, we shaped the two crown molding strips separately, laminated them together, and then miter-cut this lamination to the lengths needed for the front and sides. Also, to ensure clean, chip-free dado and router cuts, we suggest you make repetitive shallow cuts and use backing boards wherever possible.

Let's Start By Making the Clock Case

Step 1. From ¾"-thick stock, rip and crosscut two sides (A) and a top and bottom (B) to size, using dimensions listed in the Bill of Materials.

Step 2. Lay out the dovetails and pins on the ends of both sides and the

top and bottom pieces. (For dimensions of the dovetail pins and tails, see the detail shown with the Exploded View on page 21.)

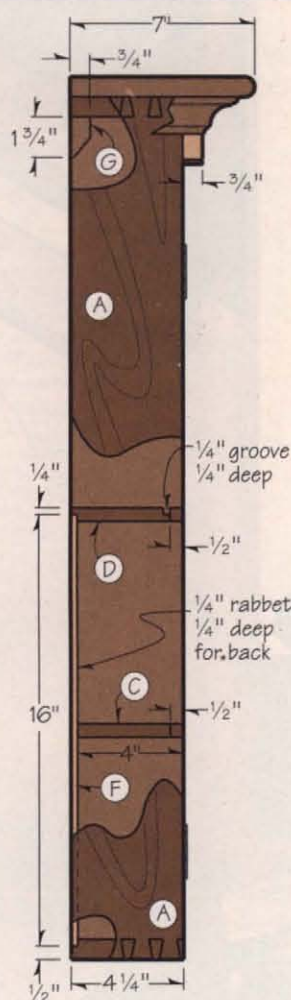
Step 3. Cut and fit the dovetails and pins. Note: We made our dovetails using the through-dovetail jig described in the May/June 1994 issue of *Woodworker's Journal*, pages 38-45. If you wish to purchase the kits needed to make the jig, see the Kit Source listing at the end of that article. You may also cut the through dovetails by hand. For assistance on hand-cutting through dovetails, we suggest you read Roger Holmes' article, "Cutting 'Through' Dovetails" in our Nov./Dec. 1994 issue, pages 34-45. If you hand-cut the dovetail joints, we recommend making a pattern using the dimensions shown on the detail, then using it to lay out the pins and tails for all corner joints.

Step 4. From ½"-thick stock, rip and crosscut the two shelves (C, D) to

the dimensions listed in the Bill of Materials. Note: The top shelf measures ¼" wider than the bottom shelf. (We planed some ¾"-thick stock to the ½" thickness.)

Step 5. Cut the ¼"-wide groove ¼" deep along the top front edge of the top shelf (D) and the same sized groove ½" deep into the underside of the top (B) where dimensioned on the Exploded View and Side View drawings. Note: We made the groove in the top deeper to facilitate installation and removal of the clock mount board.

Step 6. Cut ½"-wide blind dadoes for the shelves across the sides where dimensioned on the Front View drawing *opposite*. Stop the dadoes ½" from the front edge of both pieces, then square the dado ends with a chisel. Next, cut the mating ½"-long notches on the front ends of both shelves. Now, dry-assemble the shelves in the dadoes and adjust the parts for fit if necessary.



Side View

Step 7. From $\frac{3}{4}$ "-thick stock, cut the top rail (E) to fit the clock case front. Next, fit your table-mounted router with a $\frac{1}{8}$ "-diameter edge-beading bit, and rout the bead along the front face and both ends of the rail as shown in figure 1 at *right*. Back the piece with a backing board when routing the ends to eliminate chip-out. (We used an Eagle America $\frac{1}{8}$ " edge-beading bit, catalog no. 163-0205.)

Step 8. Finish-sand all parts. (We used an orbital disc sander and progressively finer sandpaper with grits ranging from 100 through 220.) Next, check the dimensions of your magnetic catch, then lay out and bore a centered hole for it on the side edge where shown on the Front View drawing. (We drilled a $\frac{5}{16}$ "-diameter hole for our catch, then epoxied it into the hole flush with the edge.)

Step 9. Glue, assemble, and clamp the sides, top, bottom, and shelves.

Note: Align the front edge of both shelves with the front edge of the sides. Using a damp cloth, wipe off any glue squeeze-out. Measure the case diagonally from corner to corner to check for squareness, then adjust clamps if necessary to square. After the glue dries, remove the clamps and sand all joints flush.

Step 10. To accommodate the back panel, rout a $\frac{1}{4}$ "-wide $\frac{1}{4}$ "-deep rabbet around the back inside edge of the sides and bottom and the underside of the top shelf. (See the Side View drawing *opposite*. To cut this rabbet, we used a $\frac{1}{4}$ " rabbeting bit in our handheld router. We also clamped a 2x4 to the case sides to provide additional support for the router's base during this operation.) Next, chisel the rabbet corners

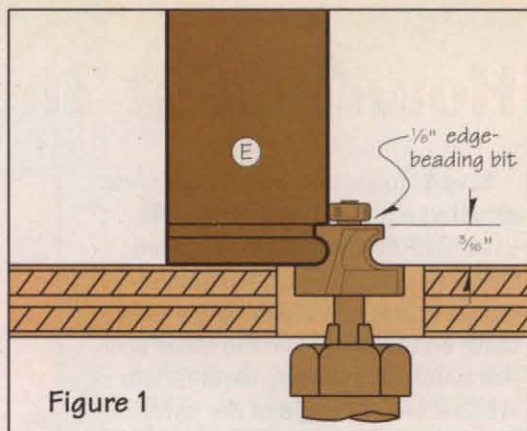


Figure 1

square. Now, measure the back opening, then cut the back (F) to fit.

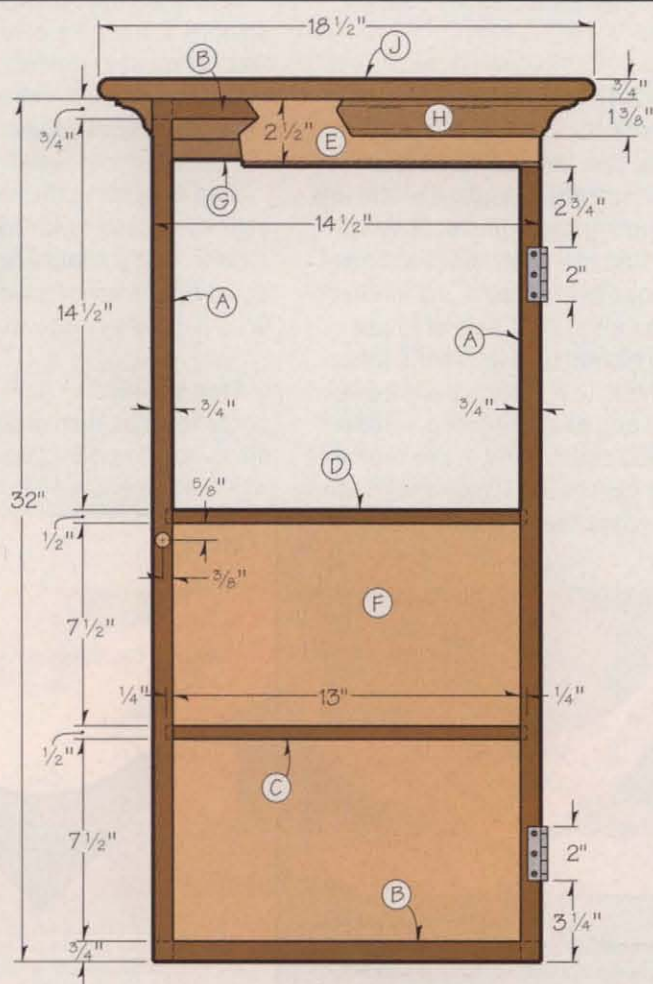
Step 11. To make the mounting strip (G) and a mating wall mount, first cut a $3\frac{3}{4}$ "-wide piece of $\frac{3}{4}$ "-thick stock to fit inside the carcass back. Next, tilt your tablesaw blade to 45° from perpendicular, and bevel-rip the piece in half. Plane $\frac{1}{8}$ " off the sharp edge on both pieces. Now, glue one of the beveled pieces into the carcass, aligning it flush with the back edge of the sides and top where shown on the Side View drawing. Crosscut the remaining piece to 9" long, then set it aside until you're ready to hang the clock.

Next, Make the Top Trim

Step 1. To make up the molding stock, first rip and crosscut a piece of $\frac{3}{4}$ "-thick cherry to $2\frac{1}{2} \times 36$ ". Cut a piece of $\frac{3}{4}$ "-thick pine or other scrap wood to the same dimensions. Next, glue and clamp the two pieces face to face. After the glue has dried, joint one edge of the laminated piece to square and straighten it. Then, rip the other edge, cutting the piece to 2" wide.

Step 2. Set up your tablesaw to produce a $\frac{1}{2}$ "-deep $1\frac{1}{2}$ "-wide cove. See "How To Cut The Crown Molding" on pages 24-25 for the procedures we followed to cut the cove and prepare the crown molding.

Step 3. Fit, miter-cut, and attach the crown moldings (H, I, J, K) to the case top. (We started by fitting and cutting the left side molding, then the front section, then the right side section, gluing and nailing each section of the molding as we worked).



Front View

How To Cut The Crown Molding

Step 1. To set the fence angle, first elevate your saw blade to $\frac{1}{2}$ ". (We used a 10" 50-tooth carbide-tipped blade.) Next, set a parallel gauge with one arm just touching the exit tooth on the blade and the other arm just touching the entry tooth (*photo A*). Capture the angle of the parallel gauge with a bevel gauge (shown),



Photo A
Elevate saw blade $\frac{1}{2}$ " above table, then use a parallel gauge to establish the angle to set on the bevel gauge.



Photo B
Using angle on bevel gauge, set auxiliary rip fence $\frac{1}{4}$ " from exiting tooth on saw blade.



Photo C
Set the blade $\frac{1}{16}$ " above the saw table, then cut the cove. Raise blade in $\frac{1}{16}$ " increments, repeating the cut until you reach $\frac{1}{2}$ " depth.



Photo E
Wrap sandpaper around a cylindrical form (we used foam pipe insulation), then finish-sand the cove.

combination square, or machinist's protractor. Then, set an auxiliary rip fence at that same angle and clamp it to the saw table, leaving $\frac{1}{4}$ " clearance between the fence and the exiting tooth on the saw blade (*photo B*).

Step 2. To start cutting, lower the saw blade to $\frac{1}{16}$ " above the table surface, turn the laminated piece cherry-face down, and make the first cove-cutting pass (*photo C*). Work slowly and use push sticks to help keep your hands free of the blade. You may also find it helpful to use featherboards to stabilize the piece while feeding it. Rotate the piece end for end and pass the piece across the blade again. Now, make repeated cutting passes in $\frac{1}{16}$ " increments until you get near the $\frac{1}{2}$ " depth. Make the



Photo D
Remove machine marks from cove with curved, handheld cabinet scraper shaped to fit the cove contour.



Photo F
Place the workpiece cove-side down, then bevel-rip the lamination at 45° (along lines B-B') to remove the back corners or waste.

last two or three cuts in $\frac{1}{32}$ " increments until you reach final depth. Making fine cuts helps reduce the cove cleanup time.

Step 3. Scrape, then sand the cove smooth. We used a curved hand cabinet scraper to work out the machining marks (*photo D*). We then finish-sanded the cove (*photo E*).

Step 4. To make the next cuts, tilt your saw blade to 45° from perpendicular. Using *photo F* for reference, bevel-rip the coved piece along both lines B-B' where shown on *figure 2*.

Step 5. Reset the saw blade to perpendicular, then make the cuts along both lines C-C' where shown in

Figure 2

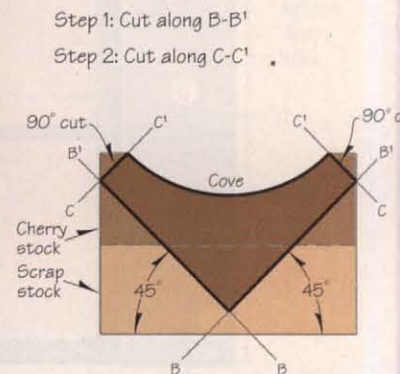




Photo G
Place the workpiece flat on its newly cut surfaces, then rip the corners perpendicular to them (along lines C-C').

photo G and *figure 2*. Note: When you set the fence for this cut, make certain you leave a $\frac{1}{4}$ "-wide shoulder next to the cove. The heavy lines shown on *figure 2* outline the profile of the finished piece.

Step 6. Joint and rip the edges of a 36"-long 2x4 carrier board to make certain the edges are parallel. Next, adhere the workpiece to this board using double-faced carpet tape. Now, fit your table-mounted router with a $\frac{3}{16}$ "-radius beading bit, and rout one edge of the workpiece (*photo H*).

Step 7. Switch to a $\frac{3}{16}$ "-radius cove bit, and turn the workpiece over. Then, with the bearing against the cove, rout a cove along its opposite edge (*photo I*).



Photo I
Using a $\frac{3}{16}$ "-radius piloted cove bit, rout a shallow cove along the inside edge of the opposite corner of the workpiece.



Photo H
Rout along the inside edge of one corner using a $\frac{3}{16}$ "-radius piloted beading bit, with the bearing riding against the cove.

Step 8. Set up your tablesaw as shown in *photo J*, and cut a shoulder (a shallow kerf) along the top of the cove to break the edge.

Step 9. Rip and crosscut a piece of $\frac{3}{4}$ "-thick cherry to $2\frac{1}{4}$ " wide and 36" long. Note: We initially cut this piece extra wide in case we damaged the front edge. Next, rout one edge of the piece. (We used a $\frac{3}{4} \times \frac{3}{16}$ " half-radius bull-nose bit, Eagle America catalog no. 161-1205, and set it to cut both edges uniformly.) Then, rip the piece to a 2" final width.

Step 10. Glue and clamp the two trim pieces face to face, aligning them along the flat back edges. After the glue has dried, remove the clamps. The combined molding is now ready for fitting to the clock carcass.



Photo J
Elevate the saw blade, and cut a shallow kerf along the top edge of the cove to break the cove's edge.

Let's Cut and Assemble the Door

Step 1. From $\frac{3}{4}$ "-thick stock, rip and crosscut two stiles (L), two rails (M), and one bottom rail (N) to the dimensions listed in the Bill of Materials. To avoid errors later, letter-code the parts and mark outside faces and top and bottom edges on each piece now.

Step 2. Cut the mortises into the stiles as dimensioned on the Door Assembly drawing *below* and on the detail that accompanies the Exploded View drawing. Next, cut mating tenons on the ends of the rails as dimensioned on the same drawings.

Step 3. Using your tablesaw and a dado head, cut centered, $\frac{1}{4}$ "-wide, $\frac{3}{8}$ "-deep blind grooves along the inside edges of the stiles where shown on the Door drawing on *page 26*. Note: The grooves start and end in the mortises. Next, cut same-sized full-length grooves along the top edge of the bottom rail and the bottom edge of the middle rail.

Step 4. Finish-sand the door parts. Next, lay out the ends of a $\frac{3}{8}$ " chamfer along the outside edge of each door stile, starting 3" from the bottom and $2\frac{1}{2}$ " from the top. If you wish to add the decorative "lamb's tongue" at the ends of each chamfer as we have, see "Forming the Lamb's Tongue" on *page 26* and follow the instructions detailed there before proceeding. If you wish to make just a simple cham-

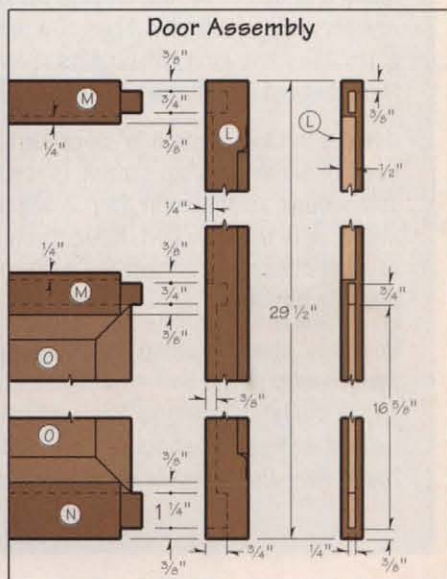
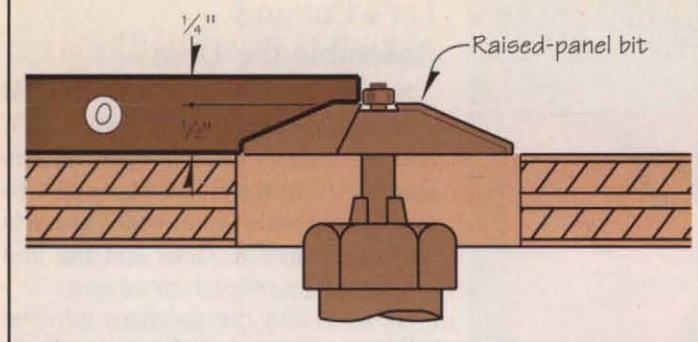


Figure 3

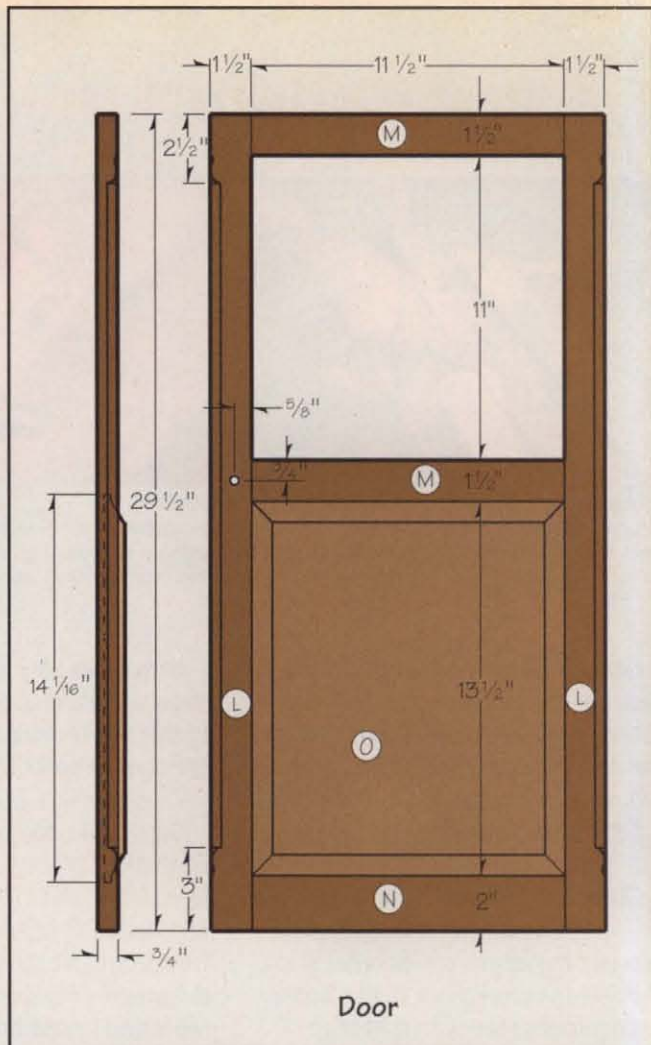


fer, rout it now using a chamfer bit in your table-mounted router, starting and stopping at the marks. Sand the arc at the chamfer ends square to the edge, then scrape the chamfer if necessary to remove machine marks. Now, finish-sand the door parts.

Step 5. Dry-assemble (without glue) the door frame and check its fit on the clock case. Next, measure the bottom opening (inside edge to inside edge), and add $\frac{3}{8}$ " to both dimensions for the raised panel's final size. To make the raised panel (O), first edge-join two $6\frac{1}{2} \times 15$ " pieces of $\frac{3}{4}$ "-thick stock. (We tried to match the two pieces of curly maple as much as possible to show off the panel's grain.) After the glue has dried, sand and scrape both surfaces smooth. Then, square and trim the panel to match the door's panel opening, cutting equal

amounts from both edges to keep the glue joint centered in the panel.

Step 6. Bevel the panel edges using the router setup shown in figure 3 above. (We used our table-mounted router and a raised-panel bit, Freud catalog no. 99-211). As with all routing jobs of this type, make small incremental cuts, use a backing board for the first cuts, and always rout the ends before the edges to minimize end-grain chip-out.



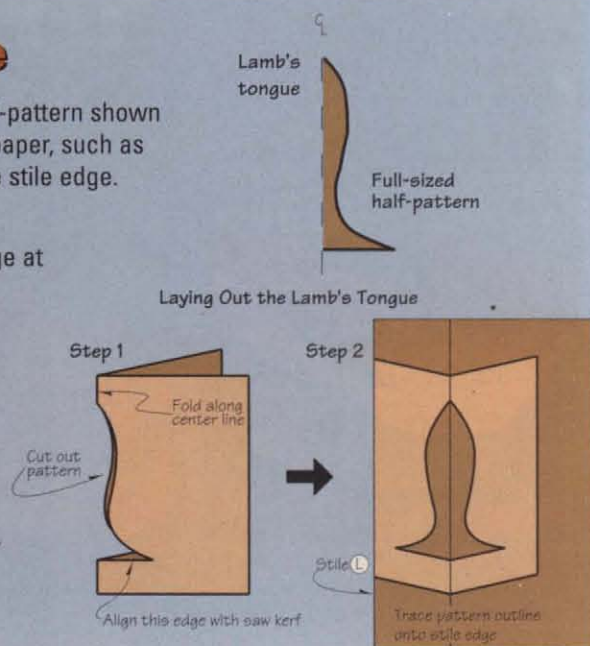
Continue routing until the panel lip measures a hair less than $\frac{1}{4}$ " thick

Forming the Lamb's Tongue

Make a template by first tracing the full-sized Lamb's Tongue half-pattern shown at right along the folded edge of a piece of paper. Use fairly stiff paper, such as a 3x5" file card, so it will hold its shape when wrapped around the stile edge. Next, cut out the shape as shown in Step 1 of the drawing below.

Using a backsaw, cut a $\frac{3}{8}$ "-deep kerf angled at 45° to the stile edge at each chamfer stop/start mark. Place the folded template over the stile's edge as shown in Step 2, aligning the bottom edge of the cutout with the saw kerf. Now, trace the pattern onto each end of both stiles. Note: Invert the pattern for the lamb's tongue at the stile bottoms.

Rout a $\frac{3}{8}$ " chamfer along the stile edge, starting and stopping the chamfer at the saw kerf. Then, finish the chamfer, and shape the lamb's tongue. We made small cuts with a chisel initially, then finished shaping the tongues using a small round file. Make very shallow cuts so the tongues won't get too deep.



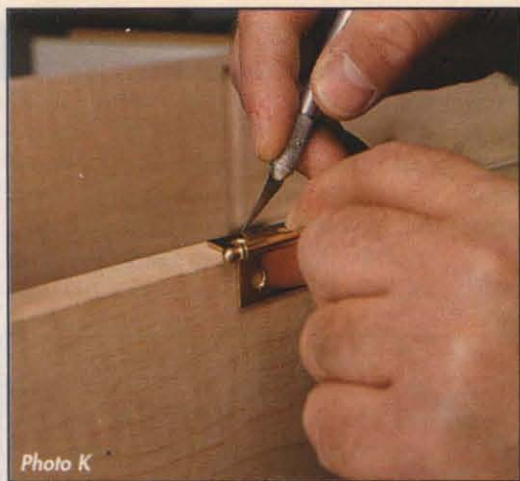


Photo K

and fits nicely in the door-frame groove. Then, scrape and sand the beveled edge to remove any machine marks.

Step 7. Apply glue, assemble, and clamp the door. Note: To avoid wood movement problems, allow the raised panel to "float" freely (without glue) in its groove. Wipe off any glue squeeze-out. Next, square the door, measuring diagonally from corner to corner. After the glue has dried, remove the clamps and sand all door joints flush.

Step 8. Using a handheld router and rabbeting bit, rout a $\frac{1}{4}$ "-wide $\frac{1}{2}$ "-deep rabbet around the back inside edges of the upper door opening to accept the glass. Then, square the rabbet corners using a sharp chisel.

Step 9. Make the quarter-round glass-retaining molding. (We routed a $\frac{1}{4}$ " round-over along both edges of a $\frac{1}{4}$ "x3"x25" piece of cherry stock. Then, we ripped the $\frac{3}{8}$ "-wide quarter-round from both edges.)

Step 10. Fold the hinges over the door edge where dimensioned. Then, as shown in *photo K*, cut around the edge of each hinge using a sharp knife to score the wood. Remove the hinge, and chisel a mortise to the depth equal to the hinge plate thickness. Temporarily screw the hinges to the door, position the door on the case, and score the hinge locations on the edge of the clock case. Now, remove the hinges from the door, and follow the same procedures to mark and cut the hinge mortises into the case edge.

Apply the Finish, Then Add the Finishing Touches

Step 1. Fill all nail holes. Then, apply your choice of finish to the case, door, glass molding, and clock panel. (We applied three coats of Minwax Antique Oil, rubbing it between coats with 0000 synthetic steel wool. We rubbed out the final coat with a cotton cloth, then applied a coat of Butcher's Wax, buffing it to a low gloss.)

Step 2. Cut the clock-mount panel (P) to size from $\frac{1}{4}$ "-thick cherry plywood, then fit it into its grooves in the case. Position the clock dial against the panel, center it from side to side, and mark the dial hole. Then, remove the panel, and bore the $\frac{1}{2}$ " hole where marked.

Step 3. Adhere the dial to the panel front. (We used strips of double-faced carpet tape along the top and bottom of the dial to hold it in place.) Next, attach the clock movement to the back of the panel, and attach the hands to the clock. (We shortened the minute hand about $\frac{3}{8}$ ".) Now, insert the battery and install this assembly in the case.

Step 4. Measure the glass opening, and have a local supplier cut a piece of $\frac{1}{8}$ "-thick plate glass to fit the opening. Next, place the glass panel into the door opening, then miter-cut the glass retaining-molding to fit each of the four sides. Nail—do not glue—the glass molding in place. (We pilot-drilled the molding, then drove three $\#18$ x $\frac{5}{8}$ " brass Escutcheon pins through each piece to hold the glass in its rabbet.)

Step 5. Lay out the centerpoint for the door knob. Drill a pilot hole, then attach the knob. Next, attach the hinges to the door, then to the case. Finally, lay out the centerpoint for the strike plate on the inside of the door opposite the magnetic catch. (We placed a flathead tack on the magnet and closed the door far enough to mark the screw location for the strike plate.)

Then, screw the strike plate to the door. Now, nail the back (F) to the case.

Step 6. To wall-mount the clock, attach the 9"-long mounting strip (made in Step 11 on *page 23*) to the wall with the bevel sloping up and away from the wall. Then, place the clock over the strip so it interlocks with the mounting strip on the clock case. 

Sources

Clock Movement, Dial, Hands.

11 $\frac{1}{2}$ "x12 $\frac{1}{2}$ " Terry dial with center hole: catalog no. 087063, \$7.95. Quartz movement: catalog no. 812021, \$16.95. Battery clock hands: catalog no. 816012, \$0.75. Credit card orders accepted. Order from:

S. LaRose, Inc.
234 Commerce Place
Greensboro, NC 27420
Telephone: 919/275-0462.

Hardware. Brass ball-tipped hinges, 2x1 $\frac{3}{8}$ ": catalog no. 73A57, \$4.45/pair. $\frac{7}{16}$ " brass knob: catalog no. 64C4A, \$0.60. $\frac{9}{16}$ "-dia. magnetic catch with strike plate: catalog no. 55F25, price: \$0.90. \$10.00 minimum order. Shipping and handling extra. Credit cards accepted. Order from:

Albert Constantine and Son, Inc.
2050 Eastchester Rd.
Bronx, NY 10461
Telephone: 800/223-8087

Drawings: Cad Art

Lead Photographer: StudioAlex

Other Photographs: Kevin May

READER LETTERS

Continued from page 8

Dennis, thanks for your kind words and insightful comments. We especially applaud your challenge to the public and industrial sectors to find ways to make technical education more responsive and current. 

We welcome opinions and comments (both pro and con) from our readers. Address correspondence to: Letters Dept., *Woodworker's Journal*, News Plaza, P.O. Box 1790, Peoria, IL 61656. Please include your full name, address, and telephone number.



Making and Fitting a Dovetailed Drawer

by Roger Holmes

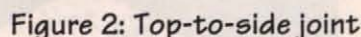
*Traditional methods
for a sweet slider*



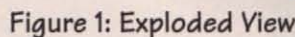
The two-drawer chest fits nicely under a table (left), forming a handy desk, or stands alone at the bedside (above) for a convenient nightstand.

Traditional drawer joinery isn't easy and takes time to master—I got the hang of it after about the tenth drawer I made. Why bother, you may ask, when machined joints and high-quality ball-bearing drawer slides pro-

Above all, a carcass made to house drawers must be square. You'll have trouble achieving anything but a rat-



After you've cleaned up the edge-joined panels (I handplane them to remove glue and slight misalignments of the faces), square the ends to the front edge with a sharp handplane. Check each panel individually using an accurate framing square, then try the pairs together (side by side, top to bottom) to make sure they match in both dimensions. An old-timer once told me he made the carcass just a tiny bit wider at the back than at the front—the difference being the thickness of a sheet of heavy paper!—so the drawer would fit tightly at the front but a bit more loosely at the back. I just try to get the panels square.



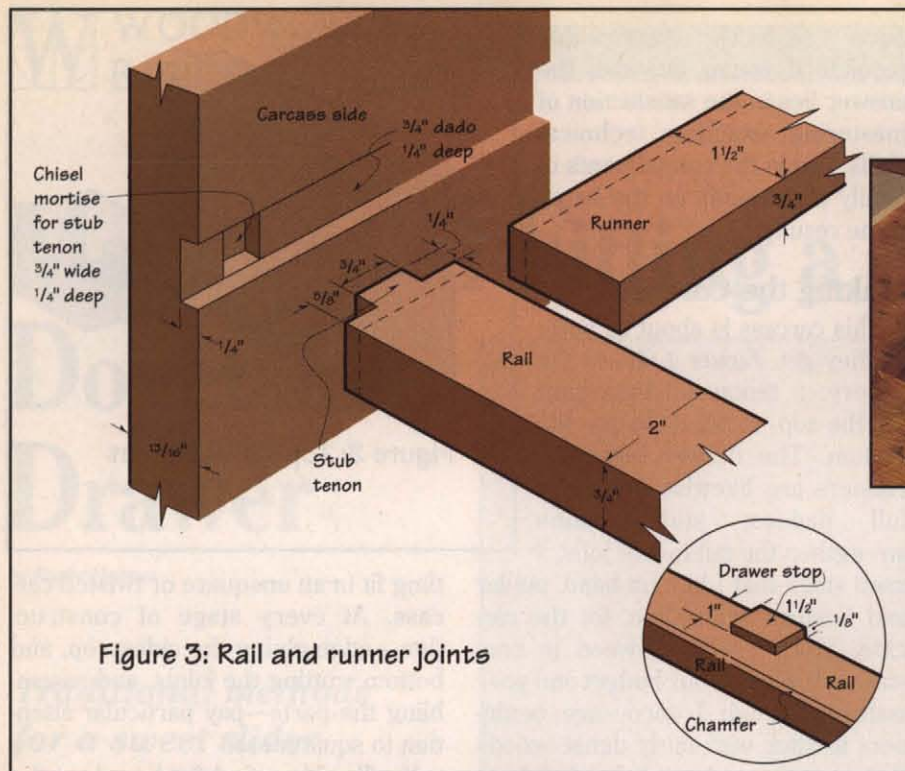


Figure 3: Rail and runner joints

If you square the panels, then the joints will be square, too. I machined all the joints on the tablesaw using a rip fence. To cut the dadoes, I laid each panel facedown on the saw table. I made a pass using a single blade to establish each dado shoulder, then cleared the waste between the kerfs freehand using a router. (The narrow dado for the top-to-side joint required only the two saw kerfs.)

To create the tenons on the top (figure 2), first make a shoulder cut with the panel facedown. Then, reset the fence, and stand the panel

on end to cut the tenon to thickness. A snug fit makes for strong dado joints, so make sure there is contact between all surfaces and that there are no gaps. I cut the dadoes slightly narrower than the thickness of the mating panel or tenon, then take shavings off the face of the mate with a handplane until the joint fits tightly.

Rails and runners support the drawers. To reinforce the rail-to-side joint, I cut a stub tenon on each rail end and

Photo G ▼

A shop-built shooting board and a sharp handplane help square up the drawer sides.



chiseled a mortise for it at the bottom of the side dado (figure 3, photo D). Seating the runners in dadoes takes more work than just screwing them to the carcass sides, but it ensures accurate alignment that won't alter with wear and tear over the years.

Gluing up even a simple carcass like this can be nerve-wracking, particularly on a hot day when the glue sets up fast (photo E). If you prepare thoroughly by doing a complete clamp-up without glue, and then work methodically when you do glue, you'll minimize potential headaches. (I don't glue the runners permanently in place until I've first fitted the drawers.)

Preparing the Drawers

For these drawers, I used poplar fronts (to match my daughter's

◀ Photo D

This simple carcass assembles entirely with dado joints cut on the tablesaw. Here the author checks the fit of a drawer rail in the carcass side.



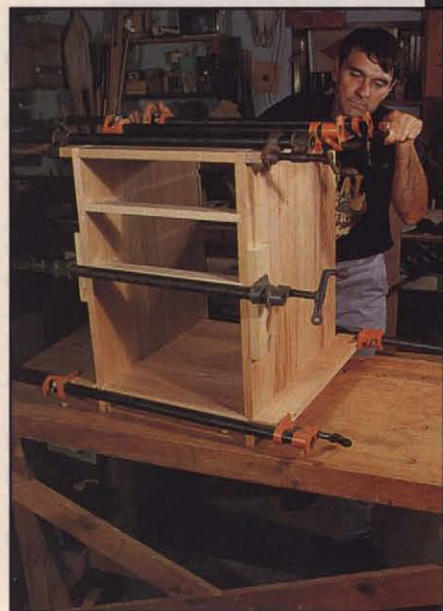
Photo F ▼

After fitting the drawer front to its carcass opening, use the front as a template to mark the length of the drawer back.



◀ Photo E

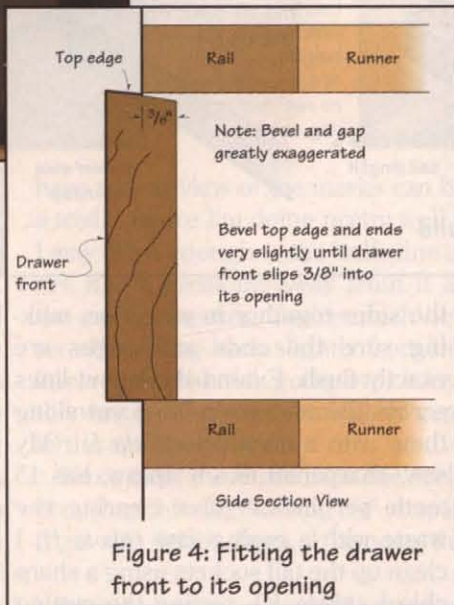
Pipe clamps bearing on stout wooden battens pull the carcass together. The bearers for the carcass bottom are curved slightly along their length to help exert additional pressure on the middle of the joint, where pipe clamps can't reach.





◀ Photo H

Set a marking gauge to the length of the tails, then scribe lines on the ends of the drawer front as shown here. Use the same setting to scribe lines around the drawer side, as shown in figure 5.



The board was clear and had been cut very near the tree's heart, giving it the same ring orientation as quartersawn lumber. When the rings run perpendicular to their faces, boards shrink

only minimally across their width and are less prone to twisting.

To ensure flat, square stock, carefully machine the drawer fronts, sides, and backs on the tablesaw, jointer, and planer. I cut the fronts just barely larger than their openings and add an extra $\frac{1}{2}$ " or so of length to the backs. Novices frequently make drawer sides too thick—I make mine $\frac{1}{4}$ ", although they could be as thin as $\frac{5}{16}$ " (with drawer slips added to support the drawer bottom).

Next, square the ends of the fronts and sides to their bottom edges. As I plane the drawer fronts, I repeatedly test-fit them in their respective openings, taking fine shavings until they slip in only $\frac{3}{8}$ " or so, with no gaps visible around the perimeter. Beveling the top edges and ends ever so slightly back from the front face eases this task (figure 4). Now, mark and cut the back to the same length as the inside face of the drawer front; just use the front as a template (photo F).

To square up the thin drawer sides, I find that a shooting board comes in handy (photo G). Once I've squared the ends, I plane the top edges of the drawer sides so they can be pushed about halfway into their openings, taking off just enough so there's as little play up and down as possible.

Laying Out and Cutting the Tails

I dovetail the drawers front and back. The dovetails at the front, called "half-blind" or "lap" because you see

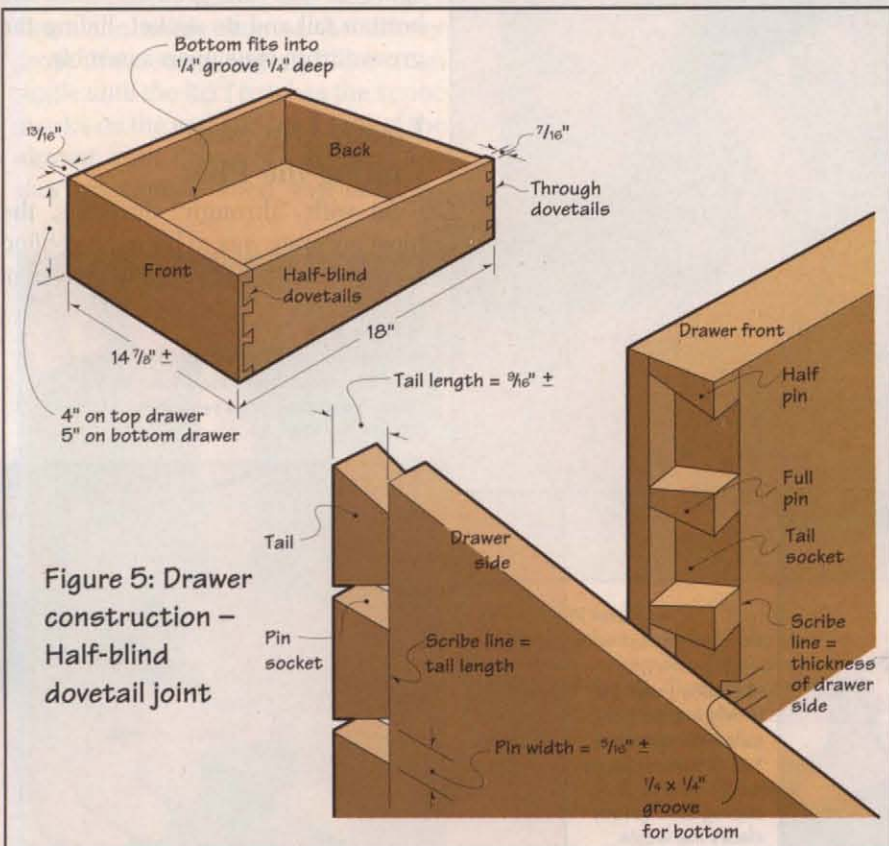


Figure 5: Drawer construction - Half-blind dovetail joint

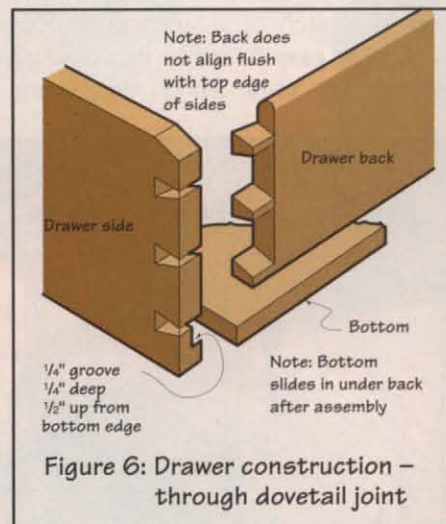


Figure 6: Drawer construction - through dovetail joint

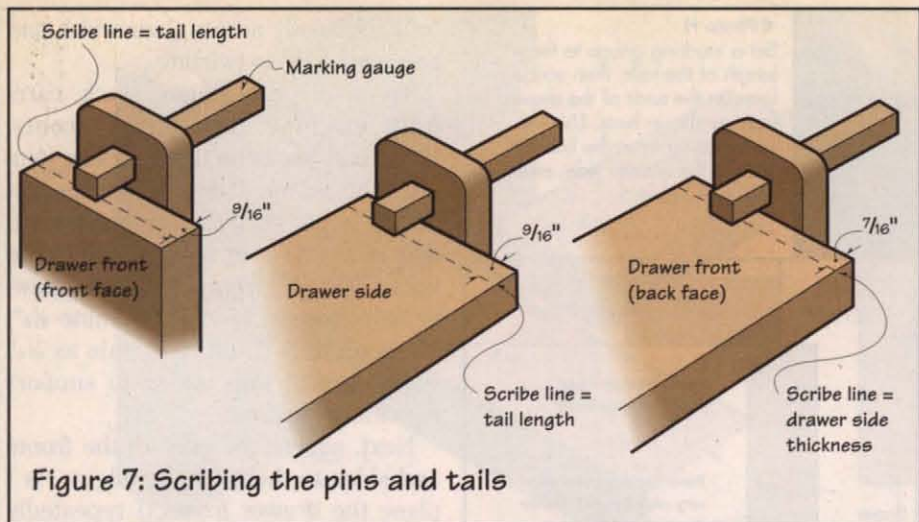


Figure 7: Scribing the pins and tails

them from the side only, are a bit trickier to cut than the "through" dovetails at the back (figures 5 and 6).

To lay out the front dovetails, first scribe the tail length on the drawer fronts and sides and the thickness of the sides on the fronts with a marking gauge (figure 7, photo H). Next, lay out the tails on one of the drawer sides. I locate the centerlines of the pins and half-pins right on the drawer side using the technique shown in figure 8.

As for dimensions and spacing, I like wide pins and narrow tails, although this is a matter of taste. Make the pins slightly wider than a chisel in your set (this makes cleaning out the sockets easier), and remember that you have to be able to fit a knife into the pin sockets to mark the tails onto the drawer front. Because I make my pins fairly narrow, I lay out the "half-pins" at the edges slightly wider than half of a full pin to provide extra strength.

I mark the tails with a sliding bevel set to a pitch of about 1 in 7. Thin sides are easy to cut in pairs, which speeds the work. To do this, clamp

the sides together in your vise, making sure the ends and edges are exactly flush. Extend the layout lines across the end grain, then cut along them with a backsaw (photo I). (My saw, sharpened like a rip saw, has 15 teeth per inch.) After clearing the waste with a coping saw (photo J), I clean up the tail sockets using a sharp chisel (photo K), resting the cutting edge in the scribed line for the final cut. Two sawcuts right to the scribed



◀ Photos I and J ▶
I: When cutting the tails, you can saw two drawer sides as easily as one. J: A coping saw quickly clears the waste.

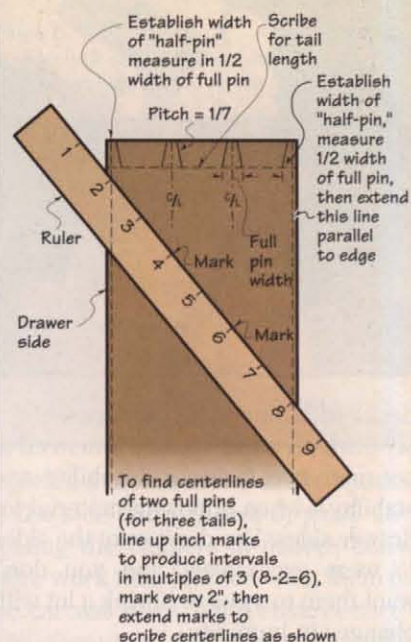


Figure 8: Laying out pins and tails

line remove the half-pin waste on the edges of the side.

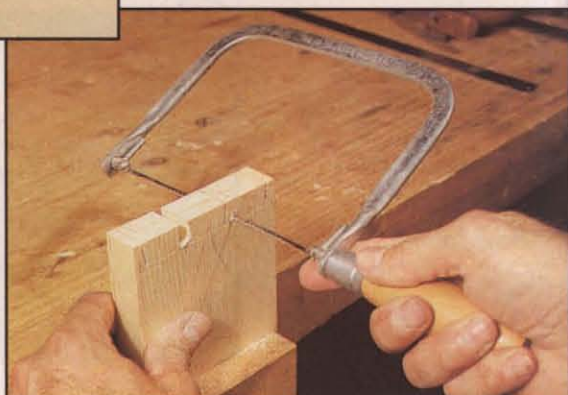
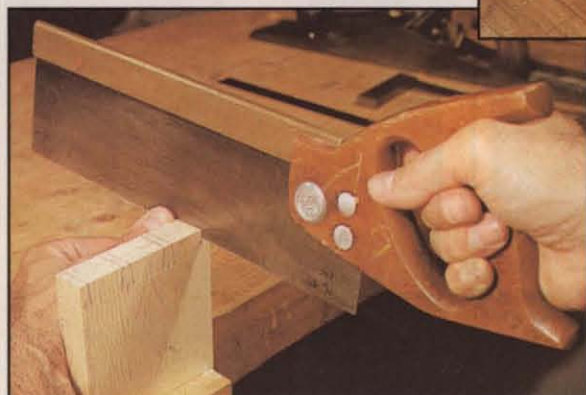
Next, I cut the grooves for the drawer bottoms with a couple of passes over the tablesaw. (Sometimes I leave the half-pin waste in place while cutting the grooves to protect the tails from inadvertent bumps.) Note in figure 5 how the grooves cross the bottom tail and its socket, hiding the groove from view upon assembly.

Laying Out and Cutting the Pins

As with "through" dovetails, the most accurate way to lay out half-blind pins is to use the mating tails as a tem-

◀ Photo K

A bevel-edge chisel just slightly narrower than the pin socket is ideal for cleanup. Here, the cutting edge rests in the scribed line for the final cut.





◀ **Photo L**
Square the side to the drawer front, then knife into the end grain along the edges of the tails to establish the exact positions of the pins.



Photo M ▶
To form the pins and tail sockets, start with an angled sawcut as close to the knifed lines as you can get.

plate (*photo L*). Clamped in the vise, the drawer front supports the tails, while a piece of scrap wood on the benchtop supports the rest of the side. To help align the pieces, I slip a small strip of the drawer-bottom plywood in the grooves where side and front meet. Then, I position the side by eye so its end barely covers the scribe mark on the end of the drawer front. A quick check with a small square tells me whether the bottom edge of the drawer side is square with the front face of the drawer. Carefully pressing the side to hold it in place, I scribe along the edge of each tail with a sharp, thin-bladed chip-carving knife.

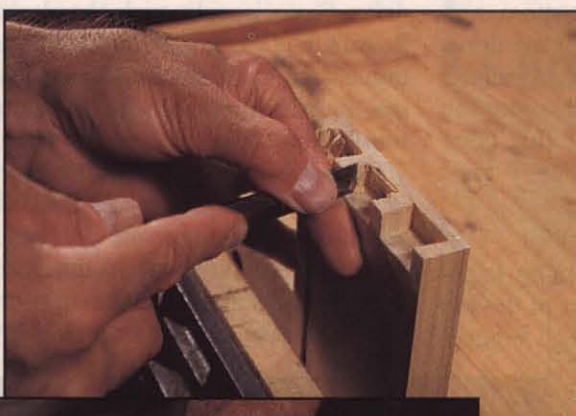
Cutting to these knife marks is the hardest step in making this joint. With a pencil, extend the knife lines down the inside face of the drawer front. Now, saw along each line at an angle until the kerf reaches the scribe marks on the end and back face of the drawer front (*photo M*). Keeping the saw on course when you don't

have a clear view of the marks can be a trial. I figure I'm doing pretty well if I stay close enough to the knife line to see fibers breaking away from it as the cut progresses. You're much better off holding back slightly from the line, rather than risk going over it into the waste and creating unsightly gaps in the assembled joint.

Next, clear the waste from the sockets using chisels. Working $\frac{1}{16}$ " or so in from the scribe lines, I remove the

bulk of the waste by chopping perpendicular to the back face, then popping the waste out from the end (*photos N and O*). I then trim carefully to the scribe lines, striving to split the lines in half (*photos P and Q*). I use a skew carving chisel to clean out the bottom (end-grain) surface of the socket in the acute-angled corners. I undercut the surfaces of the finished socket very slightly (about the thickness of one or two fine shavings) to ensure a tight fit. I start undercutting at least $\frac{1}{16}$ " from the surfaces of the end and face so that any light planing after assembly won't reveal gaps between parts.

When everything looks good, I work a



◀ **Photos P and Q** ▼
Pare away the final waste with sharp chisels, splitting the scribed lines in half.



◀ **Photos N and O** ▲
N: Remove the bulk of the waste from the sockets by working down from the face and in from the end. **O:** Clamp the drawer front to your bench or work against a bench stop when chopping horizontally.

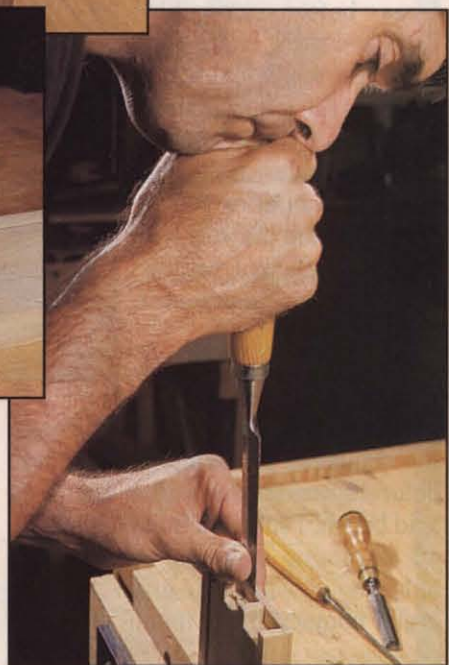




Photo R
After pushing the joints together by hand, you can drive the tails home with a few sharp raps on a narrow hardwood block.

Photo S ▶
Resting on a piece of chipboard clamped to the bench, the faces of the drawer sides, front, and back are well supported for planing during fitting.



slight chamfer on the arrises of the tails to ease insertion. Then, I check the fit by gently tapping the tails no more than half the way into the sockets.

The procedures for laying out and cutting the through dovetails for the back-to-side joints differ from those for half-blind dovetails mainly in that removing waste from the tail sockets is much easier. (For a detailed description of through dovetailing, see the article in the Nov./Dec. '94 issue.) As *figure 6* shows, the back rests upon the drawer bottom and doesn't extend to the top of the drawer sides. I position the upper half-pin on the back about $\frac{3}{8}$ " below the top edge, so I can round over that edge before assembly.

Assembling the Drawer

If you've cut and fitted the joints well, you've made this part of the job easy. To make it even easier, I suggest finishing the inside surfaces before assembly. Sand and apply finish only up to the scribe lines, not to any of the joints' mating surfaces. A single coat of sanding sealer (followed by paste wax after you've final-fitted the drawer) will provide sufficient protection for the insides of most drawers.

When you're ready to glue up, arrange all of the parts and supplies and work through the sequence of events in your mind before spreading any glue. Using an acid brush, I spread a thin coat of glue on all mating surfaces, even though only those with side-grain to side-grain contact have much strength.

Laying one drawer side on a newspaper-covered benchtop, I push home the drawer front and back as far as I can using hand pressure only. Then, I quickly add the remaining side. A few raps on each tail with a hammer on a narrow hardwood block will often seat the joint (*photo R*). To make doubly sure the joints have seated, I usually apply pressure to the block over each tail with a pipe clamp. If the joints fit snugly, you won't need to leave any clamps on while the glue dries. Some people push the drawer bottom in place at this time; if the bottom is square, this can help square up the drawer. I prefer to leave the bottom off until later.

Place the bottom edges of the drawer on a flat surface (I use a saw table), and check for squareness by measuring across the diagonals. A little hand pressure on appropriate corners will usually suffice to even up the mea-

surements. Then, tap down on each corner to see if the drawer rocks, indicating twist. To cure this problem, place weight on the raised corner and the one diagonal to it.

Fitting the Drawer

A well-fitted drawer should slide easily in and out of the carcass. Because wood expands and contracts very little across its thickness or along its length, you can fit each drawer in its opening with very little play from side to side.

Wood movement across the grain is what causes problems. I once made an entire kitchen using traditional dovetailed drawers and fitted them so that they operated like so many wooden pistons. Unfortunately, I did the fitting in the winter when it was bone-dry in the house. Come spring, the owner phoned to say she couldn't open a single drawer—the increased humidity had swelled them all shut. Where humidity fluctuates significantly in a house from season to season, it's best to fit drawers during a period of highest humidity, or at least to anticipate the consequences of that humidity if you must fit them at another time.



Photo T ▲
Fitting requires patience and repeated trips from the bench to test-fit the drawer in the opening.

Photo U ▶
Tolerances from side to side can be very fine; this drawer (shown from the back of the carcass) slides easily with very little horizontal play.



At the beginning of the fitting process, I always check the inside faces of the carcass sides for flatness using a straightedge. If they're bowed in, you can flatten them with a handplane. (This is why I don't attach the runners permanently until after the drawers are fitted.) However, fastening a wide runner in place can sometimes straighten a bowed side.

Start fitting by first cleaning up the drawer sides. Remove glue squeeze-out and protruding pins by making a few passes with a sharp handplane, but be careful not to take off too much material. To plane the sides, I rest the drawer on a piece of plywood or particleboard clamped to the benchtop and protruding over the edge of the bench by the width of the drawer sides (*photo S*).

At this point, add the drawer bottom, checking that its addition doesn't throw the drawer out of square. The grain of a solid-wood drawer bottom runs from side to side, and I like to orient plywood bottoms the same way, though it isn't really necessary. Two screws up through the bottom into the drawer back will hold the bottom in place. If you want to glue a plywood bottom into the grooves, do so only after you've finished fitting the drawer—you may need to remove the bottom to make planing easier.

Now test-fit the drawer in the opening (*photo T*). Slide it in as far as you can, then note where it seems to hang up—too wide, too high, or both. (Note the same things if it doesn't slide in at all.) Take a shaving off a side or top edge as necessary, then try it again. Avoid planing the bottom edges unless they're misaligned. Continue checking and planing until the drawer fits all the way. Don't overdo the planing after each trial—you can't add wood you've planed off.

If fitted correctly, the drawer sides and carcass sides can be in contact over much of their respective surfaces; *photo U*, shot from the back of the carcass, shows the tolerances for this drawer. I fitted the drawer in a steamy garage at the most humid time of the year, so the tolerances between the top edges of the drawer and the runner above could be very

slim. During drier conditions in winter, this drawer will develop more play up and down but will still fit closely from side to side.

I stop planing when the drawer offers only a moderate amount of resistance as it slides all the way into the carcass. A few strokes with fine sandpaper on the drawer sides and a coat of paste wax on the sides and on the carcass interior will usually reduce resistance to the point where the drawer can be opened and closed with almost no effort.

Now, you can attach the runners and the back panel to the carcass. Because the grain of the runners lies at right angles to that of the carcass sides, I glue the front ends and slot-screw them at the back. Slide the back panel into its grooves in the sides and top, then fasten it to the bottom with two screws.

Adding Final Details

I think little touches can make a big difference to simple projects like this (or to any project). I worked a small chamfer around the front edges of the carcass and set the drawer fronts just behind those chamfers. This little relief detail creates a surprisingly effective play of light and shadow.

For the drawer stops, I simply glued a thin piece of wood to each drawer rail so that it engages the back of the drawer front underneath the drawer bottom. (See the detail that accompanies *figure 3*). The end grain should contact the drawer front, since it wears better than side grain. To position the stops, make a line with a marking gauge. I've found that it's better to err toward the front in placement, as it's easier to trim back a stop that's too far forward than to cut off and reglue one that's too far back.

I almost always figure out what to do about drawer pulls last, which probably isn't an altogether wise practice. Anyway, for this chest I found some inexpensive European-style pulls that seemed just right for my daughter's room. I centered one on each front. 

Photographs: Michael Farrell
Illustrations: Art MacDillo's

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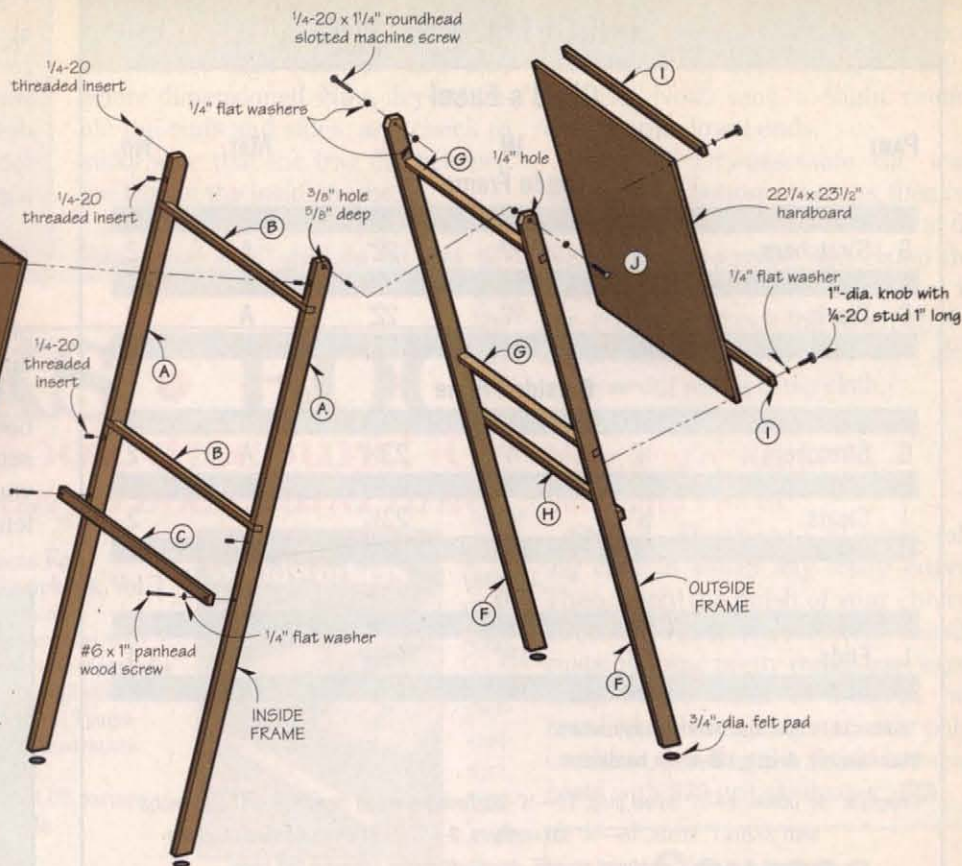
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If you find your kids hypnotized all too regularly in front of the Tube, maybe it's time you took action in the shop. Surprise them with this easel built for two, and soon their play area will pulse with creative energy. Two children can use the easel at the same time—one on each side. And, once you load it with two inexpensive rolls of paper, you can renew the paper drawing surfaces with just a tug.

Exploded View



What You'll Need: We made the easel shown *opposite* from ash, but oak, maple, or aspen would also work well. Since the white hardboard (for the drawing boards and tray bottoms) as well as the hardware might be hard for some of you to find, we've listed mail-order suppliers in the Sources list. We've also included a supplier for rolled drawing paper, in case you can't find it at local art-supply stores.

First, We'll Make the Frame

Note on the Exploded View drawing *above* that the easel frame consists of two nearly identical sections that differ only in their crossmember lengths. One frame nests inside the other, so you'll need to drill blind holes into the inside frame legs to accept threaded inserts and through holes through the outside frame legs for the roundhead machine screws.

Step 1. From 3/4"-thick stock, cut four legs (A, F) to the size specified in the Bill of Materials. Next, lay out the stretcher notches using dimensions shown on the Leg drawing *below*. To form these two notches, mount a 1/2" dado head on your tablesaw and set it to cut 3/4" deep. Gang the four legs together, bind them with masking tape, and using your miter gauge, move the legs across the dado head to cut the dados.

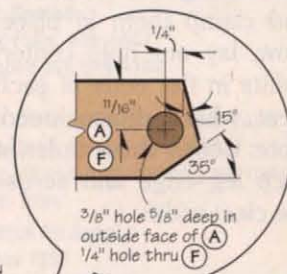
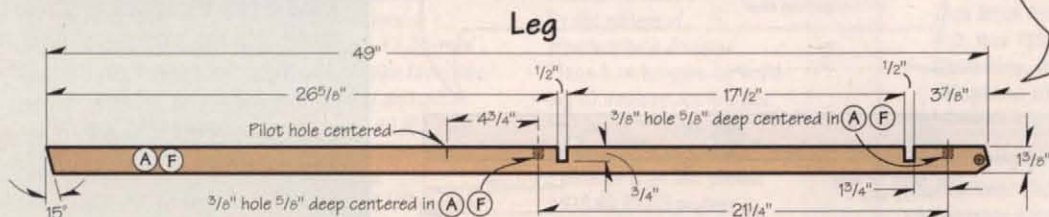
Step 2. Lay out the 15° angle cut on the bottom of each leg and the 15° and 35° cuts on the top of each leg as shown on the detail that accompanies the Leg drawing. Double-check the angle directions, then make the cuts.

Step 3. To install the threaded inserts, first lay out centerpoints for the 3/8" holes on the outside faces of the two inside legs (A). Drill these holes 5/8" deep, then install the

inserts. (See the Pro Tip on *page 38* for suggestions on how we install threaded inserts.) Now, lay out and drill 1/4" holes through the two outside legs (F) for the machine screws. (For locations, see the Leg drawing.)

Step 4. From 3/4"-thick stock, rip and crosscut short stretchers (B) and two long stretchers (G) to the sizes listed in the Bill of Materials. From the same stock, cut the tray supports (C, H) and cleats (D, I) to length. Now, cut two drawing boards (E, J) to size from 1/4"-thick white hardboard.

Step 5. Assemble the inside and outside frames by gluing the short



Bill Of Materials

Child's Easel

PART	T	W	L	MAT.	No.
Inside Frame					
A Legs*	3/4"	1 3/8"	49 1/4"	A	2
B Stretchers	1/2"	3/4"	22"	A	2
C Tray support	1/2"	3/4"	22"	A	1
D Cleats	3/8"	3/4"	22"	A	2
E Drawing board	1/4"	22 1/4"	22"	HB	1
Outside Frame					
F Legs*	3/4"	1 3/8"	49 1/4"	A	2
G Stretchers	1/2"	3/4"	23 3/4"	A	2
H Tray support	1/2"	3/4"	23 3/4"	A	1
I Cleats	3/8"	3/4"	23 3/4"	A	2
J Drawing Board	1/4"	22 1/4"	23 3/4"	HB	1
Tray					
K Sides	3/4"	1 5/8"	29"	A	2
L Ends	1/2"	1 5/8"	19 3/8"	A	4
M Bottom	1/4"	4"	19 1/2"	HB	2

*Parts cut to final size during construction.

Materials key: A—ash; HB—white hardboard

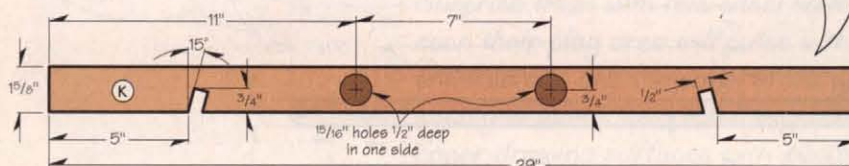
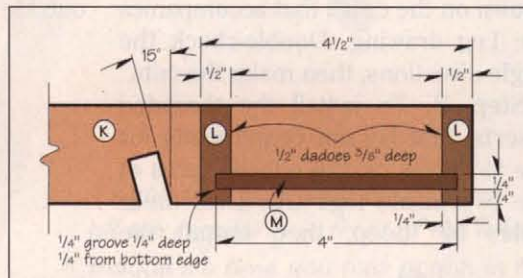
Supplies: 1/4" dowel, 2—1/4" dowel pins, 10—1/4"-20 threaded wood inserts, 8—1"-dia. knobs with 1/4-20x1" studs, 16—1/4" flat washers, 2—1/4-20x1 1/4" roundhead machine screws, 4—#6x1" panhead screws, 4—3/4"-diameter adhesive felt pads.

stretchers (B) into the notches in the inside legs (A) and the long stretchers (G) into the two outside legs (F). Measure both frames diagonally to check for squareness and adjust if necessary. Next, screw the tray supports (C, H) to the frames where shown. (We used #6x1" panhead screws and 1/4" flat washers.)

Step 6. Clamp the drawing boards to the assembled leg frames. Check for squareness. Next, position the cleats across the drawing boards, align them with the top and bottom edges of the panels, and clamp them in place. Now, lay out hole center-points in the ends of each cleat where dimensioned. Note: Center these holes in each leg edge and across the cleat width.

Step 7. Drill 1/8" holes through the cleats and drawing board and 5/8" into the legs. Then, remove the cleats and hardboard, and enlarge the eight legholes to 3/8" to accept the threaded inserts. Now, turn a 1/4-20 threaded insert into each hole.

Step 8. Redrill the 1/8" holes in the drawing boards and cleats to 1 1/4". Next, glue and clamp the drawing boards to the respective leg frames. Then, attach the cleats using 1"-diameter knobs with 1/4-20 studs.



Tray Side

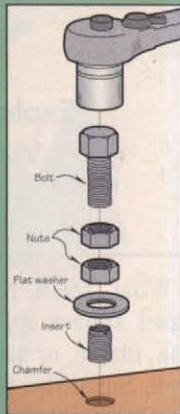
Step 9. Join the two frame sections at the top using the 1 1/4"-long 1/4-20 roundhead machine screws and 1/4" washers as shown. Then, apply 3/4"-diameter adhesive felt pads to the bottom of each leg to ensure that all four legs contact the floor evenly.

Next, Build the Tray

Size the tray to fit between the legs of the inside frame section. The dimensions listed in the Bill of Materials assume a 20 1/4"-wide span between the legs, but measure the actual distance between the legs of your inside frame and adjust the part lengths if necessary.

Pro Tip

Driving threaded inserts squarely and without tearing up the wood surrounding the holes can be tedious. For best results, we suggest using one of the following techniques.



Method 1:

Size a bolt to fit the insert, then add a flat washer and two jam nuts as shown on the illustration above. Screw the bolt into the insert, and turn the jam nuts down to the insert. Chamfer the hole edge slightly, then carefully screw in the insert using a ratchet and socket. If you use a washer larger than the hole, it will act as a depth stop when it contacts the wood surface.

Method 2:

Use the same bolt setup shown above, but cut the head off the bolt and then chuck it into your drill press. Align the bolt and insert with the hole, lower the drill quill, and hand-rotate the chuck to screw the insert into the workpiece. Applying downward pressure on the quill will help prevent the insert's threads from tearing the wood as they start into the hole.

Putting The Easel To Use

Our double easel uses standard 18"-wide roll paper. (If you have trouble finding it locally, see the Sources list for a mail-order supplier.) Mount the rolls on the $\frac{7}{8}$ " dowels, then lock the dowels in place with the dowel pins. Next, thread the paper up behind and over each drawing board and down between the cleats and board. Tighten the knobs to secure the cleats and anchor the paper.

To change the paper, simply loosen the knobs, pull the paper down until a fresh surface covers the drawing board, then retighten the knobs. Once tightened, the bottom cleat makes a hard edge for tearing off the used paper. The easel also handles standard sheet-style drawing paper. Just position a sheet under the cleats and tighten the knobs to hold it in place.

Step 1. From $\frac{3}{4}$ "-thick stock, rip and crosscut two tray sides (K) to size. Next, cut four tray ends (L) to size from $\frac{1}{2}$ "-thick stock. Then, lay out the angled notches in the tray sides where shown on the Tray Side drawing *opposite*.

Step 2. To cut the notches, mount a $\frac{1}{2}$ "-wide dado head on your table-saw, tilt it 15° from perpendicular, and raise it to make a $\frac{3}{8}$ "-deep cut (measured vertically from the table). Before making the cuts, attach an extension and a stop to the miter gauge. This will ensure that all notches are spaced uniformly from the ends.

Step 3. Reset the dado head to perpendicular, and cut $\frac{1}{2}$ "-wide dados $\frac{3}{8}$ " deep across the inside faces of the sides. (For locations, see

the detail that accompanies the Tray Side drawing.) Then, reset the fence, and rabbet both ends of each side where dimensioned. Now, dry-assemble the ends and sides, and check to make sure that the tray fits between the legs of the inside frame.

Step 4. Using your table-mounted router and a $\frac{1}{4}$ " straight bit, cut $\frac{1}{4}$ "-wide grooves $\frac{1}{4}$ " deep $\frac{1}{4}$ " up from the bottom edge of the ends to seat the tray bottoms. (See the Tray Side detail *opposite* and the Tray exploded view drawing *below*.) Next, cut matching stopped grooves into the sides where shown on the Exploded View. (To limit this cut, we clamped a stop-block to our router-table fence. You can also mark a stopline on the fence to serve as a guide, or simply stop advancing the workpiece when you feel the bit reach the dado.)

Step 5. Lay out the hole center-points in the tray sides where indicated on the Tray Side drawing. Next, bore $\frac{15}{16}$ " holes $\frac{1}{2}$ " deep into the inside face of one side piece and all the way through the other side. Note: The dowels (paper roll holders) pass through the holes in one tray side and seat in the $\frac{1}{2}$ "-deep "sockets" in the opposite tray side.

Step 6. Cut two $\frac{7}{8}$ " dowels 20" long. (Ours were slightly smaller than a full $\frac{7}{8}$ ".) Then, drill a $\frac{1}{4}$ " hole $\frac{5}{8}$ " deep 19" from one end of each dowel to

accept $\frac{1}{4} \times 1\frac{1}{4}$ " dowel pins. When inserted, these friction-fit pins prevent the dowels from sliding out of the sockets. Now, sand a slight round-over on the dowel ends.

Step 7. Dry-assemble the tray. Measure the bottom openings, then cut the two white hardboard bottoms to fit. Next, glue, assemble, and clamp the tray. (We let the tray bottoms float in the grooves.) Check the assembly for squareness, and wipe off any glue squeeze-out with a damp cloth.

Now, You're Ready to Sand and Finish

Step 1. Finish-sand all parts, taking care to soften any sharp edges. Then, apply the finish of your choice. (Because children's furniture usually sustains some pretty rough use, especially where water is involved, we brushed on three coats of satin polyurethane, leveling the finish between coats with 320-grit sandpaper.) 

Sources

Hardware Kit. Includes 4—#6 x 1" panhead screws; 10— $\frac{1}{4}$ "-20 threaded inserts; 2— $\frac{1}{4}$ "-20x1 $\frac{1}{4}$ " machine screws; 16— $\frac{1}{4}$ "-dia. washers; 8—1"-dia. knobs with $\frac{1}{4}$ "-20x1" studs; 4— $\frac{3}{4}$ "-dia. adhesive felt pads. \$22.95 ppd., check or money order only please. (Canadian orders \$25.95 U.S. funds.) Order from:

Aspen Kits
6 Hilltop Drive
Old Saybrook, CT 06475
Telephone 203/388-6179

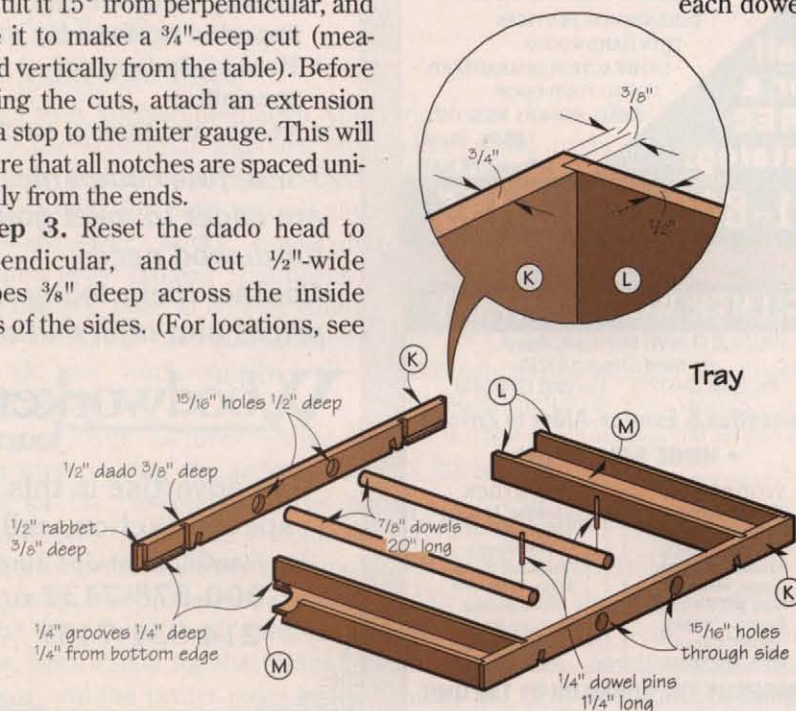
White Hardboard. Includes enough $\frac{1}{4}$ "-thick stock for two drawing boards and two tray bottoms. Kit no. WJ1952, \$19.95 ppd. Order from:

Heritage Building Specialties
205 N. Cascade
Fergus Falls, MN 56537
Telephone 800/524-4184

Roll Paper. 20-lb. white poster bond paper, 18" x 50-yard roll. Catalog no. 540018. \$10.20 per roll plus 15% shipping and handling. Order from:

Dick Blick Art Supply
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Project design: David Moretti
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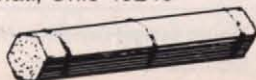
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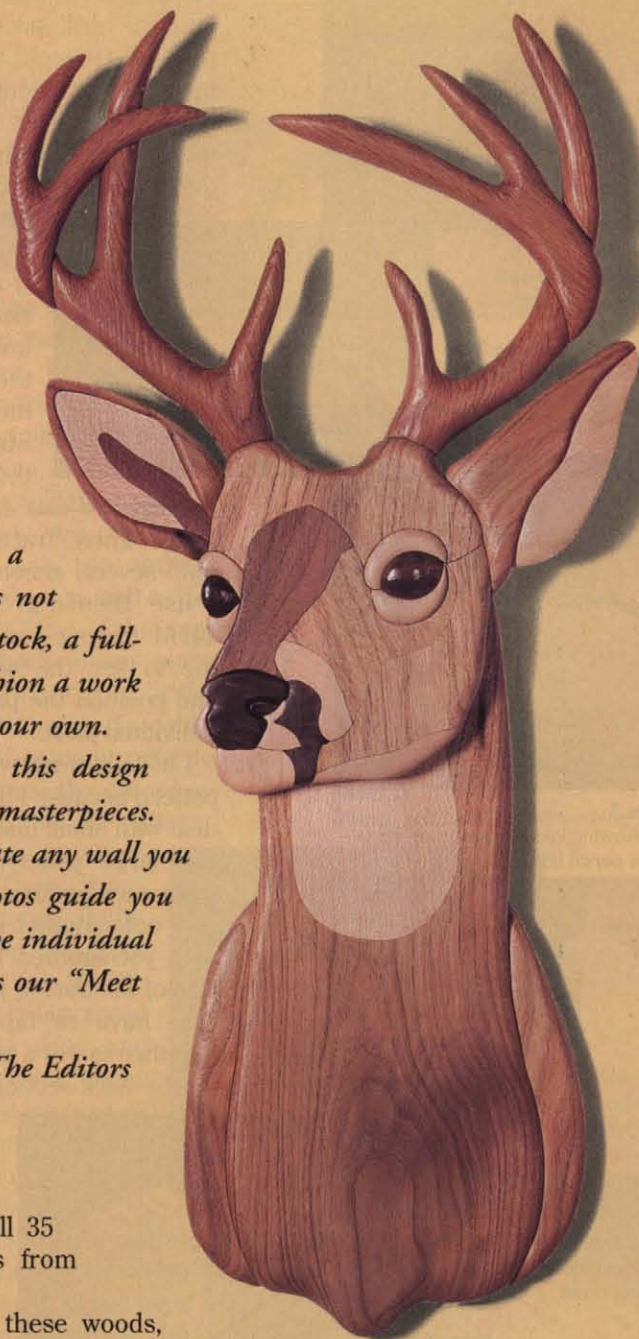
Eight-Point Buck

by Robert J. Hlavacek Sr.

Robert Hlavacek's stunning intarsias have gotten a clamorous response of late from our readers, and it's not hard to see why. With only a couple of board feet of stock, a full-sized pattern, and a weekend in the shop, you can fashion a work of art that will gain you an enthusiastic following of your own.

Like the dramatic bald eagle (Sept./Oct. 1993), this design continues in the Hlavacek tradition of wildlife masterpieces. Stretching 27" from top to bottom, it tends to dominate any wall you mount it on. Bob's step-by-step instructions and photos guide you through every phase of the project as you cut and fit the individual pieces. By the way, if you admire this piece, don't miss our "Meet The Designer" column on page 47.

The Editors



If You're Ready, Let's Make The Buck

For a truly successful intarsia, you need to use wood grain and color creatively as design elements. I select specific woods for their texture and color—whatever works especially well for a given project. That doesn't mean that you need to do everything exactly as I have. Other combinations of stock may work equally well—maybe even better.

For the buck pictured above, I chose white oak for the antlers; butternut for the tan-colored pieces of the face, ears, neck, and shoulders; sycamore sapwood for the white facial pieces, ears, and throat; dark walnut for the eyes, nose, and dark facial pieces; light walnut for the bridge of the nose and the center piece in the

right ear. I cut all 35 solid wood parts from $\frac{3}{4}$ "-thick stock.

Since some of these woods, such as butternut and sycamore sapwood, aren't readily found at neighborhood lumber yards, *Woodworker's Journal* has asked a stock-kit company to put together a mail-order kit that includes the woods you'll need. (See the Sources list at the end of the article.)

Now, Follow My Step-By-Step Instructions

To complete the eight-point buck, I used a technique I call "intarsia on intarsia." This simply means that I make the face, ears, and antlers as a

separate unit, then glue them on top of the neck. This layering adds interesting depth and dimension to the finished project. Since the buck has these two overlapping layers, I simplified things a bit by separating them on the full-sized pattern. A dashed line on the neck section of the pattern indicates where to position the head.

I cut out all parts on my bandsaw, using a $\frac{1}{8}$ " skip-tooth blade for the large body pieces and a $\frac{1}{16}$ " blade for the tight-radius cuts. To smooth the



Photo 1 ▲
Transferring the neck
pattern to the stock



Photo 2 ▲
Scribing the neck
profile onto the
mating throat piece

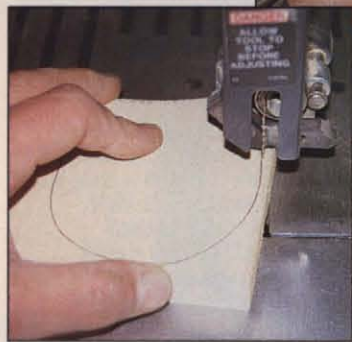


Photo 3 ▲
Bandsawing along the outside edge
of the pencil line

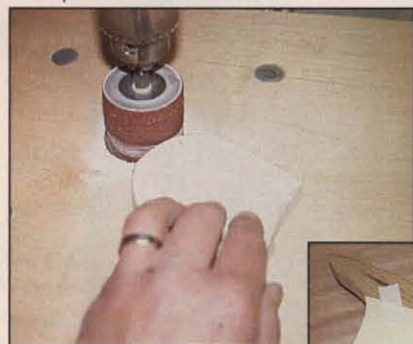


Photo 4 ▲
Smoothing cut edges with a
sanding drum

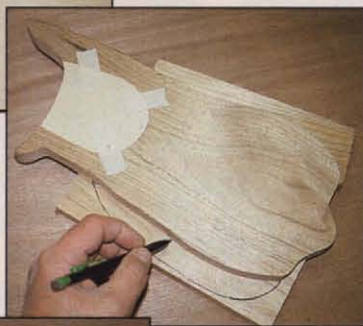
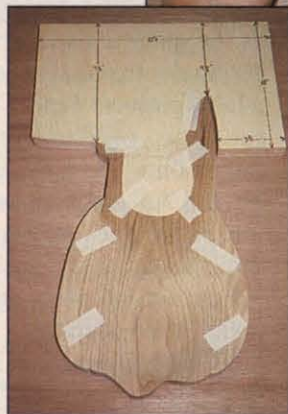


Photo 5 ▲
Scribing neck profile
onto the shoulders piece

Photo 6 ▲
Fitting 3/4"-thick
plywood base
to the neck
subassembly



edges and also to fit and contour the pieces, I use sanding drums chucked into the drill press and fitted with medium (100-grit) sleeves. My drums measure 2 to 3" long and range from 1/2 to 2" in diameter. I've also equipped my drill press with an auxiliary table that's bored in the center to accept the

drums (see *photo 4*). Note: We don't actually start contouring or shaping any pieces until we've cut all of them and test-fitted them together.

Step 1. Photocopy the patterns found on *pages 44 and 45* at 150% enlargement. Then, trace the photocopies onto several sheets of tracing paper. I use Bienfang Satin Design No. 147M tracing paper, which enables me to see the wood grain clearly and position the pattern to suit each individual piece.

I usually work with sections of the pattern because I find it a lot easier to deal with small units rather than with one large pattern. For example, I trace each antler onto one sheet, the ears onto another sheet, and the face onto yet another. Depending on the size of the tracing paper you use, you may have to tape several sheets together to get a piece large enough for the neck section.

Step 2. Lay out and cut the neck section first. The neck contains the largest parts, and it's a good place to start getting the feel for this type of project, especially if this is your first

attempt at intarsia. Position your pattern on the butternut board that you'll use for the main neck section. To get you started, I put arrows on the pattern showing how to orient it with respect to the grain. When you are satisfied with the pattern's position, slip a sheet of carbon paper between the pattern and the wood, and trace the neck profile. I use a fine-tip ballpoint pen when tracing the patterns onto the wood (*photo 1*). Bandsaw the neck to shape, then smooth and round the cut edges using a sanding drum.

Step 3. Place this neck section over the sycamore sapwood stock you've selected for the throat patch. Using the neck as a template, draw an accurate cutline with a sharp pencil (*photo 2*). I like to use a 0.5mm mechanical pencil because it makes a uniform line, and if the point breaks, I can advance new lead easily.

Step 4. Cut the throat patch to shape, keeping the saw blade on the outside edge of the pencil line (*photo 3*), then smooth the cut edge (*photo 4*). As you sand, check the fit of the mating pieces frequently. You want to create snug, gapless joints so the pieces can later be edge-glued. For a superior-quality intarsia, the joints must be "gapless." Once you've fitted the throat patch to the neck, apply masking tape to both sides to hold the pieces together.

Step 5. Transfer the shoulder pattern to the butternut shoulder stock. Again, move the tracing-paper pattern around until you find the best position, then slide the carbon paper in place and trace the shoulder profile.

Next, position the neck unit over the shoulder sections and redraw that portion of the pattern where the neck and shoulders meet (*photo 5*). Redrawing the cutline from the actual piece helps ensure a good fit of the mating parts. Now, cut and fit the pieces, then tape



Photo 7 ▲
Antlers cut to shape with extra stock left
at the head ends



Photo 8 ▲
Ear parts ready to be fitted to the head

them in place. Note: Use these same basic steps—first tracing the pattern to the stock, then retracing each subsequent part from the previously cut mating piece—throughout the rest of the project.

Step 6. Trace, cut, and fit a piece of 3/4"-thick plywood to the neck subassembly (photo 6). This plywood will provide a base board on which to mount the head and antlers later. Note: So far, you've taped parts together but haven't yet shaped or glued any of them.

Step 7. Put the neck section aside for now, and trace the antlers. Again, watch the grain direction. When cutting out the antlers, leave extra stock at the ends where they join the head (photo 7). This extra stock will later enable you to trace the cutline from the head to achieve a good fit.

Step 8. Using the same cut-and-fit technique, trace, cut, and tape the ears. Again, leave a little extra stock for joining the ears to the head (photo 8).

Step 9. For the head, start by cutting the large pieces, such as the two halves at the top. Tape them together, then add surrounding pieces until you've assembled the complete head.

I've found it easier to handle the smaller pieces if they are glued together before I try to fit them to larger sections. You can do this with parts that don't require any shaping on the front. For example, cut, fit, and glue the small pieces of sycamore sapwood and dark walnut (located to the right of the buck's nose) to make a subassembly (photo 9). Gluing these small pieces together now also reduces the chance of breaking the thin section of sycamore later when you sand and fit the pieces to the head assembly.

I use fast-setting epoxy to glue these small parts, placing waxed paper underneath so the pieces won't stick to the surface. Also, when working with small parts, I leave enough extra stock on each piece to serve as a handle for fitting it to the adjoining piece. When cutting out the nose, save the small nostril piece—you'll use it later.

Step 10. Position the assembled head over the ears, using scrapwood shims to level it. Next, draw the cutlines

from the head to the ears (photo 10). Fit the ears to the head and tape them in place. Following the same procedure, position the head on the antlers, then cut, fit, and tape the antlers in place (photo 11).

Step 11. Once you've cut and fitted all of the pieces, you can begin contouring. Start with the antlers, rounding all front edges as well as the backs of the "point" tips. Take care not to round the back of any piece excessively. Otherwise, it won't lie flat and will be difficult to glue. To determine the degree of contour, refer to the various photos and the cross-sectional details shown with the pattern.

Use sanding drums to rough-shape the parts. Then, finish-sand by hand, or use flutter sheets mounted on an arbor in the drill press (photo 12). The flutter sheets really speed the sanding process along, and I strongly recommend them. (See the Sources list on page 47 for mail-order information.)

Step 12. Once you've shaped the individual antler parts to your satisfaction, epoxy the antler pieces together. To assemble them, place a sheet of waxed paper over the pattern, then position the pieces on the waxed paper, using the pattern underneath as a placement guide. When the epoxy has cured, remove the antlers from the waxed paper, position them against the head, and draw the contours of the antlers on the edge of the head (photo 13). Then, sand the top of the head to match the antler contour lines (photo 14). Note: You'll need to remove the masking tape and

Photo 9
Making subassemblies of the head parts



Photo 10
Tracing head outline onto mating ear

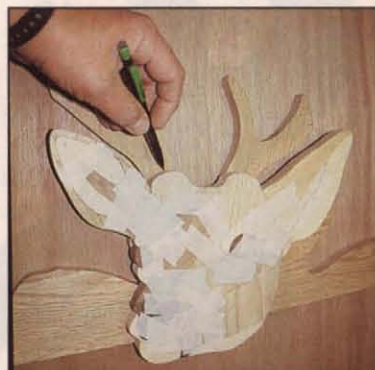


Photo 11
Tracing head outline onto mating antlers

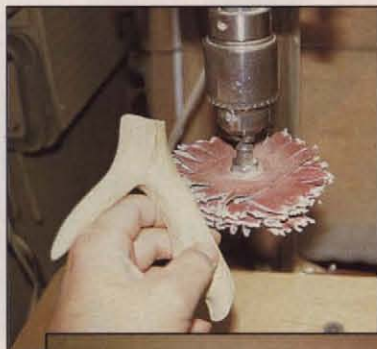


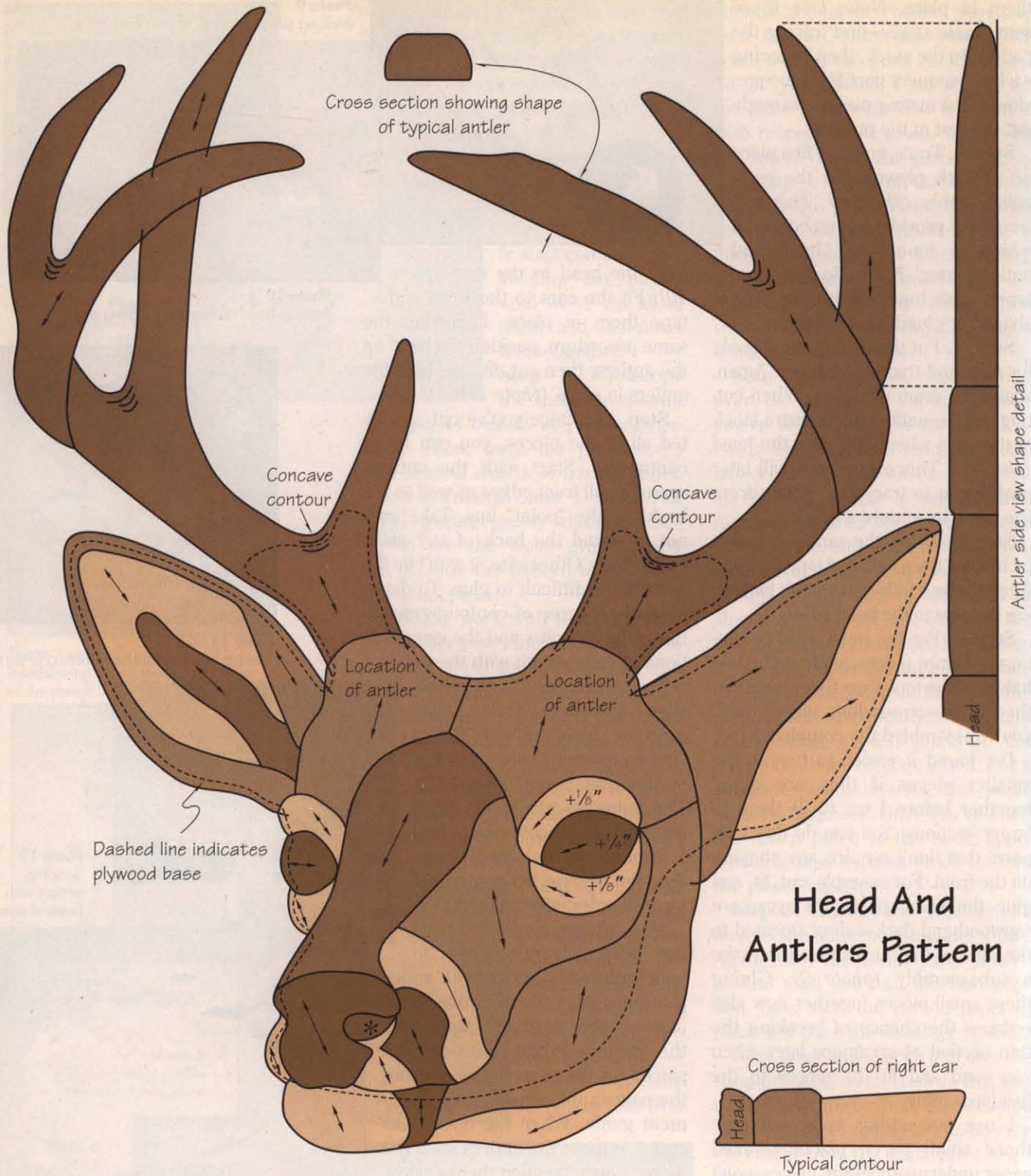
Photo 12
Sanding antlers with flutter sheets



Photo 13
Scribing antlers contour onto edge of head pieces

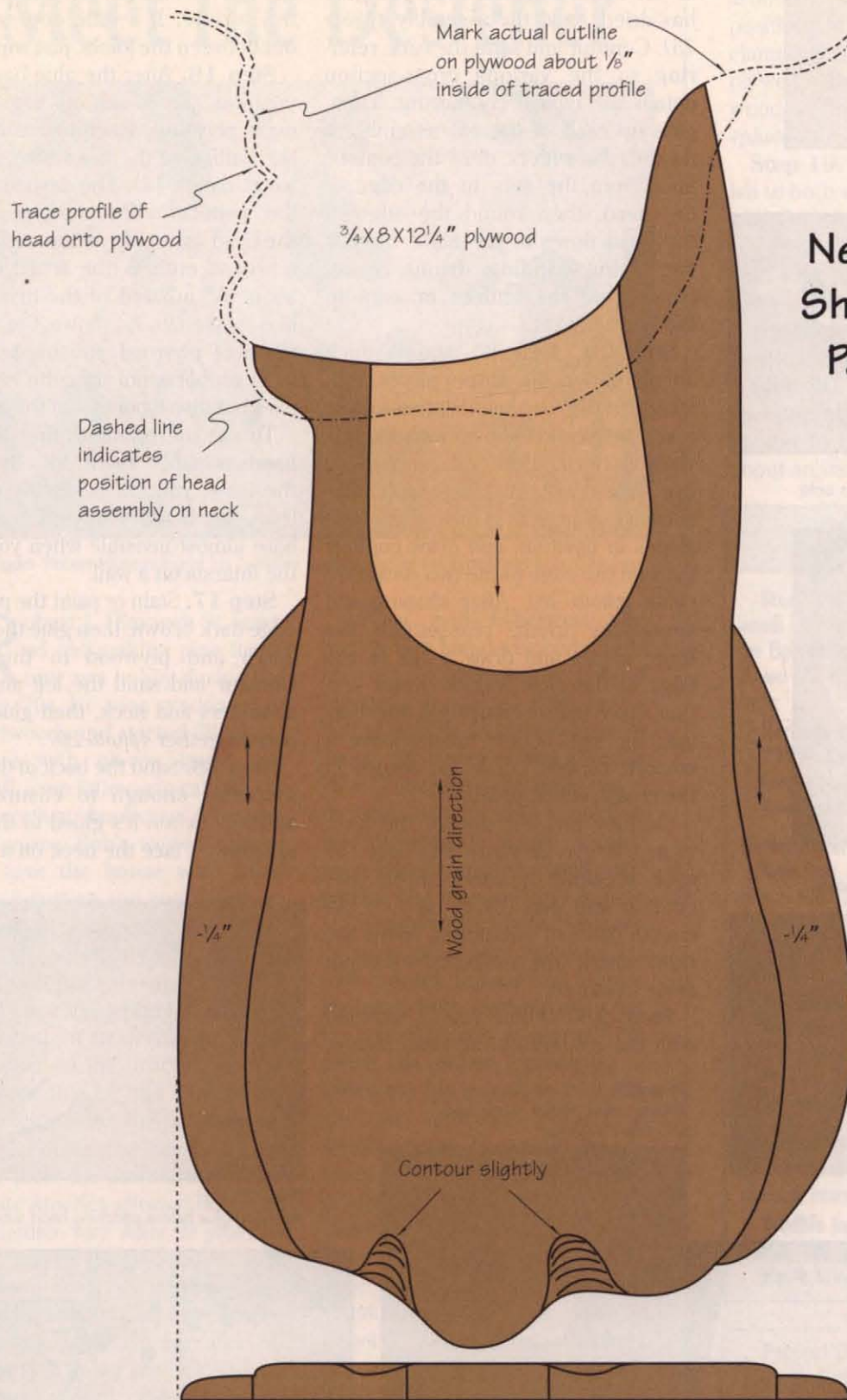


Photo 14
Shaping top of head down to antler contour lines



Enlarge Pattern 200%

Neck And Shoulders Pattern



Enlarge Pattern 200%



Photo 15 ▲
Sanding the head subassembly



Photo 16 ▲
Transferring outline of eyes onto mating piece



Photo 17 ▲
Edge-gluing head parts using epoxy



Photo 18 ▲
Scribing head outline onto neck

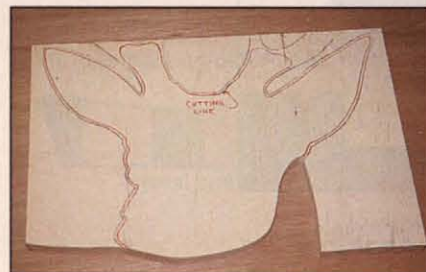


Photo 19 ▲
Draw second outline 1/8" inboard of first

separate the topmost head parts to complete this sanding operation.

Step 13. Edge-glue the flat pieces of the head together. After the glue has dried, sand the assembly (*photo 15*). Contour and sand the ears, referring to the various cross-section details for typical contouring. Then, glue up each of the ear assemblies. As with the antlers, draw the contour lines from the ears to the edge of the head, then round the edge of the head down to meet the contour line using sanding drums. Note: Don't glue the antlers or ears to the head just yet.

Step 14. Glue 1/8"- and 1/4"-thick shims under the three pieces that form the right eye as detailed on the eye cross section shown with the full-sized pattern. This will raise these eye parts relative to the surrounding surface. When dry, place the eye pieces in position, and draw contour lines on the edge of the two sycamore parts (*photo 16*). After shaping and smoothing them, reassemble the three pieces and draw a line to the edge of the dark walnut center section. Once you've completed the shaping, the eye center should have a smooth convex curve, as shown in the cross-section detail.

Contour the left side of the face, from the eye down to the nose, by softly breaking the sharp edges. Also, contour and thin (by about 1/16") the cut-out piece of walnut that forms the right nostril (the small piece you put aside in *step 9*).

Step 15. When you're satisfied with the contours of all head pieces,

Photo 20 ▼
Gluing head, throat, neck, and shoulders together



edge-glue them together on a sheet of waxed paper placed on a flat surface (*photo 17*). I prefer using epoxy because it dries clear and doesn't mar the surface. If a little does squeeze out between the joints, just wipe it off.

Step 16. After the glue has dried, position the head on top of the neck/plywood assembly, and trace the outline of the head onto the plywood (*photo 18*). The dashed line on the pattern indicates the position of the head assembly on the neck. Draw a second outline (the actual cutline) about 1/8" inboard of the first traced line (*photo 19*). As shown, the 8x12 1/4" piece of plywood you used for the base supports not only the head and ears but also a portion of the antlers.

To cut the plywood, first tilt your bandsaw table about 10°. By tilting the table, you cut it slightly smaller than the head. This will make the base almost invisible when you hang the intarsia on a wall.

Step 17. Stain or paint the plywood edge dark brown, then glue the throat patch and plywood to the neck. Contour and sand the left and right shoulders and neck, then glue these parts together (*photo 20*).

Step 18. Sand the back of the head assembly enough to ensure good adhesion when it's glued to the neck assembly. Place the neck on a couple



Photo 21 ▲
Applying glue before attaching head subassembly



Photo 22 ▲
Clamping head to body while the glue dries

Meet The Designer



Designer Robert Hlavacek and his "wildlife menagerie" at the Brookfield Zoo, Chicago.

Robert J. Hlavacek Sr. started out making pine furniture as a hobby during the early '70s. He soon graduated to hardwoods and started filling his home with pieces large and small, from little curio cabinets to a secretary/bookcase. After several years, Bob's wife laid down the law: the house was "filled with furniture and could hold no more." He had to switch to smaller projects, which partly explains how he started experimenting with intarsia—creating pictorial scenes from small shaped pieces of wood. In the process, he discovered that he had a talent not only for making the projects, but also for designing them.

In 1989, the downsizing of corporate America affected Bob in an immediate way. After 24 years as a printer, he found himself out of work—out of corporate work, anyway. This sudden turn, however, encouraged him to realize his dream of "going pro" as a woodworker and turning his hobby into a business.

As an avid fisherman and hunter, Bob had developed a keen interest in preserving natural habitats. He started designing a line of wildlife intarsia, which he eventually began selling through local Chicago-area galleries and in the gift shop at the Brookfield Zoo, Chicago's major wildlife park. He also started a mail-order pattern business, selling his intarsia designs to other woodworkers.

Today, with over 300 projects sold through the zoo and a growing mail-order pattern business, Bob hardly has a moment to spare. He works constantly at improving his intarsia techniques, and in between, creates a steady stream of new designs to share with *Woodworker's Journal* readers. If you like this project, try making the trout (Sept./Oct. 1994), the "bad puppy" (May/June 1994), and the bald eagle (Sept./Oct. 1993), a few of Robert's more recent offerings. (To order a free catalog of full-sized Hlavacek patterns, see our Sources list at right.)

of blocks and apply carpenter's glue (photo 21). Don't be too generous—you'll want to avoid glue squeeze-out around the edges. Then, carefully position the head on the neck and clamp lightly together. Use scraps of plywood between the clamps and wood so they don't mar the surface (photo 22).

Step 19. Apply your choice of finish to both sides of the project. I suggest five or six light coats of Krylon no. 1311 Matte Finish. Sand lightly with 400-grit paper, then dust off and apply the final coat. When dry, brush a gloss finish—I prefer Hydrocote—on the eyes and nostril.

Step 20. To prepare the buck for wall-mounting, attach a sawtooth hanger to the back of the plywood about an inch below the antlers. 

Sources

Stock Kit. Includes all recommended hardwoods and 3/4"-thick plywood required to build the Eight-Point Buck exactly as shown. Specify Project-PAK Kit No. 1952. \$28.95 ppd. Order from:

Heritage Building Specialties
205 N. Cascade
Fergus Falls, MN 56537
Telephone: 800/524-4184

Flutter Sheets. Pack of 50 sheets, 2x6" with 1/2"-wide flaps. Includes mandrel. Available in grits of 100, 120, 150, 180, 240, and 280. \$10.65 plus \$3.50 shipping and handling. Without mandrel, \$8.49 plus s/h. Order from:

The Sanding Catalog
P.O. Box 3737
2555 Tate Blvd.
Hickory, NC 28603-3737
Telephone 800/228-0000

Intarsia Pattern Catalog. Free catalog lists all currently available Robert Hlavacek intarsia patterns. Order from:

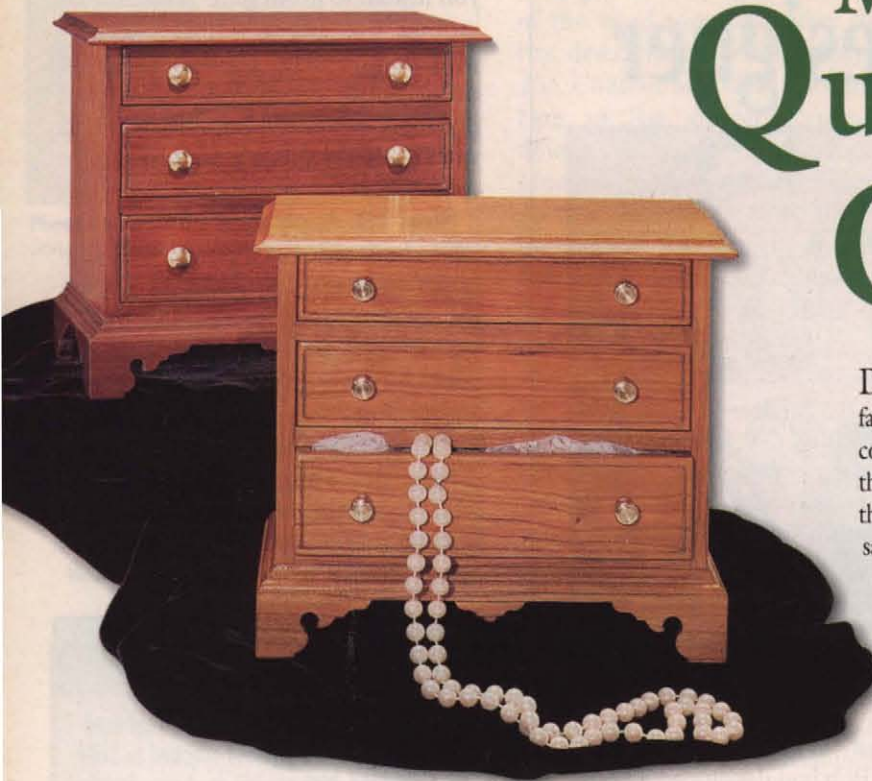
Wildlife Intarsia Designs
P.O. Box 1246
North Riverside, IL 60546

Project Designer and Builder:
Robert J. Hlavacek Sr.

Lead Photograph:
Lynxwiler Photography

How-To Photographs: The Author

Miniature Queen Anne Chest



During colonial times, skilled furniture makers commonly fashioned miniatures to show potential clients what they could do—their repertoire of designs as well as the quality of their work. The well-heeled parties who usually retained these artisans took a fancy to the diminutive “salesman’s samples,” as they came to be called, and started commissioning them as gifts for family and business associates.

We designed and built this Queen Anne-style piece to replicate its 1760s-vintage original, using solid wood for all panels and reinforcing the main carcass joints with pegs. As the colonists were quick to notice, it makes a charming, heirloom-quality gift.

Cut, Machine, and Assemble the Carcass Parts

Step 1. From $\frac{5}{16}$ "-thick stock, rip and crosscut the top (A) and the sides (B) to the dimensions listed on the Bill of Materials. (We suggest cherry. As you can see in the photo, we also tried curly maple and walnut, resawing and planing thicker stock to this thickness. For safe and accurate resawing, we adhered the stock to a tall box fence using double-faced tape.) Next, fit your table-mounted router with a $\frac{5}{16}$ " straight bit, and elevate it to $\frac{1}{8}$ ". Using a fence, rout “through” dados across the inside faces of the sides where shown on the Side drawing on *page 50*. (We used a backup board to minimize tear-out.)

Step 2. To rout the stopped dados on the underside of the top, first position and clamp a stopblock to your fence. Then, using the same router setup, rout the dados where shown on the Top drawing on *page 50*. (To rout the second dado, we kept our

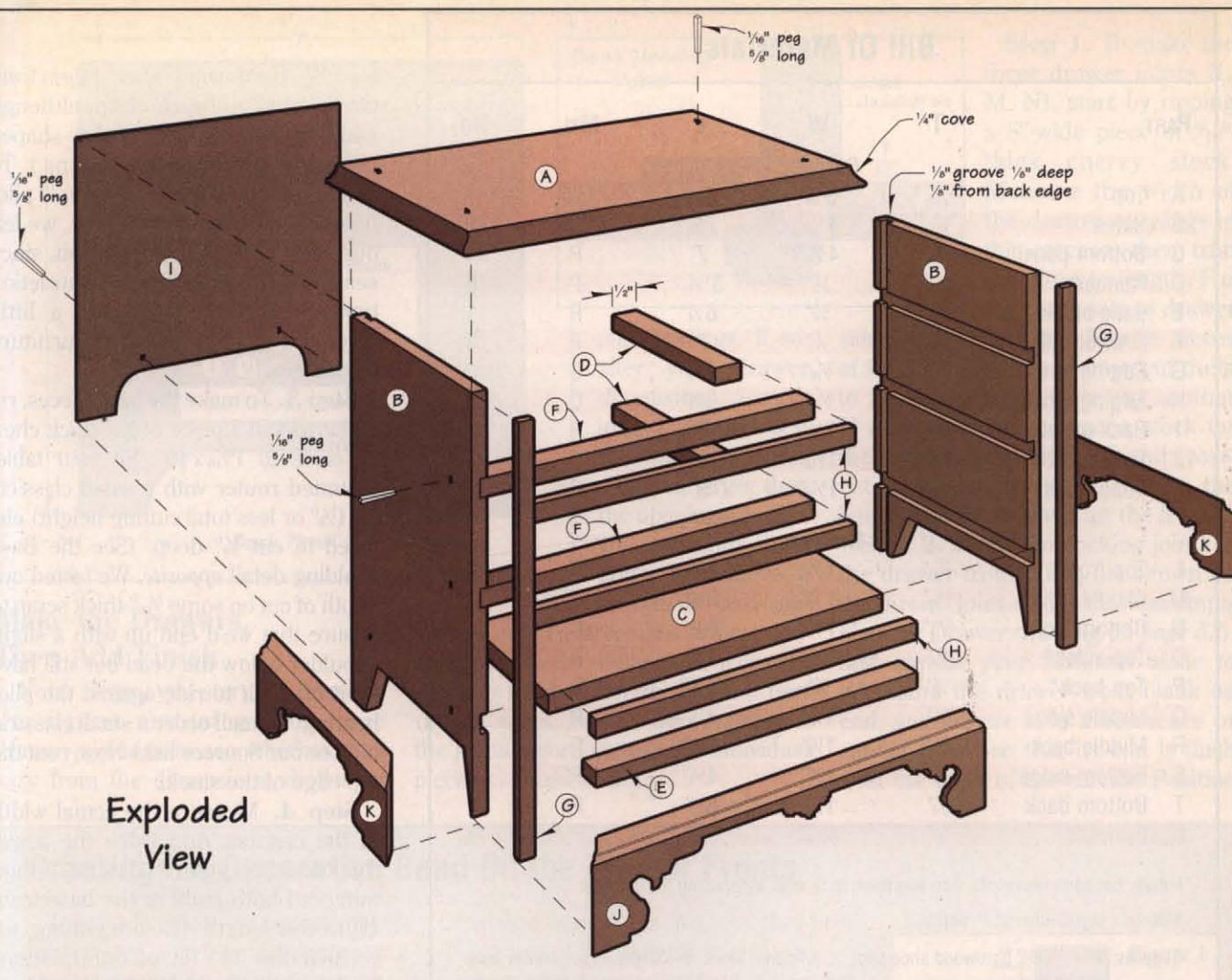
stopblock in the same position and moved the fence back 7".) Now, square the ends of the dados using a chisel.

Step 3. Switch to a $\frac{1}{8}$ " straight bit, and rout a $\frac{1}{8}$ "-deep groove on the inside faces of the sides and top to accept the back panel. (For locations, see the Side and Top drawings.) Be careful to stop the groove on the top within the $\frac{5}{16}$ "-wide dados where shown on the Top drawing. Next, lay out and bandsaw the cutout at the bottom of each side where shown on the Side drawing. (To do this, we stacked the two sides face to face using double-faced carpet tape, then cut them both at once.)

Step 4. To rout the molding around the top, switch to a piloted $\frac{1}{4}$ "-radius cove bit, but elevate it to cut only $\frac{3}{16}$ " deep, as shown on the Top Molding

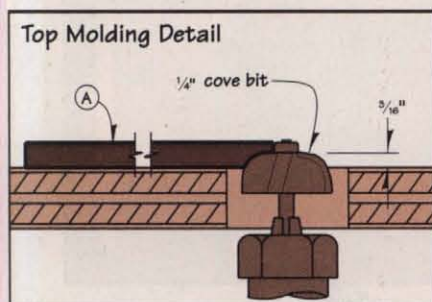
detail *opposite*. Rout both ends first, then the front edge. (Routing the front edge last should clean up any end-grain tear-out.) Next, round over the edge along the bottom of the resulting cove as well as the bottom edge of the workpiece. (We did this





by hand using a small, sharp plane and sandpaper, but you can also rout a $\frac{3}{32}$ "-radius half-round (bull nose) along these edges (Freud bit no. 82-100).

Step 5. From $\frac{1}{16}$ "-thick hardwood stock (we used poplar), cut the bottom panel (C), runners (D), and base block (E) to size. To make the drawer rails (F), cut a $\frac{1}{2} \times 15$ " strip from the same stock and leave it as is for now. (To cut these narrow parts, we used a pushstick for safety. For dimensions and quantities, see the Bill of Materials on *page 50*.)



Step 6. To make the edging strips, first rip a total of 35" of $\frac{3}{16} \times \frac{1}{16}$ " cherry stock. Crosscut the vertical strips (G) to match the length of the sides, then glue them to the front edges. Next, cut two pieces, one 7" and one 15" long, for the horizontal strips (H). Glue the 7" strip to the front edge of the bottom panel. Then, glue and clamp the 15" piece to one edge of the drawer rail blank you cut in the previous step.

Step 7. After the glue has dried, scrape or finish-sand the sides and top. Next, dry-assemble the top, sides, and bottom to check for fit. Adjust any parts that need it. Then, mark the edging strip on the bottom panel for length at each end. Using your miter gauge, stand the panel on edge, and cut the strip to fit, leaving a notch at each front corner of the bottom panel. Now, glue, clamp, and assemble the carcass. Check the assembly for squareness,

then allow the glue to dry before removing the clamps.

Step 8. Dry-assemble the rails and runners in their dadoes. As you did in the previous step, mark the edging strips on the rails for length and then trim them, leaving notches at the front corners. Trim the runners if necessary, then glue and clamp the rails and runners to the carcass. Also, center, glue, and clamp the base block to the bottom panel so that both front edges are flush.

Add the Back Panel, Pegs, and Base

Step 1. From $\frac{1}{4}$ "-thick stock, rip and crosscut the back panel (I) to size, with the grain running horizontally as shown on the Back Panel drawing on *page 51*. (We used poplar, edge-joining two narrower 8" rough lengths before planing and cutting it to finished dimensions.) Next, plane a bevel along the top

Bill Of Materials

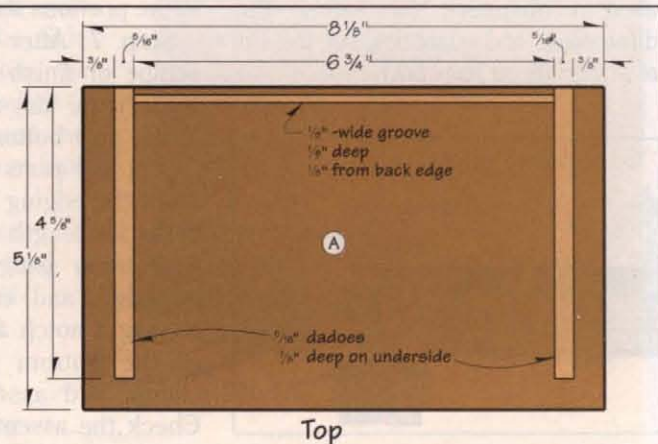
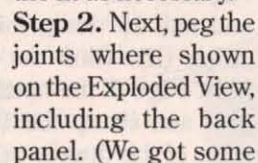
PART	T	W	L	MTL.	No.
Carcass					
A Top	5/16"	5 5/8"	8 1/8"	C	1
B Sides	5/16"	4 7/16"	7 5/8"	C	2
C Bottom panel	5/16"	4 3/16"	7"	P	1
D Runners	5/16"	1/2"	3 1 1/16"	P	6
E Base block	5/16"	3/4"	6 1/4"	P	1
F Drawer rails	5/16"	1/2"	7"	P	3
G Edging strips	3/16"	5/16"	7 1/8"	C	2
H Edging strips	3/16"	5/16"	6 3/4"	C	3
I Back panel	1/4"	7 1/8"	7"	P	1
J Base front*	5/16"	1 1/16"	8"	C	1
K Base sides*	5/16"	1 9/16"	5"	C	2
Drawers					
L Top front*	5/16"	1 1/4"	6 3/4"	C	1
M Middle front	5/16"	1 1/2"	6 3/4"	C	1
N Bottom front	5/16"	1 3/4"	6 3/4"	C	1
O Top sides*	1/4"	1 1/4"	4 1/4"	P	2
P Top back*	1/4"	7/8"	6 1/2"	P	1
Q Middle sides	1/4"	1 1/2"	4 1/4"	P	2
R Middle back	1/4"	1 1/8"	6 1/2"	P	1
S Bottom sides	1/4"	1 3/4"	4 1/4"	P	2
T Bottom back	1/4"	1 3/8"	6 1/2"	P	1
U Bottoms	1/4"	4 3/16"	6 1/2"	P	3

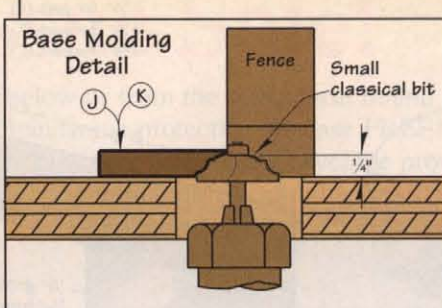
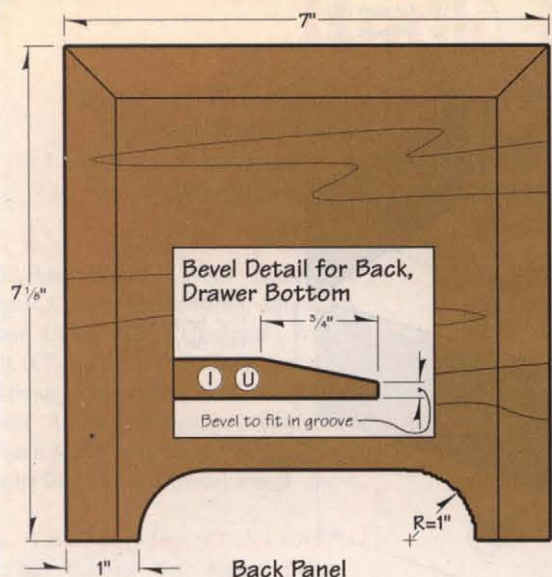
*Initially cut parts oversized, then size them to fit after assembling the carcass.

Materials key: C—cherry; P—poplar.

Supplies: 10—1/8x3/8" hardwood shoe pegs or 1/8" dowel stock; 6—3/8"-dia. brass drawer pulls; finish; paste wax.

Step 5. Make two copies of the Base Front half-pattern shown on *page 61*, and join them to make a full pattern. Transfer this pattern and the Base Side pattern to the respective base pieces. Next, cut these parts to shape, keeping your blade outside the line. Finish-sand the three parts. Now, glue and clamp them to the carcass.





our drawings. If so, alter your drawer dimensions accordingly. It's always best to size drawer fronts a tiny bit larger than the openings, so that you can trim them down to achieve a precise fit and uniform reveal.

To streamline drawer construction, we cut wide pieces of drawer stock to finished length for each part (fronts, sides, backs), then machined the joints before cutting the individual pieces to finished width.

sides (O, Q, S), rip two 5"-wide pieces of 1/4"-thick poplar, and crosscut them to finished length. Now, rip another 5"-wide piece of this same stock for the drawer backs (P, R, T), and crosscut it to length (1/4" less than the length you established for the fronts).

Step 2. To cut the locking joints in the drawer front blank (as shown on the Front Joint detail that accompanies the Drawer drawing on page 52), first elevate your tablesaw blade to 1/4". Stand the drawer front blank on end, and adhere it to a box fence or carrier board so that its end is flush with the edge of the carrier. Position

Make the Drawers, Then Add Finish

Note: Before you start the drawers, we suggest measuring your three drawer openings to see whether they vary from the dimensions shown on

Creating the Decorative Bead On the Drawer Fronts

To make the bead, we first laid out the four corners 1/8" in from both edges with a pencil. Then, use a marking gauge to score the groove along both edges and ends, being careful to stop at each corner (*photo A*).

Next, we deepened the score line by rescoring it several times with an X-Acto knife. We then created a groove by cutting along the scoreline with the X-Acto blade held at a 45° angle (*photo B*).

At this point, we widened the groove by making several passes with a homemade V-grooving tool (*photo C*). To make this simple device, we first clamped a #8x3/4"

flathead wood screw in a vise, then filed one side of the head flat to create a sharp edge for scoring. Next, we cut a 3/4x1 1/2x5" piece of pine and drilled a pilot hole 3/8" from one edge and 1" from one end. We drove the screw into this pilot hole, adjusting the depth until the screw's cutting edge protruded 1/8" from the surface of the pine piece.

To complete the bead, we rounded the edges and ends of each drawer front slightly using a small, sharp plane (*photo D*). Then, we sanded these edges and ends as well as any rough spots we found along the groove.

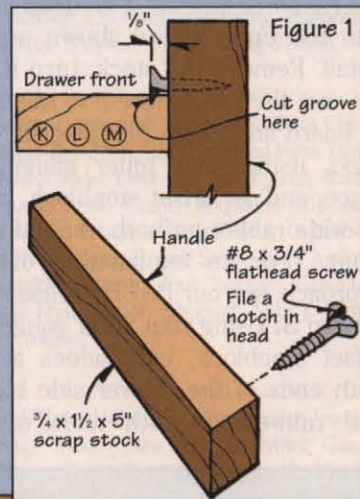


Photo A ▲



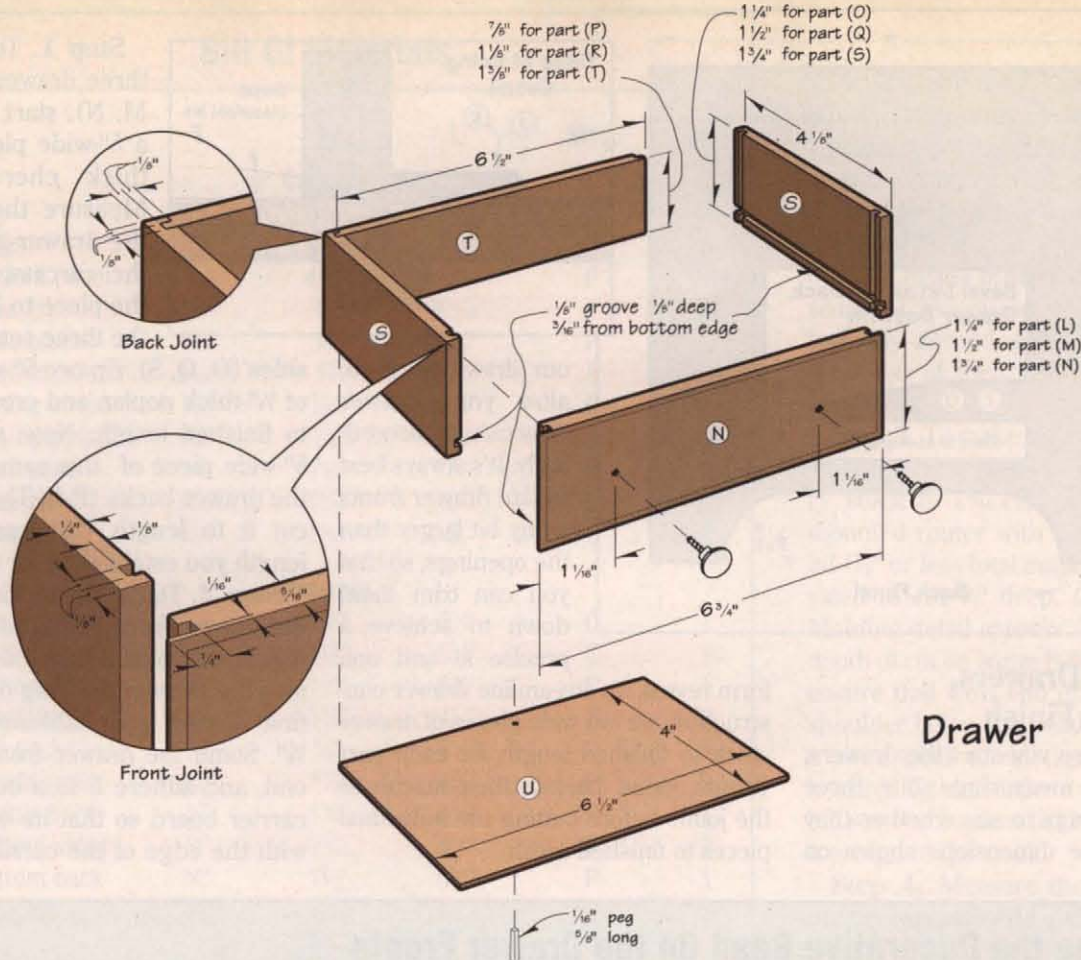
Photo B ►



Photo C ▲



Photo D ►



the rip fence and cut a 1/4"-deep notch into the ends where shown on the detail. Remove the stock, turn it end for end, then re-adhere it to the carrier board and notch the opposite end. Next, using your miter gauge, rip fence, and an offset stopblock, cut a 1/8"-wide rabbet on both ends of each front. (For an explanation of this approach, see our Pro Tip below.)

Step 3. Using your miter gauge and offset stopblock, cut dados across both ends of the drawer side blanks and rabbets at both ends of the

drawer back blank. (See the Front Joint and Back Joint details shown with the Drawer drawing.) Now, rip all drawer fronts, sides, and backs to the appropriate finished widths.

Step 4. Elevate your tablesaw blade 1/8", and cut a 1/8"-deep groove along the inside faces of all drawer fronts and sides where shown on the Drawer drawing. Next, cut the three drawer bottoms (U) to size, and plane a bevel along the front edge and ends. (See the Bevel detail that accompanies the Back Panel drawing.)

Step 5. Sand the interior surfaces of the drawer parts smooth. Next, dry-assemble the three drawers to check for fit. Adjust any parts that need it, then glue and assemble the fronts, sides, and backs. Slide each bottom into its groove—without glue—to square the drawer. Clamp each assembly, then check for square. Wipe away any glue squeeze-out, and allow the glue to dry.

Step 6. Remove the clamps, and peg each drawer bottom to the bottom edge of the drawer back. To do this,

first drill a 1/16" pilot hole where shown on the Drawer drawing. Then, apply glue to a peg, and drive it into the hole.

Step 7. Test-fit the drawers in their openings. Using a small, sharp plane, remove a shaving or two at a time where necessary to achieve a free sliding action, while still maintaining a slight, uniform reveal around all four sides. Next, glue and clamp 1/8"-thick spacer blocks to the drawer backs. If these prevent the drawers from sliding in flush with the front of the chest, sand the spacers to proper thickness.

Step 8. Lay out and drill holes of appropriate diameter and depth for the drawer pulls. (See the Drawer drawing for locations. To order brass drawer pulls, see the Sources list.) Now, add the bead to the drawer fronts, as explained in "Creating the Decorative Bead On the Drawer Fronts" on page 51.

Step 9. Apply your choice of finish. (For authenticity's sake, we brushed all surfaces with two coats of orange shellac, then leveled the

continued on page 61

Pro Tip

For safety's sake, we clamped a stopblock to our rip fence several inches from the point where the blade would enter the stock. We set the fence and block to establish the location of each cut, then did the actual sawing without the stock making contact with the stopblock or fence.

Back Issue Sale!

Choose any 12 back issues from those listed below or from the order form bound in the center of this magazine for just \$35 — and get our handsome protective slipcase FREE! Or choose individual back issues for just \$5 each. Send the order form in the envelope provided or write: Woodworker's Journal, 405 Riverhills Business Park, Birmingham, AL 35242.

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TV and VCR Cabinet Sep/Oct '90



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Kids' Bobsled Nov/Dec '89



Vol. 13 No. 6 Nov-Dec '89 (No. 8911)

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TV/VCR Cabinet w/Pocket Doors, Shaker Woodbox, Cabinet with Punched Tin Doors, Sushi Set, Carved Pineapple, English Cutlery Tray, Toy Train Set, Workbench, Portable Tool Chest; *Articles:* Files and How to Use Them; Compound Angle Dovetails; Water-Based Finishes; Making the Slip Joint; Shop Test: 6 Dovetail Jigs.

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Early American Pine Hutch, Child's Windsor Chair, Universal Table Saw Jig, Convertible Step Stool/Chair, Finger-saving Plastic Bag Handle, Acrobatic Bear Folk Toy, Kids' Kitchen Playcenter, Easy-build Bookshelves; *Articles:* Amps vs. Horsepower; An Introduction to Chairbuilding; Vacuum Turning; Tool Review: Benchtop Table Saws.

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Gov. Winthrop Slant-front Desk, Futon Bed/Couch, Low-cost Router Table, Toy Livestock Truck, Heirloom Jewelry Box, Scroll-sawn Nativity Scene, Early American Doll Bed, Router-built Wall Cabinet; *Articles:* Stick and Cope Doorbuilding; Linenfold Carving; Tool Review: High-end Scroll Saws.

Vol. 17 No. 3 May-June '93 (No. 9305)

Country Pie Safe, Collapsible Basket, Intarsia: Humpback Whale, Classic Jewelry Chest, Skittles Game, Porch/Yard Swing,

Handsaw Caddy, Shaker Wall Cabinet; *Articles:* Doweling Jigs, Taming the Hand Scraper; Shoptest: Porter-Cable's Pocket Hole Cutter.

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Early American Corner Cupboard, Gossip Bench, Band Saw Cutoff Table, Roaring 20's Sports Car, Pussycat Napkin Holder, Aerobic Step, Desktop Bookshelf, Cherry Letterbox w/Mountain Scene Relief Carving; *Articles:* How to Buy Wood; Incised Lettering; Choosing and Using Sharpening Stones; Shoptest: The Incra Jig System.

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Intarsia: American Eagle, Blockfront Chest, Super Box Joint, Old Fashioned Farm Table, Sunset Rider Desk Set, Scroll-sawn Bunny Puzzle, Quilt Crane, Magazine Slipcases; *Articles:* Pennypincher's Clamp Organizer; How to Flatten Rough Stock; Faux Antique Cracked Finish; Tool Review: Benchtop and Mini Lathes; Shoptest: Safe-T Planer by Wagner.

Vol. 17 No. 6 Nov-Dec '93 (No. 9311)

Old-Time Icebox, Contemporary Jewelry Box, Windowpane Mirrors, Miter Gauge Fence, Toys (Boat, Helicopter & Truck), Noah's Ark & Scroll-sawn Animals, Victorian Wall Shelf, Kids' Modular Furniture Set, Santa Carving; *Articles:* How to Rip and Crosscut on the Table Saw; Getting Started in Carving; Turning Bricklaid Bowls; Shoptest: Laguna Tools Mortising Table; Tool Review: Random-Orbit Palm Sanders.

Vol. 18 No. 3 May-June '94 (No. 9405)

Through-Dovetail Jig, Woody Wagon Toy, Intarsia: Bad Puppy, Oval Collapsible Basket, Cherry Coffee Table, Salt & Pepper Shaker Set; *Articles:* Fine Tuning Your Band Saw; Tool Review: Benchtop Band Saws.

Pierced Tin Country-Pine Wall Cabinet

If you're drawn to the warmth of country kitchens, this project has much to recommend it—whatever room you decide to put it in. In colonial times, pierced tin or copper panels offered functional beauty. They protected food from insects and dust as well as providing ventilated refuge for a pie or pudding still warm from the oven.

We chose honey-finished pine to set off the tin's pewter finish and its faceted "sunburst" pattern, an authentic pie-safe motif that dates from the early eighteenth century. We also had this piece in mind as a companion for the free-standing unit shown in the photo opposite, which we presented a year ago (Jan./Feb. 1994, pp. 56-62).

Cherry, maple, oak, or even cottonwood, stained to enhance the panels, might suit you better than what we chose. And, as you've probably observed, clear pine is no more a bargain these days than many hardwoods. As for the tin panels, our supplier offers them unpunched (including patterns), for those of you who want to "tinker" with them yourselves, or prepunched and ready to install.

Prepare the Sides, Top, and Bottom

Step 1. From $\frac{3}{4}$ "-thick stock, rip and crosscut two sides (A), the top/bottom pieces (B), and the bottom shelf (C) to the dimensions listed in the Bill of Materials. (We selected pine. See the Cutting Diagram on page 57 for suggestions on how we laid out our stock.)

Step 2. Mount a $\frac{3}{8}$ "-wide dado head on your tablesaw. Elevate it to

cut $\frac{3}{8}$ " deep, and cut the dados along the ends of both sides where detailed on the Exploded View *opposite*.

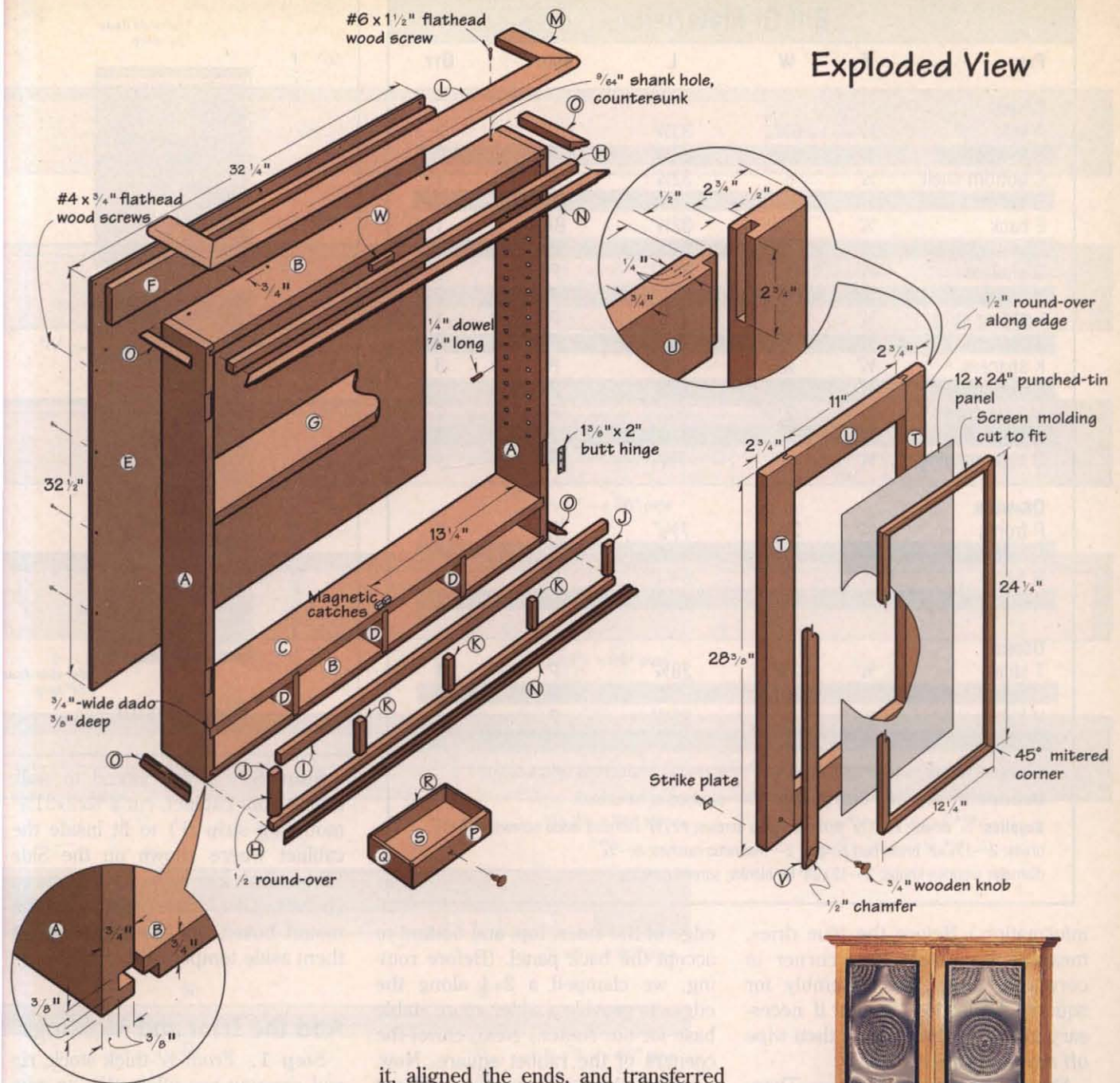
Next, cut $\frac{3}{8} \times \frac{3}{8}$ " rabbets (to create tenons of the same dimensions) along the ends of the top/bottom pieces as shown on the same detail. (To avoid errors, we found it helpful

to mark the inside/outside or top/bottom faces of each piece and to indicate locations of all rabbets and dados before cutting.)

Step 3. Switch to a $\frac{1}{2}$ " dado head, and set it to cut $\frac{3}{8}$ " deep. Using dimensions shown on the Bottom drawing on page 56, lay out and cut



Exploded View



it, aligned the ends, and transferred the centerpoints using a combination square.) Now, using a $\frac{1}{4}"$ brad-point or Forstner bit, drill the holes $\frac{1}{2}"$ deep.

Step 5. From $\frac{1}{2}"$ -thick stock, cut three drawer dividers (D) to size. Then, finish-sand all parts. Note: We usually sand pine and other softwoods to 120-grit, hardwoods to 180- or 220-grit.

Step 6. Dry-assemble the cabinet (without glue) to check for fit. Adjust any parts that require it, then glue, assemble, and clamp the carcass (A, B, C, D). Note: Align the front edge of the bottom shelf with the front edges of the sides. (See the Side View drawing on page 60 for additional



Wall cabinet combined with the cabinet project from Jan./Feb. 1994

the $\frac{1}{2}"$ -wide dados across the top face of the bottom (B) and the bottom face of the bottom shelf (C). Next, change to a $\frac{3}{4}"$ dado head elevated to cut $\frac{3}{8}"$ deep. Now, lay out and cut a $\frac{3}{4}"$ -wide dado across the inside face of each side to accept the bottom shelf. (For location, see the Side detail drawing on page 56.)

Step 4. Lay out centerpoints for the $\frac{1}{4}"$ shelf support holes on the inside face of each side where shown on the Side detail. (To ensure uniformity, we first marked the holes on one board, then placed the second board next to

Bill Of Materials

PART	T	W	L	MAT.	QTY
CABINET					
A side	3/4"	6 1/4"	33 1/4"	P	2
B top/bottom	3/4"	6 1/4"	32 1/4"	P	2
C bottom shelf	3/4"	6"	32 1/4"	P	1
D dividers	1/2"	3 1/4"	6"	P	3
E back	1/4"	32 1/4"	32 1/2"	BP	1
F mounting strip	3/4"	2"	31 1/2"	P	1
G shelves	3/4"	5 3/4"	31 1/2"	P	3
H fillers	3/4"	3/4"	33"	P	2
I edging strip	3/4"	3/4"	31 1/2"	P	1
J corners	3/4"	3/4"	3 1/4"	P	2
K spacers	3/4"	1 1/2"	2 1/2"	P	3
L front crown*	3/4"	2"	35 1/2"	P	1
M side crown*	3/4"	2"	8 1/4"	P	2
N front molding*	3/4"	3/4"	34 1/2"	P	2
O side molding*	3/4"	3/4"	7 3/4"	P	4
DRAWERS					
P fronts	3/4"	2 1/2"	7 1/8"	P	4
Q sides	1/2"	2 1/2"	6 1/2"	P	8
R backs	1/2"	2"	6 15/16"	P	4
S bottoms	1/4"	6 3/16"	6 7/8"	PW	4
DOORS					
T stiles	3/4"	2 3/4"	28 3/8"	P	4
U rails	3/4"	2 3/4"	12"	P	4
V batten	1/4"	3/4"	28 3/8"	P	1
W doorstop	3/8"	1"	2 1/2"	P	1

*Parts cut to final size during construction. Please read all instructions before cutting.

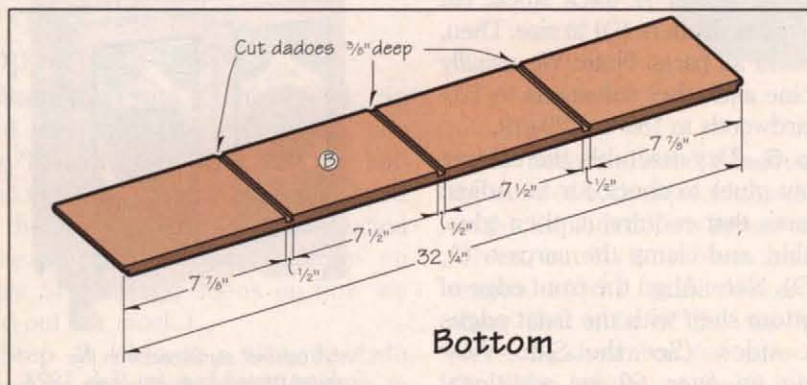
Materials: P—pine; BP—birch plywood; PW—plywood or hardboard.

Supplies: 1/4" dowel; #6 x 1 1/2" flathead wood screws; #2 x 1/2" flathead wood screws; #18 x 3/8" brads; 2—1 3/8" x 2" brass butt hinges; 2—magnetic catches; 6—3/4" diameter wooden knobs; 2—12 x 24" tin blanks; screen molding.

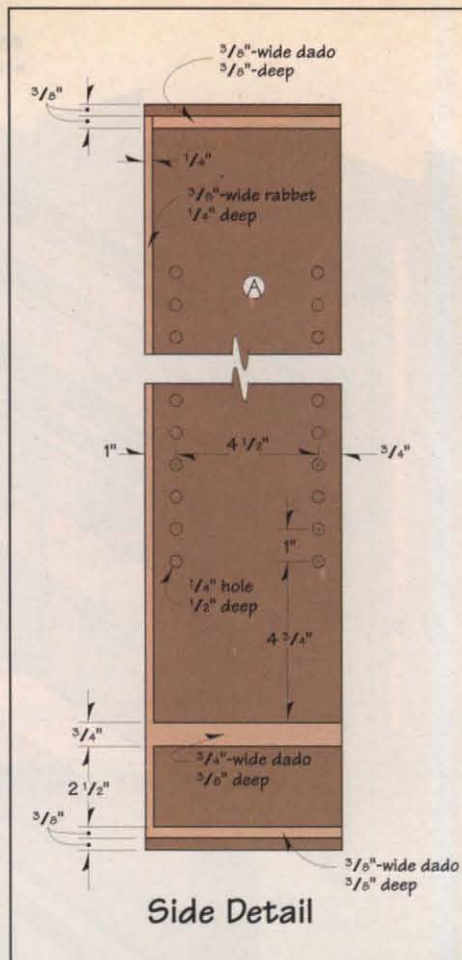
information.) Before the glue dries, measure diagonally from corner to corner to check the assembly for square. Adjust the clamps if necessary to square the carcass, then wipe off any glue squeeze-out.

Step 7. Remove the clamps. Then, using a 3/8" rabbeting bit, rout a 1/4"-deep rabbet around the inside back

edge of the sides, top, and bottom to accept the back panel. (Before routing, we clamped a 2x4 along the edges to provide a wider, more stable base for our router.) Next, chisel the corners of the rabbet square. Now, measure the back opening, and cut the back (E) to fit from 1/4"-thick plywood. (We used birch.)



Bottom

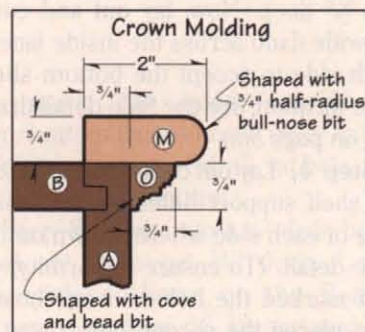


Side Detail

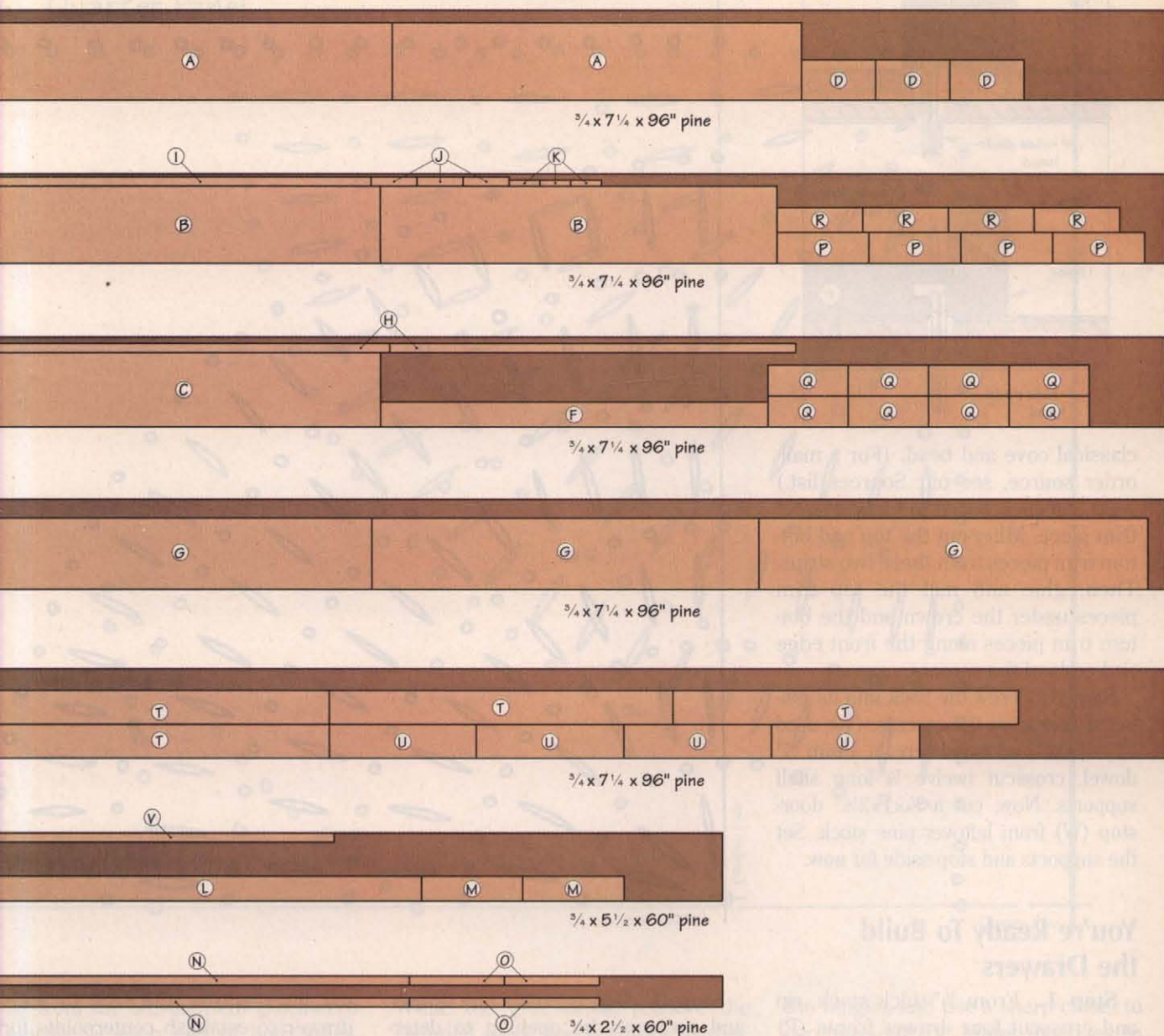
Step 8. If you intend to wall-mount your cabinet, cut a 3/4" x 2 x 31 1/2" mounting strip (F) to fit inside the cabinet where shown on the Side View. Next, rip and crosscut three shelves (G) to size. Finish-sand the mount board and shelves, then set them aside temporarily.

Add the Trim and Moldings

Step 1. From 3/4"-thick stock, rip and crosscut two fillers (H), an edging strip (I), and three spacers (K). (Although we list specific lengths for these pieces in the Bill of Materials, we suggest you size the pieces to fit



Cutting Diagram



your carcass.) To make the corners (J), cut a $\frac{3}{4} \times \frac{3}{4} \times 12$ " piece, then round over one edge. (We used a $\frac{1}{2}$ " round-over bit with our table-mounted router.) Now, crosscut two $\frac{3}{4}$ "-long corners from the piece. Finish-sand all parts, then glue and clamp them to the carcass where shown on the Exploded View drawing.

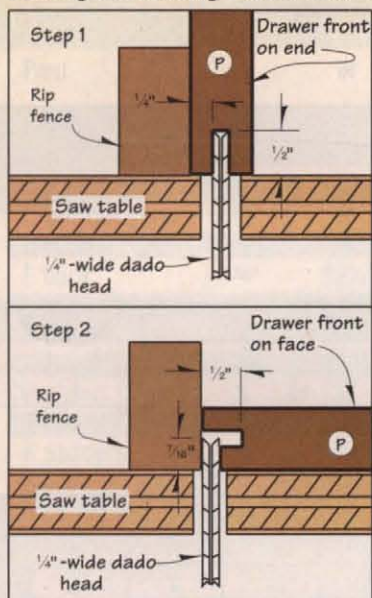
Step 2. To form the crown (L, M), first rip and crosscut a piece of $\frac{3}{4}$ "-thick stock to 4×56 ". Then, round over both edges. (We used our table-mounted router with a $\frac{1}{2}$ " half-radius

bull-nose bit to shape the edge in one pass. See the Crown Molding drawing *opposite* for details.) Note: To mail-order the router bits we used for the moldings and trim, see the Sources list on page 61.

Step 3. Set your tablesaw fence 2" from the blade and rip the edged crown piece into two parts. Set the narrow edged piece aside—you'll cut the door batten from it later. From the 2"-wide piece, miter-cut the crown to fit the cabinet top. Note: As shown on the Crown Molding and Exploded

View drawings, the back edge of the molding aligns flush with the inside face of the sides and the front edge of the filler (H). We cut and fit the long piece (L) first, then the two end pieces (M). Now, glue and nail the crown to the cabinet top.

Step 4. To form the decorative trim (N, O) shown on the Crown Molding drawing, first cut two pieces of $\frac{3}{4}$ "-thick stock to 2×56 ". Mount a cove and bead bit in your table-mounted router, then rout one edge of each piece. Note: This profile differs from a



classical cove and bead. (For a mail-order source, see our Sources list.) Next, rip each board to form a $\frac{3}{4} \times \frac{3}{4}$ " trim piece. Miter-cut the top and bottom trim pieces from these two strips. Then, glue and nail the top trim pieces under the crown and the bottom trim pieces along the front edge and ends of the carcass.

Step 5. Screw the back into its rabbeted recess on the carcass. (We used #2 $\times \frac{1}{2}$ " flathead wood screws. From $\frac{1}{4}$ " dowel, crosscut twelve $\frac{7}{8}$ "-long shelf supports. Now, cut a $\frac{3}{8} \times 1 \times 2\frac{1}{2}$ " door-stop (W) from leftover pine stock. Set the supports and stop aside for now.

You're Ready To Build the Drawers

Step 1. From $\frac{3}{4}$ "-thick stock, rip and crosscut four drawer fronts (P) to the dimensions listed in the Bill of Materials. From $\frac{1}{2}$ "-thick stock, cut eight drawer sides (Q) and four drawer backs (R) to their respective sizes. Now, set up your tablesaw and dado head to cut a $\frac{1}{4}$ " groove $\frac{1}{4}$ " deep $\frac{3}{16}$ " up from the bottom edge of each front and side. (See the Drawer drawing on page 60.)

Step 2. To cut the locking joints on the ends of the drawer fronts, follow the procedure shown on the two-step drawing above. Next, dado the sides and rabbet the backs as dimensioned on the details that accompany the Drawer drawing.

Step 3. Dry-assemble one drawer and measure the opening to determine the bottom's size. Then, cut four $\frac{1}{4}$ "-thick plywood or hardboard bottoms (S) to fit. Next, glue, assemble, and clamp the drawer fronts, sides, and backs. Note: Align the top edge of the back piece with the top edges of the sides. Check each drawer for squareness and flatness. After the glue dries, remove the clamps, sand the joints flush, and insert the bottoms into the grooves. Tack the bottoms to the back using small brads.

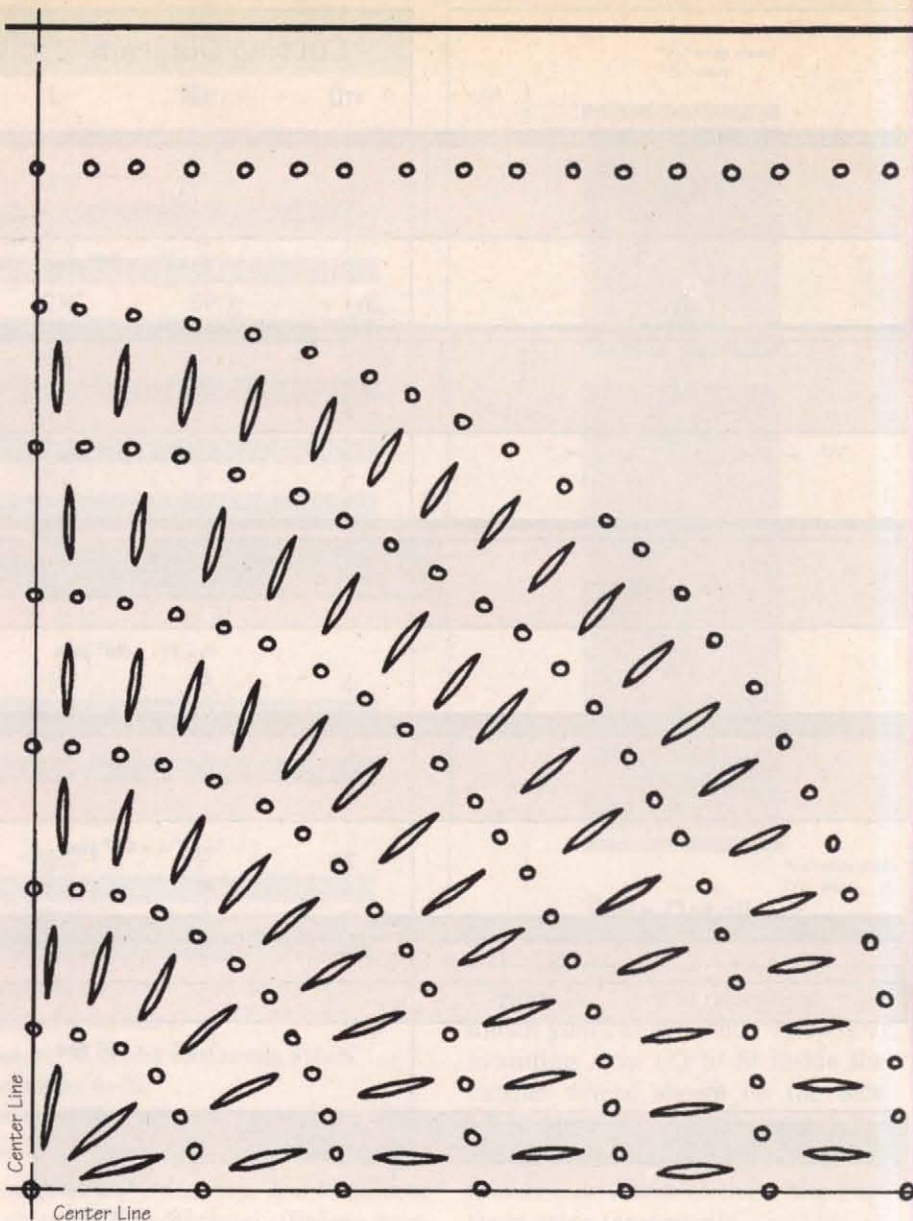
Step 4. Test-fit the drawers in the cabinet compartments. If necessary, belt-sand the drawer sides to increase clearance. Next, draw diagonals

across the face of each drawer to establish centerpoints for the drawer knobs. Then, drill holes for the knob tenons. (Ours required a $\frac{3}{8}$ " hole. We shortened the tenons to $\frac{1}{2}$ " and drilled the holes $\frac{1}{16}$ " deep.)

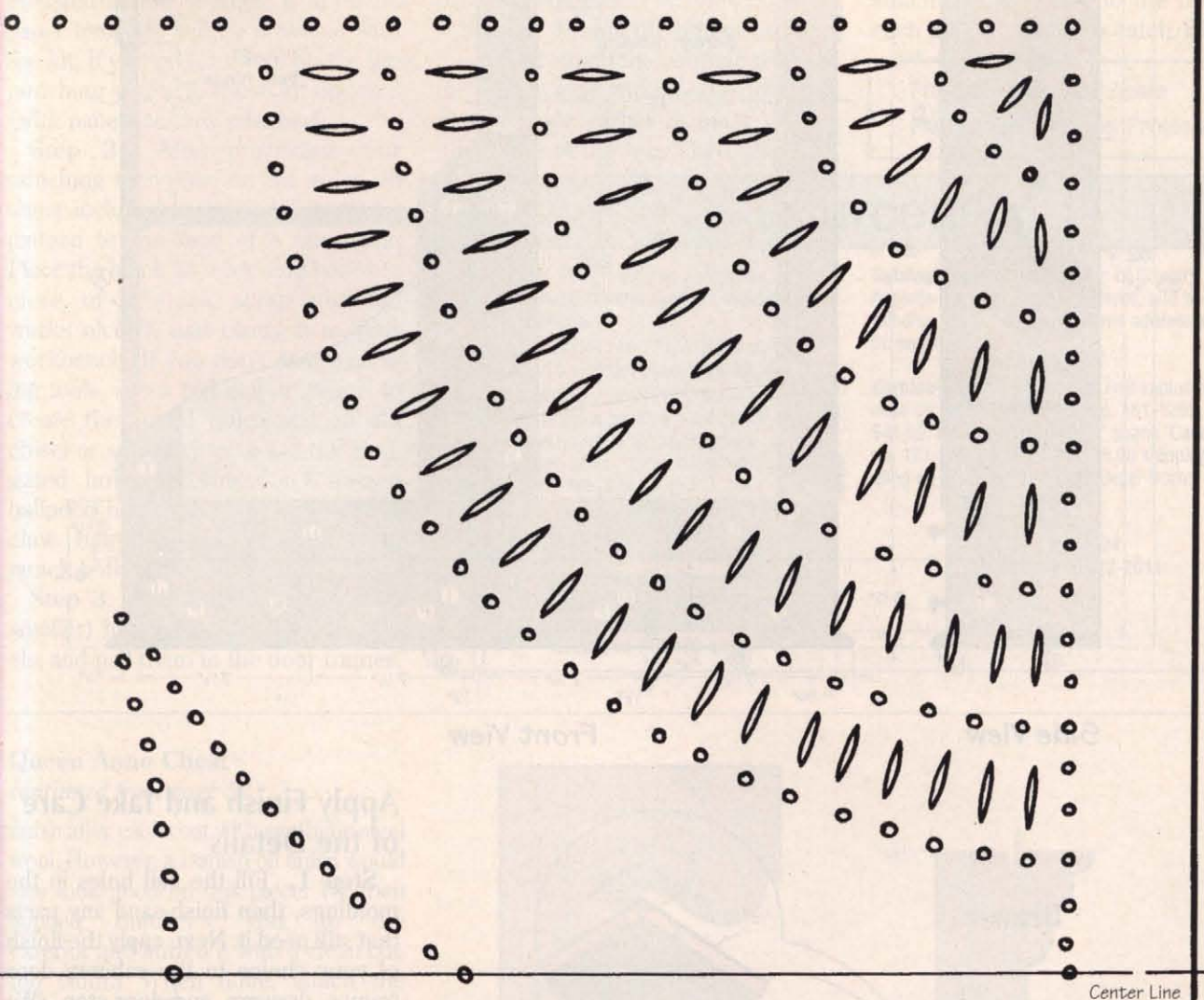
Now, Make the Doors

Step 1. Measure the cabinet opening to determine if the door dimensions listed in the Bill of Materials need to be adjusted. Then, rip and crosscut four stiles (T) and four rails (U) from $\frac{3}{4}$ "-thick stock.

Step 2. Fit your table-mounted router with a $\frac{1}{4}$ " straight bit, and elevate it to cut $\frac{1}{2}$ " deep. Clamp a fence



Full-Sized Pattern Quarter Panel



$\frac{1}{4}$ " from the bit, then cut a centered mortise at each end of both stiles. (See the detail that accompanies the Door drawing on the Exploded View.) Now, square the end of each mortise with a sharp chisel.

Step 3. Using your tablesaw, cut a centered tenon on each end of both rails to fit snugly into the mortises you cut in the previous step. (Again, see the detail shown with the Door drawing.)

Step 4. Dry-assemble the door frames to test for fit. Adjust the tenons if necessary. When everything fits, glue, assemble, and clamp both door frames. Check to make sure the doors are square and flat.

While the glue dries, retrieve the rounded piece you set aside earlier, and rip the $\frac{1}{4}$ "-thick batten (V) from it. Bevel-cut the ends to final length. Then, glue and nail it to the door edge where shown on the Front View drawing on page 60. Now, using the same bit you used to round over the cabinet corners (J), rout the front outside edge of each door frame.

Step 5. Position the hinges on the door stiles where shown on the Front View drawing. Screw them to the doors, and score around the hinge edges using a sharp knife. Next, place the doors on the cabinet, center them, and mark the hinge locations on the cabinet edges. Then, remove

the hinges, and use a sharp chisel to carefully cut the hinge mortises to the depth of the hinge blade in the door stiles. Cut the mortises to that depth in the cabinet edge.

Step 6. If you plan to hang the cabinet on a wall, hold the mount strip (F) in position on the wall, then mark the wall stud locations on the piece. Drill and countersink $\frac{5}{32}$ " shank holes. Next, position the mounting strip inside the cabinet where shown on the Exploded View drawing. Drill and counterbore five $\frac{9}{64}$ " shank holes in the top piece $\frac{3}{4}$ " in from the back edge. Drive #6x1 $\frac{1}{2}$ " flathead wood screws to secure the mounting board to the top.

and 59. If you don't have paper large enough, simply tape together several sheets of typing paper. Note: If you purchase kit option 2 from the supplier listed in the sources, a full-sized paper template will be provided with the kit. If you prefer not to do the tin-punching yourself, chose kit option 3 (with panels already punched).

Step 2. After practicing your punching technique on the extra tin sheet included with the kit, tape the pattern to the face of a tin blank. Place the blank on a backing board (a piece of 1/2"-thick scrap plywood works nicely), and clamp it to your workbench. If you don't own punching tools, use a 16d nail or an awl to create the round holes and an old chisel or screwdriver to cut the elongated holes. If you don't own a ballpeen hammer, a 12- or 16-ounce claw hammer will suffice. Now, punch both panels.

Step 3. Drill a small hole (1/16" or smaller) in each corner of both panels, and nail them to the door frames.

Next, miter-cut the panel trim to length, and nail it over the edges of the tin panels. (We used #18x5/8" brads.) Now, touch up the joints with paint as required.

Step 4. Mount the hinges on each door, then attach the doors to the cabinet. Next, glue and nail the doorstep in you made earlier in place on the underside of the top. Then, glue the

door knobs into the door and drawer holes. Mount the magnetic catches on the bottom shelf where shown, and adjust them for position. Finally, attach a strike plate to the inside of each door opposite its catch. 

Project Design: Mark Ziobro

Photographs: Lynxwiler Photography

Sources

Tin Panels. Pewter-tone tin panels like the ones we used on this cabinet are available in three kit options.

Option 1: Includes two 12x24" blank panels and one 8x10" practice panel. \$14.20 ppd.

Option 2: Includes two 12x24" blank panels and one 8x10" practice panel, a point punch (to make round holes), a 1/16" chisel punch (to make the elongated holes), and a full-sized Sunburst (RP1057) pattern. \$29.45 ppd.

Option 3: Includes two 12x24" panels pre-punched with the Sunburst (RP1057) pattern (as shown in photo). \$59.80 ppd. Order from:

Country Accents
P.O. Box 437
Montoursville, PA 17754
Telephone 717/478-4127.

Catalog. Shows complete line of Country Accents punched panels, patterns, and tin-punching supplies. \$5.00. Same address as for tin panels.

Carbide-Tipped Router Bits. Half-radius bull-nose bit, 1/2" shank. Catalog no. 161-1205, \$41.99. Cove and bead bit, 1/2" shank. Catalog no. 171-2605, \$34.99. Add \$5.00 shipping/handling on orders under \$100. Order from:

Eagle America
P.O. Box 1099
Chardon, OH 44024
Telephone 800/872-2511

Queen Anne Chest

continued from page 52

finish after each coat with synthetic steel wool. However, a Danish oil finish would also look good on this piece. We then applied Butcher's Wax to the exterior and buffed it with a clean cotton cloth.) When done, attach the drawer pulls. 

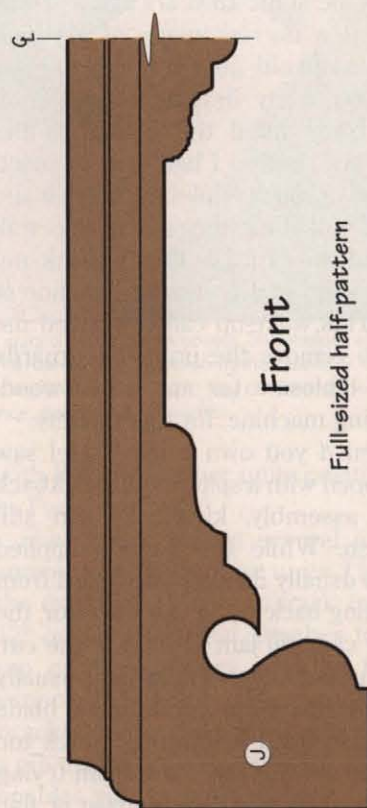
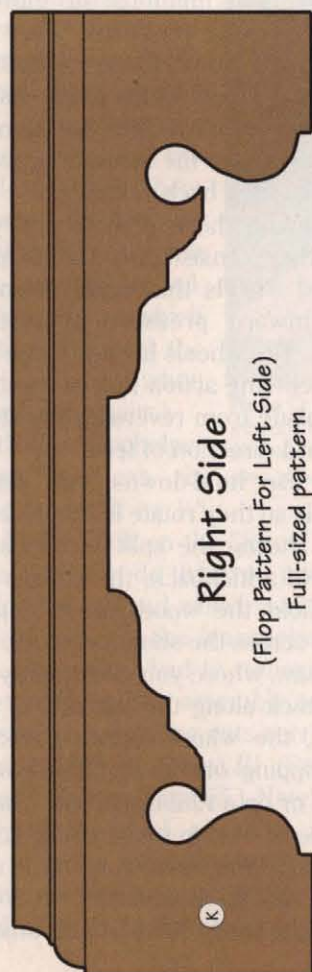
Sources

Small Classical Router Bit. Woodtek carbide-tipped, 1/16" cutting surface, 1/8"-radius bead. Catalog no. 820-522 (1/4" shank) or no. 820-543 (1/2" shank). \$27.95 plus \$4.95 shipping/handling. Order from:

Woodworker's Supply, Inc.
5604 Alameda Place N.E.
Albuquerque, NM 87113-2100
Telephone: 800/645-9292

Drawer Pulls. As used on the cherry chest shown in the photo. Set of six solid brass pulls with 1/4" screw mounts. Ask for kit no. 71247. Price: \$8.49 ppd. Order from:

Klockit
P.O. Box 636
Lake Geneva, WI 53147-0636
Telephone: 800/556-2548





ANTI-KICKBACK HOLD-DOWNS

**For Safer, More Accurate
Cuts On Tablesaws and
Other Woodworking
Machines**

Review by Jim Barrett

It's a rare woodworker who has not experienced a kickback on the tablesaw. Kickback first found me some 15 years ago as I was ripping a narrow piece of $\frac{3}{4}$ "-thick stock on an old, poorly tuned tablesaw with no safety devices of any kind. The blade lifted the board off the table and, before I had time to react, kicked it back violently across the shop, impaling the sheetrock wall behind me. To this day, I thank my lucky stars that I wasn't in the line of fire. This wake-up call convinced me not to remove the protective guards on a tablesaw (or any other woodworking machine, for that matter).

Even if you own a late-model saw equipped with a splitter/anti-kickback pawl assembly, kickbacks can still happen. While the factory-supplied pawls usually do keep the board from shooting back at the saw operator, the blade can still jam or bind in the cut, stalling the motor. These jams usually result either from a misaligned blade or fence, from feeding the stock too quickly through the saw, from trying to cut stock that's not square or flat, or from not holding the work firmly against the table and fence.

Properly set up, anti-kickback hold-downs help minimize or eliminate most of these problems. They hold the board down firmly against the table and fence, which helps ensure a straight, clean cut. And, during operation, they grip the stock to prevent it from kicking back violently.

Examine these devices and you'll find they consist of a set of spring-loaded wheels that apply downward and inward pressure against the stock. The wheels include some form of ratcheting action that prevents the saw blade from reversing the stock's forward direction of feed.

To use hold-downs, you set the wheels so they rotate in one direction only. During the split second at the start of a kickback, the wheels grab and hold the wood, preventing the usual across-the-shop trajectory. On a tablesaw, where you customarily feed the stock along the left side of a rip fence, the wheels rotate clockwise. For ripping on the right side of the fence or on a radial-arm saw, you can set the wheels to rotate counterclockwise only. You can also set (or in some cases, adapt) hold-downs to a free-wheeling mode for use with shapers,

router tables, bandsaws, and other machines that pose little or no threat of kickback.

I tested four anti-kickback hold-down products currently on the market: Shophelper, Board Buddies, Ripstrate, and Leichtung. In my tests, all four of these wheeled devices worked as advertised, but I did find some significant performance differences among them.

Shophelper

The Shophelper units come in pairs—using just one won't do much good. Each unit has a beveled, plastic-composite wheel attached near the end of a spring-loaded, cast-aluminum pivot arm that's mounted in a cast-aluminum housing. The housing fits into a dovetailed mounting bracket (also aluminum), which clamps to an auxiliary wooden fence attached to the saw's rip fence. (As with the other three hold-downs, you must use an auxiliary wooden fence.)

The housing slides in and out on the mounting bracket and locks in place with thumbscrews, enabling you to position the wheels at various



Photo A: On Shophelper, infed wheel (foreground) is positioned to left of cut line, outfeed wheel to right of cut line. Optional 24" track attached to auxiliary fence enables you to position units at different positions along the fence.

distances from the fence. You can also adjust the position of the wheel on the threaded axle shaft of the pivot arm. You position the infed wheel assembly so the wheel rides on the left side of the cut line and in front of the blade (*photo A*). The outfeed wheel rides on the right side of the cut line between the blade and the fence. (If you place the outfeed wheel to the left of the cut, it tends to close the kerf behind the blade, and could cause binding or burning). The wheels extend a maximum of $5\frac{1}{4}$ " away from the fence, enabling you to rip boards up to 5" wide with the front wheel in the outboard position.

The Shophelper also allows you to adjust spring tension and wheel height above the table. Generally, you



Photo B: The blade guard on most saws interferes with the outfeed wheel on all four hold-downs tested (as shown here with the Shophelper), limiting inboard rip cuts to a minimum of 3 to $3\frac{1}{2}$ " wide.

adjust the wheels to a height $\frac{1}{8}$ " lower than the thinnest stock you usually cut (e.g., $\frac{5}{8}$ " above the table for $\frac{3}{4}$ " stock). You can then slide boards $\frac{3}{4}$ " or thicker beneath both of the wheels. You adjust the spring tension by means of a wing nut located behind the pivot arm lever.

Shophelper offers three different wheels for these units. The yellow wheels (shown) turn clockwise for use in conventional tablesaw operations where

you rip on the left-hand side of the fence (left-hand feed). The orange wheels turn counterclockwise for use in right-hand feed operations (including ripping on a radial-arm saw). The green wheels turn in both directions. In this mode, they serve as hold-downs but provide no kickback protection. Use them only with bandsaws, shapers, and router tables. (Note: According to the manufacturer, the yellow and orange wheels on the Shophelper are being redesigned so you can reverse them on the axle—by removing the retainer ring on the wheel—to allow them to rotate in the opposite direction. Whether you choose orange or yellow depends on which direction you want the wheels to turn when you order the units.)

With the Shophelper system, you can rip pieces as small as $\frac{1}{4}$ " wide by $\frac{1}{4}$ " thick on the "fence" side of the blade. To do this, you need to position the outfeed wheel to ride on the corner where the fence joins the table. However, I had to remove the blade guard/splitter assembly on my tablesaw when making cuts narrower than about 3" wide (*photo B*). (See the Author's Note on page 65.) Note: The factory blade-guard assembly interfered with the outfeed wheels when making narrow cuts on all four units tested. With the guard removed, I was

able to rip pieces as narrow as $\frac{3}{4}$ " (*photo C*). To get the $\frac{1}{4}$ "-wide rip, you'd need to bevel the top front edge of the wooden auxiliary fence. This provides enough clearance for the pivot arm to angle farther downward (as specified in the owner's manual).

The units I tested fit fences $2\frac{1}{2}$ " to 3" tall. Shophelper also makes models that fit 4"-high fences; be sure to specify your fence height when ordering. Mounted to the $2\frac{1}{2}$ " fence on my Sears 10" tablesaw, the Shophelper enabled me to rip boards up to about 3" thick. With a 3"-high fence, you can rip boards up to $3\frac{1}{2}$ " thick.

The minimum length of stock you can rip using Shophelpers depends on the distance between the front and rear wheels. In most applications, you mount the wheels 1" in front of and 1" behind the blade (with the blade fully raised). With this setup, the board must be long enough so that both wheels can catch and hold it before the cut is completed. (This is true of all the units tested). With a 10" blade, I could safely rip boards 14" or longer



Photo C: With saw's guard assembly removed, Shophelper allowed inboard rip cuts as narrow as $\frac{3}{4}$ ". By beveling the auxiliary wooden fence to provide clearance for the arm, you can move the wheel even closer to the fence, permitting $\frac{1}{4}$ " widths.

with the Shophelper units positioned as I've described.

Shophelper makes several accessories to use with these units. I found the extruded aluminum track (either 12" or 24" long) that attaches to the top of the auxiliary wooden fence especially useful. The mounting bracket on the hold-down attaches to a gib that slides along this track. This enables you to position each unit at various locations along the fence to accommodate different lengths of

stock. With the track, you can also remove individual units without detaching the wooden fence. You can also get special gibs for securing the Shophelper directly to extruded aluminum fences found on the Vega, Shopsmith, Ryobi BT-3000, Excalibur, and several other saws.

The Shophelper hold-downs worked as advertised, keeping stock of various thicknesses tight against the table and fence. I did notice a small amount of backward slippage when I tried to pull the board back against the wheel rotation. However, I consider this an asset, because in a strong kickback, the board would probably back off slightly from the blade's leading edge, which would prevent binding.

Board Buddies

Board Buddies resemble the Shophelper units and operate much the same way (*photo D*). At first glance, the castings for the pivot arm, housing, and mounting bracket appear to be identical to Shophelper's, although I did find some subtle differences. (The pivot arm on the Shophelper looks a bit more substantial, for example). The height-adjustment screw on the Board Buddies units is a bit shorter, which made it slightly more difficult to reach when I adjusted the wheel to its highest position. Also, the longer adjustment screw on the Shophelper has a stop nut inside the housing, whereas the one on the Board Buddies does not. (According to the manufacturer, the stop nut compensates for eventual thread wear in the aluminum housing.)

These and other minor differences gave me the impression that the

Board Buddies units lacked the refinement of the Shophelper. But then, they don't cost as much either. (For price comparison, see the Sources list on *page 66*).

The most obvious difference between these two units lies in the size and shape of their wheels. The larger, cone-shaped wheels on the Board Buddies are not reversible—you must order yellow wheels for clockwise rotation. Note: You'll see wheels of this shape on older versions of the Shophelper. If you do much work that requires right-hand feed or ripping on a radial-arm saw, you'll need orange wheels for counterclockwise rotation. If you want the freewheeling mode (for use with bandsaws, routers, and shapers), order the green wheels.

While testing, I noticed that the harder plastic wheels on the Board Buddies didn't grip the wood quite as firmly as the softer wheels on the Shophelper, allowing a bit more backward slippage.

However, slippage was still minimal and didn't seriously affect performance of the unit.

On the Board Buddies I tested, I found a small protrusion inside the housing prevented the wheel from bottoming out to its lowest position when the height adjustment knob was fully retracted. At its lowest position, the wheel re-mained about $\frac{3}{4}$ " above the table. I pointed out this problem to Grizzly, the Board Buddies distributor. A Grizzly rep immediately sent a new set of housings to replace the defective ones, which solved the problem. Evidently a bad batch had made its way undetected into the marketplace. I was told that the problem would be rectified by the time this article went to press. (If you already own a pair of these defective units, contact Grizzly for free replacement parts.)

Ripstrate

The Ripstrate, unlike the Shophelper and Board Buddies, comes as a single unit (*photo E*). Both rollers mount on spring-loaded arms that connect to a sturdy cast-iron base. A single pawl between the wheels prevents backward rotation of both. You can reverse the position of the pawl and tension spring to set up for right-hand feed, or remove the pawl altogether to switch to freewheeling.

To mount the unit, you make an auxiliary wooden fence from 1"- to 1½"-thick stock. Two guide pins in the



Photo E: Ripstrate includes both infeed and outfeed wheels in a single assembly. Short distance between wheels provides better support for ripping shorter lengths of stock.

unit's base fit into matching holes drilled in the top of the auxiliary fence. This angles the wheels slightly toward the fence. (The manufacturer supplies a template for establishing these hole locations). As you push stock through the blade, the offset wheels force the stock against the fence, and the spring's tension holds the board flat against the table. To secure the unit to the fence, you tighten a clamp bolt on the backside of the base. (The manufacturer recommends placing a hardwood shim between the clamp bolt and the fence to avoid marring it and to distribute clamping pressure along the fence.)

While the Ripstrate worked well once assembled and mounted, I encountered a few problems in assembling the device. The assembly instructions were somewhat vague, leaving it up to my intuitive mechanical ability to figure things out. The hole locations shown on the paper template packed with the device were off by about $\frac{1}{8}$ " (center to center)



Photo D: At a glance, Board Buddies look nearly identical to Shophelper, except for their conical wheels.

AUTHOR'S NOTE

For the sake of photographic clarity, I've either lifted up or removed the blade guard on my saw to better illustrate the anti-kickback hold-downs. Also, while describing the limitations of the various hold-down devices, I've noted in the text that narrow rip cuts against the rip fence cannot be made without removing the blade guard altogether. Several photos illustrate this. However, as a responsible journalist, I'll remind you that you should not remove the guard on your table saw if you can possibly avoid it. Although several of the hold-down manufacturers point out that the hold-downs themselves help protect your fingers from the blade, an exposed blade still poses a safety risk. If you do remove the guard for the purpose of ripping narrower widths, you do so at your own risk. Whether the guard is in place or not, always wear safety glasses, use a push stick or similar device to finish cuts, and follow the other common-sense safety practices when using woodworking equipment.

when compared against the stud locations on the mounting bracket. I also had to guess how far back the holes should be located from the front edge of the fence; the instructions didn't tell me. Before you cut out the template, I suggest you hold it against the studs on the mounting bracket to make sure the holes align.

I also found the holes in the base (for the sliding bars of the wheel-arm assembly) to be a hair undersized. I had to enlarge them slightly, using a piece of silicon carbide paper wrapped around a dowel, before they'd accept the sliding rods. Finally, I discovered that you have to rip the auxiliary fence to the exact height of the rip fence to fully support the wide base. Otherwise, the unit tilts slightly when you tighten down the clamp bolt. I'd prefer to see a clamping screw like those used in C-clamps rather than the hex-head bolt and wimpy wing nut provided for clamping the device. Trendlines, the Ripstrate supplier, assures me that they'll look into these minor problems and address them in the instruction manual.

As with the other units, you adjust the wheel height on the Ripstrate to accommodate the thinnest stock you usually cut. The Ripstrate will handle boards as thin as $\frac{1}{4}$ " and as thick as the height of your fence, but it only allows you to make cuts as narrow as $1\frac{1}{4}$ "—not even close to the $\frac{1}{4}$ " width you can get with other units. To manage a $1\frac{1}{4}$ "-wide cut, you'll have to remove the saw's blade guard and position the wheels directly over the blade. The center of the crowned outfeed wheel must ride just a hair to the right of the cut line to avoid closing the kerf behind the blade.

In this configuration, the Ripstrate acts as a blade guard of sorts. However, you need to make sure that the wheels do not contact the blade. To do this, set the wheel height to the exact thickness of the stock so the wheels won't snap down onto the blade after you feed the board through. I didn't feel terribly comfortable with this procedure. If you forget to set the correct height just once, you'll be buying a new set of wheels and maybe a new blade as well. I confess, however, that I can count on the fingers of one hand the times I've tried to rip extremely narrow pieces on the fence side of the blade. So, not having this capability probably isn't as critical as it may seem.

On the other hand, the Ripstrate enables you to rip shorter pieces than the other devices can handle, simply because the infeed and outfeed wheels are positioned closer together. In my tests, I felt comfortable ripping pieces as short as 9". When you work with short lengths, the maker recommends using a push stick that is slightly thinner than the stock being ripped to push the board under the wheels and through the blade. (For extra insurance, I also used a second push stick on the outside edge of the board.) What the Ripstrate manual lacks in

assembly instructions it makes up for in safety tips; a good percentage of the manual discusses proper use of the device.

The distance between the Ripstrate's wheels—and the fact that they both raise at once—also made it relatively easy to push stock through the device. With the other hold-downs, you encounter some resistance when the board end contacts and lifts the outfeed wheel. This can cause a slight slowdown or pause in the feed rate, which could result in a burn mark.

When I pulled my test board slowly back from the blade, I noticed a bit more backward slippage of the wheels on the Ripstrate than on the other devices. This occurs because the bar-type pawl relies on friction against the soft rubber wheels to prevent backward rotation. In a violent kickback, however, the pawl really digs in, stopping the wheels instantly.

Leichtung

The Leichtung system consists of a pair of spring-loaded, cast-aluminum wheel/arm assemblies that attach to a movable cast-aluminum clamp base (photo F). Adjustable steel rods enable you to move the wheels up to 7" away from the fence. Each unit clamps to the top of an auxiliary wooden fence by means of a sturdy clamp screw (like those found on C-clamps). It requires an auxiliary fence measuring 5" high, $1\frac{1}{2}$ " thick, and as long as the rip fence. Unlike some of the other devices, the Leichtung system allows you to

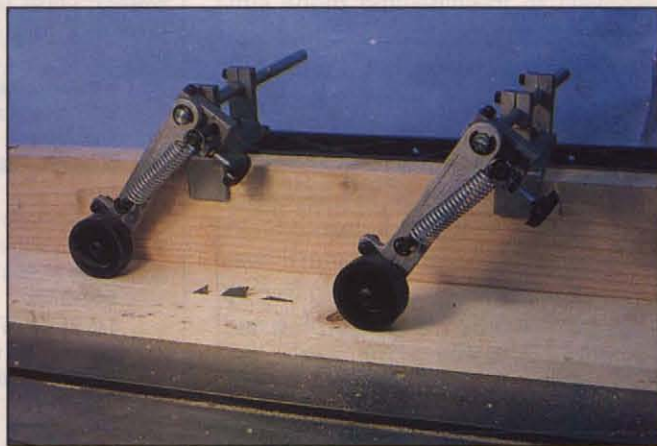


Photo F: Leichtung hold-downs simply clamp to wood auxiliary fence, making them easy to reposition or remove. Infeed wheel rides to left of cut line, as shown.

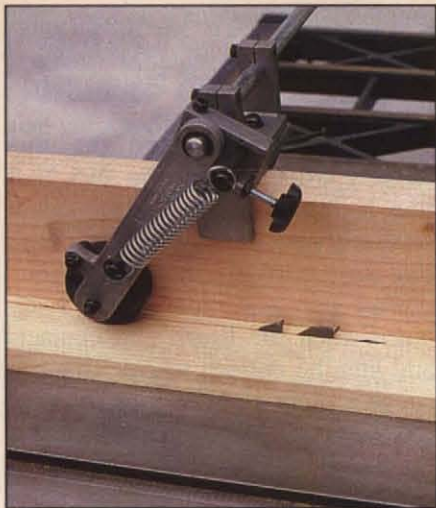


Photo G: Reversing the wheels to the inside of the arm enables the Leichtung system to make extremely narrow rip cuts. Blade guard, however, must be removed.

clamp the hold-downs anywhere along the fence and to remove them quickly when they're not needed.

You can angle the adjustable-arm assemblies up to 15° toward the fence to adjust the amount of inward pressure applied against the fence when you feed the stock. The principle resembles that used by the Ripstrate. However, that unit's arms have been permanently canted at a 5° angle.

To prevent kickback, a pawl engages a fixed ratchet attached to the axle behind the wheel. The Leichtung unit comes set up for left-hand feed (clockwise wheel rotation). To reverse wheel rotation for right-hand feed, you must remove the wheel and reverse the direction of the ratchet teeth, then reverse the arm (ribbed side out) and the stop bracket. From either setup, you can convert to freewheeling mode simply by flipping up the pawl to disengage it from the ratchet. (You'll find these procedures described clearly in the owner's manual.) When engaged, the ratchet/pawl assembly allows a maximum of 1/16" backward rotation of the wheel before it locks firmly in place. This feature was engineered into the device to free up the blade in the event of a bind and avoid motor stall.

To make extremely narrow rips against the fence (down to 1/4"), you remove the wheels and mount them on the inside of the arms (*photo G*). As with the other hold-downs, you'll

also need to remove the saw's blade guard assembly. (On my saw, I could not make rips any narrower than about 3 1/2" with the blade guard in place). For most other cutting jobs, you mount the wheels on the outside of the arms, positioning the infeed wheel to the left of the cut line (outboard position) and the outfeed wheel to the right of the cut line, as shown.

To set the wheel height above the table, you adjust a stop-bracket assembly that limits downward arm travel. I found that for stock up to about 1 1/2" thick, the unit worked most efficiently with the wheel height adjusted so that the bottom of the wheel just cleared the saw table (as per the instructions). For thicker stock, you raise the wheels to a height that allows the stock to feed easily but still maintains adequate spring tension. When attached to a 5"-tall fence, the Leichtung will accept stock up to about 3 5/8" thick.

Author's Choice

The Leichtung hold-downs performed the most impressively of the four I tested. The wheels held the stock firmly in place against the table and fence and locked positively when I tried to pull the stock back out of

the cut. The Leichtung also offered the most versatility and ease of operation and adjustment. The simple clamp-on feature enabled me to move the units anywhere along the fence (or to another tool) without requiring a special track. I liked being able to set up the unit for left-hand feed, right-hand feed, or freewheeling without changing or buying extra wheels.

By simply flipping up the pawls on the Leichtung wheel ratchets, you can easily back the board out of the saw part way through the cut, should you need to do this. With the others, you need a second person to raise and hold the wheels while you remove the board. Although it may sound somewhat subjective, the Leichtung gave me a greater feeling of security, probably because it performed its task a bit more effectively than the others.

All of these devices, however, struck me as well worth the money in terms of the improved safety and cutting performance they provide. They truly fall into that category of innovations that leave you wondering "How did I ever get along without it?" 

Lead Photograph: Kevin May

Remaining Photographs: Tom Barrett

Sources

Shophelper. Includes two hold-downs. Specify yellow (clockwise rotation, no. 101-084), orange (counterclockwise rotation, no. 809-093), or green (freewheeling, no. 809-099) wheels when ordering. \$49.95 plus \$6.45 shipping/handling. Optional 24" track (no. 801-557), \$29.95. Order from:

Woodworker's Supply
5604 Alameda Place N.E.
Albuquerque, NM 87113
Telephone: 800/645-9292

Ripstrate. Includes two hold-downs yoked together in a single assembly. Catalog no. RS1. \$29.95 plus \$5.95 shipping/handling. Order from:

Trendlines
375 Beacham St.
Chelsea, MA 02150
Telephone: 800/767-9999

Board Buddies. Includes two hold-downs. Specify yellow (clockwise rotation), orange (counterclockwise rotation), or green wheels (freewheeling). \$29.95 each. 12" track, \$11.95. 24" track, \$18.95. Order from:

Grizzly Imports (west of Rockies)
P.O. Box 2069
Bellingham, WA 98227
Telephone: 800/541-5537

Grizzly Imports (east of Rockies)
2406 Reach Rd.
Williamsport, PA 17701
Telephone: 800/523-4777

Leichtung Anti-Kickback Hold-Down System. Includes two hold-downs. Catalog no. 96974. \$39.99 plus \$6.50 shipping/handling. Order from:

Leichtung Workshops
23297 Commerce Park
Beachwood, OH 44122
Telephone: 800/321-6840

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Coal Scuttle	C, E
Country Bucket Basket	G, 10-4
Heart Box, Bandsawn	16-1
Jewelry Armoire, Miniature	18-6
Jewelry Box	G
Jewelry Box w/Sliding Tray	17-6
Jewelry Box, Heirloom	16-6
Jewelry Box, Laminated	13-6
Jewelry Box, Musical	A, 15-6
Jewelry Chest	17-3
Jewelry Chest, Chippendale	H, 13-3
Jewelry Chest, 3-Drawer	G, 11-6
Key Cabinet (11")	D, 12-2
Letterbox w/Relief Carving	17-4
Mailbox, Lidded, Wall-hung	C, E
Matchbox	A, E
Mitered Boxes	18-5
Mitten Box	C, E
Pencil Box, Laminated	13-5
Pipe Box	D, E, 12-3
Pipe Cabinet	F
Portable Chest, Shaker	F
Radio Case, Old-Time	B
Rake, Cranberry	10-5
Salt Box	D, 12-3
Slipcase, Magazine	17-5
Small Chest, Pennsylvania	H
Spoel-Chest, Inlaid	F
Tray, Antique, Knife & Fork	A, E, 12-3
Treasure Chest	F
Valentine Box	10-1
Vanity Case	G, 10-5
Wall Box	E, F, G
Wall Box, 3-Drawer, Country (17" hgt.)	D, 12-2
Woodbox, Shaker	E, 14-5
Woodbox, w/Drawer	G, 11-5

Cabinets & Cupboards

Armoire, Pine	13-2
Armoire, Tabletop	14-3
Cabinet, 2-Door, 2-Drawer, Shaker	17-3
Cabinet, Contemporary	A
Cabinet, Country Kitchen	B, E
Cabinet, Gun/Bookcase/Curio	15-5, F
Cabinet, Multipurpose	A
Cabinet, Pierced Tin, Pine	18-1
Cabinet, Pierced Tin, w/2 Doors	B, E
Cabinet, Pierced Tin, w/1 Drawer	D, 12-1
Cabinet w/Louvered Doors, Wall-hung	15-5
Cabinet w/Pierced Tin Doors	14-5
Cabinet, Pine	C, E
Chest/Cupboard, Side-by-Side	16-4

Cupboard, Corner	11-6, 17-4, B, C, E
Cupboard, Country	F
Cupboard, Country (flatback)	D, 12-4
Cupboard, Pine, Shaker	A, E
Cupboard, Slant-Back	14-4
Cupboard/Hutch, Early American	F
Curio Cabinet	11-6, H
Dry Sink	F, 12-3
File Cabinet, Oak	B
High Chest, Shaker	12-6
Hutch, Early American	16-5
Hutch/Cupboard, Pine	10-3
Ice Box, Old-Time	A
Pie Safe, Pierced-Tin Panels	13-4
Pie Safe, Pierced-Tin w/2 Doors and 2 Drawers	17-3
Pier Cabinet, Collector's	F
Pipe Cabinet	F
Record/Tape Cabinet	C
Recycling Island (Kitchen Workstation)	18-2
Sewing Cabinet w/Tambour Doors	A
Spice Cabinet, Pierced Tin	C, E
Stepped-Back Hutch	B, E
Stereo Cabinet and Speakers	12-1
TV/VCR Cabinet w/Pocket Doors	14-5
TV/VCR Cabinet, Swivel w/Casters and Tape Rack	11-4
Vegetable Bin w/Carved Doors	G, 11-3
Vegetable Bin w/Pierced-Tin Doors	D, 12-6
Vegetable Bin, Country	E
Water Bench, 18th Cent.	F
Woodbox, Pine w/Drawer	11-5

Cabinets (Wall-Hung)

Cabinet w/Recessed Finger Pulls	9-3
Cabinet, Shaker, Peg-hung	13-1
Cabinet w/Drawer & Tinsel-Art Panel	13-4
Cabinet w/Louvered Doors	15-5, F
Display Cabinet	10-4
Key Cabinet (11" hgt)	12-2
Medicine Cabinet w/Towel Rack	G, 11-3
Shell, Corner, 18th Cent.	B, E
Shelf, Victorian	H, 14-3
Wall Cabinet, Pierced Tin	E
Wall Cabinet w/Reverse Glass Stencil	C, E
Wall Cabinet, Router-Built	16-6

Carving Projects

Alvah Dunning & Hound, Whittling	J
Cardinal, Wildlife	J
Driftwood Troll, Relief	18-4, J
Decoy, Merganser Duck	J, 13-1
Decoys, Duck (2)	F
Eagle	C
Father Christmas Carving	15-6
Hamper/Trash Container w/Carving	11-4
Incised Carving, How-To	11-4
Incised Lettering	17-4
Loon Carving	D, 12-3

Love Spoon, Chip Carving	J
Lynx, Wildlife	J
Mountain Scene, Relief	17-4
Pineapple	J, 14-5
Quilt Rack, Floorstanding w/Chip Carving	J
Russian Dancing Bears, Whittling	J
St. Nicholas Carving	J, 13-6
Salt Box, Chip Carving	J
Santa Carving, Butz Collection	17-6
Santa Carving, Victorian	18-6
Spice Rack, 3-Shelf w/Chip Carving	11-5
Swedish Folk-Art Dollhouse	J
Thoroughbred Horse, Relief	J
Tobacconist's Indian, Relief	J
Vegetable Bin w/Incised Carving	11-3

Chairs, Stools, & Benches

Adirondack Chair	G, 10-4
Adirondack Lawn Chair	F
Adirondack Settee	13-2
Bench, Colonial (footstool)	15-5
Bench, Country	10-1
Bench, Early American	G, 10-3
Bench, Provincial w/Slip Seat	15-1
Bench, Santa Fe	14-2
Buckboard Seat	B, E
Chair, Moravian (Side Chair)	9-6
Chair, Pine	F
Chair, Santa Fe (Arm Chair)	15-1
Chair-Table, 18th Cent.	A, E
Chair & Table Set, Child's	13-1
Footstool, Dovetailed	B, E
Footstool, Empire	B
Footstool, Pine	B
Garden Bench & Table, English	11-2
Garden Chair & Table, Teak	14-3
Glider, Lawn, w/Canopy	16-4
Gossip Bench	17-4, F
Library Stool	A
Long Bench, Shaker	13-4
Love Seat, Contemporary	11-5
Patio Settee, Divided	F
Rocker Footrest	A
Side Chair, Shaker, Slat-back	10-4
Sleigh Seat, 18th Cent.	A, E
Step-Chair, 19th Cent.	B, E
Step Stool, Shaker	11-5, F, G
Step Stool/Chair Convertible	16-5
Stool, Heart, 1-Step	D, 12-4
Stool, High	G, 10-5
Stool, Joint (Jacobean)	9-3
Stool, Queen Anne	F

Chests

Apothecary Chest	11-4, F, G
Bachelor's Chest, Chippendale	10-1
Blanket Chest w/Drawer, Colonial	10-5, 18-6
Blanket Chest w/Inset Boxes, Shaker	11-1
Blanket/Toy Chest	B, E, F
Blockfront Chest	17-5
Chest, Chippendale, Small	H, 13-5
Chest, Early American	B
Chest, Spanish	F
Chest, Toy or Blanket	15-6
Chest of Drawers, Danish	B, E
Chest of Drawers, Shaker	C, E
Chest of Drawers, Weaver's	14-1
Chest/Cupboard, Side-by-Side	16-4
Dry Sink, Early American	D, 12-3
Highboy	H
High Chest, Shaker	12-6
Icebox, Old-Time	17-6
Ice Chest w/Faux-Marble Top	13-5
Lingerie Chest (7-Drawer)	H, 16-3
Pennsylvania Small Chest	H
Portable Chest, Shaker	F
Spool Chest, Inlaid	F

Storage Seats (Toy Boxes)	13-3
Treasure Chest	F

Children's Furniture

Bookends, Puss 'n' Books	12-1
Carousel Lamp, Child's	12-6
Cart, Toddler's	14-2
Chair & Table Set, Child's	13-1
Chest, Toy	15-6
Cradle, Jenny Lind	18-5
Cradle, Swinging, Spindled	B
Cradle, Swinging, Contemporary	12-6
Cradle, Swinging, Slatted	9-3
Cupboard, Stepped-Back (child sized)	14-3
Desk & Bench, Little Folks'	15-6
Growth Stick, Child's	18-4
Kitchen Playcenter	16-5
Platform Bed, Twin, w/Drawers	11-5
Rocker, Child's	A, E
Settle Bench, Child's	10-1
Step Stool, Child's	A
Storage Seats (Toy Boxes)	13-3
Table & Chair Set, Child's	13-1
Toy/Blanket Chest	B, E
Windsor Chair, Child's	16-5

Clocks

Black Forest Clock	A
Captain's Clock	12-5
Cedar Clock, Rough-Sawn	B, E
Contemporary Clock	C
Country Curio Clock	16-3
Crystal Regulator Clock	12-2
Desk Clock	17-1
Desk Clock, Oak	B
Disc Clock	G, 10-4
Grandfather Clock, Chippendale	H
Hourglass	14-2
Hutch Clock	B, E
Kitchen Clock, 19th Cent.	E
Lyre Clock	B
Mantle Clock 17th Cent.	A
Seascope Clock	18-2
Steambent Clock, Desktop	10-3
Tall Clock, Early Amer. (82" hgt.)	9-6
Tall Clock, Shaker	14-3
Tile Clock	A
Vienna Regulator Clock (40")	H, 11-3
Wall Clock	F
Wall Clock w/Dyed Veneer	9-3
Wall Clock, Book-Matched Veneer	9-6
Wall Clock, Pine (20" hgt.)	13-1
Wall Clock, Shaker	12-1, E

Decorative & Ornamental

Aeolian Wind Harp	16-4
Arrow Wall Decoration	12-2
Bud Vase	A, D, 12-3
Christmas Ornament, Treetop	12-6
Collapsible Oval Basket, Bandsawn	18-3
Country Village Doorway Ornament	13-2
Cow, Folk Art	13-2
Door Harp	G
Door Stop, Apple	13-5
Door Stop, Rooster, Folk Art	11-2
Flower Cart, Miniature	13-4
Globe Stand, Floorstanding	13-5
Grain Scoop	A, E
Intarsia Bad Puppy	18-3
Intarsia Bald Eagle	17-5
Intarsia Raccoons	16-3
Intarsia Spring Bouquet	18-2
Intarsia Toucan-on-a-Branch	16-1
Intarsia Trout	18-5
Intarsia Whale	17-3
Jewelry Pin & Earrings	12-1
Lamp, Hurricane	15-6

Longhorn Steer	A
Mobile, Canada Goose	G
Mobile, Ghostly Halloween	18-5
Mobile, Scrollsaw	17-1
Name Sign, Folk Art	13-4
Nativity Scene, Scrollsaw	16-6
Noah's Ark & 33 Animals	17-6
Picture Frame Primer	F
Picture Frame, Oak Dentil Molding	18-1
Picture Frames, Four Easy	15-4
Quilt Crane	17-5
Silhouette, Gabriel, Folk Art	G, 11-6
Silhouette, Rooster, Folk Art	D, 12-5
Silhouette, Tulip, Folk Art	D, 12-3
Silhouette, Whale, Folk Art	G, 10-5
Spoon Rack, Early American	C, E
Thermometer, Anchor	A
Tree Ornaments	B
Treetop Christmas Ornament	D, 12-6
Vessels, Faux-Turned, Four	15-6
Wall Key, Decorative	13-3
Wall Sconce, Colonial	12-6
Weather Forecaster, Old World	C
Weather Station	A
Weather Station, Ship's Wheel	B
Weather Vane, Arrow	F
Weather Vane, Codfish	F
Weather Vane, Horse	F
Weather Vane, Sailing Ship	B, E
Weather Vane, Snake	F
Whirligig, Kicking Donkey	G
Windmill, Catboat	F
Window Valance	16-1
Winter Sleigh Scene, Scrollsaw	18-6

Desks

Bookcase Desk, Contemporary	12-5
Desk, Compact Computer	18-4
Desk, Countinghouse	F
Desk, Rolltop	F
Desk, Shaker	C, E
Desk on Frame, Tambour Top	H, 10-5
Lap Desk, Shaker	10-3
Lap Desk	F
Little Folks' Desk & Bench	15-6
Oak Writing Desk	A
Schoolhouse Desk, Pine	A, E
Secretary Desk w/Paneled Doors	H, 13-6
Sewing Desk, Shaker	11-2
Slant-Front Desk, Gov. Winthrop	H, 16-6
Slant-Top Desk, Shaker	9-3
Tambour Desk	B
Tambour (Rolltop) Desk	10-5
Wall Desk, Ash	15-1
Wall Secretary, Early American	C, E
Writing Desk	B, E
Writing Desk, Country Pine	15-6

Desktop

Bank, Walnut	A
Bookends, Katchina Dancer	18-1
Bookends, Puss 'n' Books	D, 12-1
Bookrack, Laminated	A
Calculator Stand	A
Desk Caddy	B
Desk Calendar w/Pen & Pencil Holders	11-4
Desk Trays, Stacking	13-5
Desktop Bookcase	17-4
Desktop Organizer	9-6
Dictionary Stand, Tabletop	G, 10-4
Key Cabinet (11" hgt.)	12-2
Letter Holder, Paul Revere	18-4
Letter Opener	C
Message Cube	A
Note Caddy	A
Pencil Box w/Lid	13-5
Piggy Bank	D, 12-4
Stamp/Clip Box, Contemporary	12-2

Sunset Rider Desk Set	17-5
Tape Dispenser	10-1

Household

Audio/Video Remote-Control Rack	16-4
Basket, Canada Goose	10-3
Basket, Clamdigger's	10-4
Basket, Country (Apple)	11-4
Basket, Harvest (Pumpkin)	12-5
Bellows, Fireplace	A, E
Bowl, Turned	12-4
Breadbox, Butternut	16-3
Butcher Block Cart, Kitchen	9-3
Canister Set, Key Dovetails	11-3
Card Box	9-3
Coaster Set, Marquetry	13-5
Coffee Mill	G, 10-4
Collector's Plate Frame	B
Condiment Holder	10-3
Cranberry Rack	G, 10-5
Firewood Rack	B, E
Flower Cart, Miniature	13-4
Globe Stand, Floorstanding	13-5
Gumball Machine	15-4
Hourglass	14-2
Ironing Board, Wall Hung	14-1
Key Cabinet (11" hgt.)	12-2
Key Holder	C, E
Knife & Fork Tray	D, 12-3
Lamp, Hurricane	15-6
Letter Rack	A
Magazine Rack, Floorstanding	12-4
Mortar & Pestle	G, 10-5
Mug Rack	A
Napkin Holder, Pineapple	11-3
Napkin Holder w/Leather	16-3
Picture Frames, Four Easy	15-4
Pipe Box, Old-Time	12-3
Plastic Bag Handle	16-5
Plastic Bag Recycler	15-6
Quilt Rack	A, E
Quilting Frame	F
Serving Cart, Contemporary	13-3
Serving Tray, Oriental	10-1
Sewing Desk, Shaker	11-2
Spoon Rack	A, E
Spoon Rack, Colonial	F
Step Stool	15-1
Tape Dispenser	10-1
Tissue Box Cover	14-1
Towel Bar w/Glass Shelf	9-3
Towel Racks (2)	G, 11-6
Towel Rack w/Swinging Arms	13-6
Tray, Bed & Breakfast	13-6
Trivets, Routed	11-5
Trivets, Slatted Half-Lap	13-2
Vases & Vessels, Faux-Turned	15-6
Wall Sconce, Colonial	9-3
Wall Sconce w/Chimney	12-6
Window Valance	16-1
Wine Glass Holder	A
Wine Rack	C
Wine Racks, Stacking	G, 11-6
Woodbox w/Drawer	11-5
Woodbox, Shaker	14-5

Jigs

Drill Press Angle Fixture	12-1
Doweling Jigs	17-3
Jig, Key Spline	D
Lathe Spigot Chuck	15-4
Leg Tapering Jig	11-6
Miter Clamping Jig	9-3
Miter Cutting Jig	12-5
Miter Slot Tenon Jig	18-4
Super Box Joint Jig	17-5
Tablesaw Crosscut Box	12-6
Tablesaw Jigs	15-5, 18-6
Tablesaw Edge Joiner	18-5

Tenon Jig, Fence-Mounted	10-4
Through Dovetail Jig	18-3

Kitchen

Apothecary Chest, 7-Drawer	11-4
Bagel Slicer	A
Bowl, Turned	12-4
Breakfast Tray w/Marquetry, Adjustable	13-6
Butcher Block Cart	9-3
Canister Set	11-3
Canning Jar Storage Shelves	C, E
Casserole Dish Holder	B
Coaster Set, Marquetry	13-5
Coffee Mill	G, 10-4
Condiment Holder	
(Miniature Picnic Table)	G, 10-3
Cookbook Holder	D, 12-1
Cookie Jar Holder	14-2
Cooling Rack	15-5
Cutlery Tray, English	H, 14-5
Cutting Board, Cheese	B
Cutting Board, Onion	F
Cutting Board w/Knife Drawer	18-5
Cutting Boards	A, D, 12-4
Cutting Boards, Landscape Design	9-6
Dish Rack, Kitchen	A, E
Dish Towel Holder	B
Knife Rack, Butcher Block	B
Knife Tray, Antique w/Drawer	10-1
Knife Tray, Antique	12-3
Message Center	17-1
Mortar & Pestle	10-5
Napkin Holder	14-1, 16-3
Napkin Holder, Pineapple	G, 11-3
Napkin Holder, Prancing Pony	15-4
Napkin Holder, Pussycat	17-4
Paper Towel Holder	F
Pie Sale w/8 Pierced-Tin Panels	13-4
Plastic Bag Recycler	15-6
Plate Rack, Oak	14-4
Recipe Box	15-5
Salad Tongs	15-5
Salt and Pepper Shaker Set	18-3
Serving Board	15-5
Serving Cart, Contemporary	13-3
Spaghetti Measure	B
Spice Rack w/Chip Carving	11-5
Sushi Set	14-5
Tongs, Kitchen	13-4
Trash Container/Hamper	11-4
Trivets, Routed	11-5
Trivets, Slatted w/Half-Lap Joints	13-2
Trivet, Woodpile	B, E
Utensils, Kitchen	A
Vegetable Bin w/Chip Carving	11-3
Vegetable Bin w/Pierced-Tin Doors	12-6

Lamps & Lighting

Candle Holders	16-4, B, E
Candle Lantern, Contemporary	F
Candle Sconce	F
Candlestick, Colonial	A, E
Candlesticks, Contemporary	13-1
Candlesticks, Turned	
Early American (6" hgt)	D, 12-2
Carousel Lamp, Child's	D, 12-6
Cider Press Lamp	B, E
Five-Candle Holder	14-2
Geodesic Light Fixture, Hanging	B
Hurricane Lamp	15-6
Lamp w/Floating Panels, Contemporary	10-3
Lamp, Four-Drawer, Traditional	D, 12-4
Light Fixture, Oak, Hanging	B
Ratchet Table Lamp	A, E
Table Lamp, End Grain	C
Table Lamp, Nautical	C, E
Table Lamp, Shaker	F
Table Lamp, Turned	C

Wall Sconce, Colonial	9-3
Wall Sconce, w/Chimney	D, 12-6

Mirrors

Cheval Mirror	C
Contemporary Wall Mirror	13-3
Country Pine Mirror	16-1
Dressing Mirror, Cherry	F
Hall Mirror, Oriental	13-2
Hand Mirror	A
Hand Mirror w/Carving	C, E
Infinity Mirror	B
Medicine Cabinet w/Towel Rack	11-3
Mirror Frame, Pine	F
Mirror w/Shell, Pine	C, E
Mirror, 18th Cent.	F
Mirror, Chippendale	C
Mirror, Early American	14-2, E
Mirror, Mortise and Tenon	14-1
Mirror, Sunburst	14-4
Mirror, Tinsel Art	C
Vanity, 18th Cent., Tabletop	A, C
Vanity Case w/Mirror	10-5
Vanity Mirror, Tabletop	9-3
Vanity Mirror w/Drawer (9" hgt)	G, 11-4
Wall Shelf, Mirrored, 3-Panel	G, 11-2
Windowpane Mirrors	17-6

Musical Instruments & Accessories

Aeolian Wind Harp	16-4
Audio/Video Remote Rack	16-4
Bowed Psaltery	18-2
Box Drum	13-6
Cassette Tape Holder	G
CD Carousel	17-1
Compact Disc Holder	14-1
Door Harp, Swedish	F
Dulcimer	9-6, 17-1
Dulcimer, Mountain	15-4
Folk Fiddle	14-2
Harp	12-2, F
Record and Tape Cabinet	C, F
Stereo Cabinet & Speakers	12-1
Stereo End Table	F

Outdoor

Adirondack Chair	10-4
Adirondack Settee	13-2
Barbecue Tray	14-4
Bike Rack	A
Birdhouse, Greek Revival	13-2
Birdhouse, Tudor	F
Bobsled, Child's	13-6
Deck Table, Folding	14-4
Garden Bench & Table, English	11-2
Garden Chair & Planter	14-3
Lawn Glider, Canopied	16-4
Loon Carving	12-3
Name Sign, Colonial	14-4
Porch Swing	17-3
Sled, Victorian	A, E
Sun Seat, Folding	18-4, A
Swing, Porch	C, F
Table, Garden w/Bench	11-2
Table, Picnic	16-3
Whirligig, Fisherman	15-4
Whirligig, Wood Sawyer	11-2

Personal Accessories

Back Massager	13-3, C
Belt Buckle & Bolso Set, Western style	16-4
Belt Rack	A
Bootjack	C, E
Earrings and Pin	D, 12-1
Heart-Shaped Box	18-1
Jewelry Box, Heirloom	16-6

Jewelry Box, Laminated	13-6
Jewelry Box, Musical	15-6
Jewelry Chest, Chippendale	13-3
Jewelry Chest, 3-Drawer	11-6
Jewelry, Pin and Earrings	12-1
Shoehorn, Laminated	B
Valentine Box	10-1
Vanity Mirror	9-3
Vanity Mirror w/Drawer	11-4
Wooden Combs	A

Planters

Bud Vase	12-3
Flower Cart, Miniature	13-4
Plant Stand	14-2, B, E
Planter, Fret-Sawn	C
Planter, Latticework	G, 10-4
Planter, Octagonal	B
Planter, Pulley	F
Planter, Salt Box	C, E
Planter, Teak	14-3
Vases & Vessels, Faux-Turned	15-6
Wall Planter, Lighted	C
Wheelbarrow Planter	G, 11-3

Tables, Trays, Stands, & Carts

Bake-Room Table, Country	13-5
Bench, Colonial	15-5
Breakfast Tray, Adjustable	13-6
Breakfast Tray, Folding	B
Butcher Block Cart, Kitchen	9-3
Butler's Tray Table	C, F
Chess Table	B
Child's Table & Chairs	13-1
Cobbler's Bench Coffee Table	A, E
Coffee Table	10-5, F
Coffee Table, Contemporary	12-1, F
Coffee Table, Country, w/Drawer	D, 12-5
Coffee Table, 6-Drawer Cherry	18-3
Cube Table	F
Curio Table	F
Dining Table	9-6
Display Pedestal	C, G, 11-3
Drop-Leaf Dining Table	16-1
Drop-Leaf Table, Shaker	15-4
Drop-Leaf Table, Shaker, Double w/Drawers	10-1
Drop-leaf Table, Shaker, Single w/Drawer	10-5
End Table	17-1
End Table, Contemporary	F
End Table, Doughboy	E
End Table, Early American	G
End Table, Shaker	D, 12-4
End Table, Veneered	B
End Table, Zebra Wood Veneer	G
Extension Table, Dining, Oval	13-3
Farm Table	17-5
Garden Table & Bench, English	11-2
Garden Table & Chair, Teak	14-3
Gate-Leg Table	H
Half-Round Table	A, E
Half-Round Table, 18th Cent.	F
Hall Table	11-2, E
Harvest Table	14-4
Harvest Table, Early American	F
Hunt Table	D, 12-3
Hutch Chair/Table	F
Nesting Tables	C
Nightstand, Pencil Post	D, 12-5
Occasional Table, Cherry	13-1
Occasional Table, Shaker	12-4
Occasional Table w/Shell, Country	D, 12-1
Oriental Table	C
Parson's Table	10-3, F
Pedestal Table, Oak	C
Picnic Table w/Attached Benches	16-3
Rudder Table, 18th Cent.	A, E
Serving Cart, Contemporary	11-3

Serving Tray	C, F
Serving Tray, Oriental	10-1
Sewing Stand, Shaker	E
Ship's Wheel Table	A
Side Table, Santa Fe	15-1
Side Table, Shaker	G
Snack Table, Folding	C
Table, Butcher Block	F
Table, Butterfly-Wing	F
Table, Chopping-Block	F
Table, Contemporary	F
Table, Glass-Top	D, 12-1
Table, Louis XV	F
Table, Shaker	F
Table, 19th Cent., Cherry	A, E
Tavern Table	H, 14-1
Tavern Table, 18th Cent.	A
Tea Table, Chinese	C
Tea Table, Porringer Top	18-1
Television Stand/End Table	C
Tier Table, Contemporary	F
Tier Table, 4-Shelf, Oak & Glass	12-2
Tilt-Top Table, Tripod, 18th Cent.	H, 13-2
Trestle Table & Benches	E
Trestle Table, Mission	H, 13-6
Trestle Table, Pine	F
Trestle Table, 18th Cent.	A, E
Tripod Table, Mahogany	B
Utility Table	F
Washstand	F, H
Washstand, 19th Cent., Danish	B, E

Toys & Games

Aerobatic Bear Folk Toy	16-5
Airplane Toy	C
Balancing Sawyer	F
Bang-a-Peg Toy	C
Baseball Bat, Turned	18-2
Beam Balance	C, E
Biplane, Riding	G, 11-3, 18-1
Bobsled, Child's	13-6
Boomerang, Australian	F
Boomerang, Cross-Slick	F
Box-of-Shapes Toy	G, 10-4
Bunny Puzzle, Scrollsawn	17-5
Car w/Boat & Trailer	C
Cart, Toddler's	14-2
Chess Set w/Board & Case	16-1
Chinese Rhombhedron Puzzle	11-2
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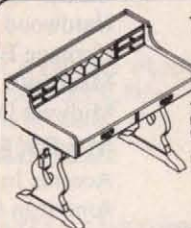
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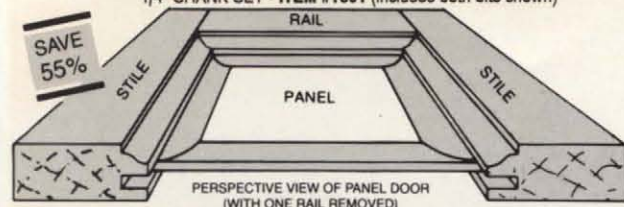
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SUPPLIED WITH
BALL BEARING

2" Large Diameter
CARBIDE TIPPED
1/4" Shank

REVERSIBLE COMBINATION RAIL and STILE BIT

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#1309	45° CHAMFER - 3/8" Cutting Length	1/4"	\$13.00		#1340	PATTERN / FLUSH TRIM - 1/2" Diameter	1/4"	\$15.00
#1310	45° CHAMFER - 5/8" Cutting Length NEW !	1/4"	\$15.00		#1341	PATTERN / FLUSH TRIM - 3/4" Diameter NEW !	1/4"	\$17.00
#1311	45° CHAMFER - 5/8" Cutting Length	1/2"	\$17.00		#1342	PATTERN / FLUSH TRIM - 3/4" Diameter	1/2"	\$19.00
#1312	THUMBNAIL - 1- 3/16" Large Diameter	1/4"	\$18.50		#1343	KEYHOLE CUTTER - 3/8" (bit not shown)	1/4"	\$ 8.50
#1313	THUMBNAIL - 2-1/2" Large Diameter	1/2"	\$35.00		#1344	KEYHOLE CUTTER - 1/2" shown)	1/4"	\$ 9.00
#1314	ROUND OVER - 1/8" Radius	1/4"	\$11.00		#1345	DOVETAIL (HSS) - 1/4" Diameter — 7-1/2"	1/4"	\$ 6.50
#1315	ROUND OVER - 3/16" Radius	1/4"	\$11.00		#1346	DOVETAIL - 1/2" Diameter — 14° NEW !	1/4"	\$ 6.00
#1316	ROUND OVER - 5/16" Radius	1/4"	\$14.00		#1347	DOVETAIL - 1/2" Diameter — 14°	1/2"	\$ 6.50
#1317	ROUND OVER - 1/4" Radius NEW !	1/2"	\$12.00		#1348	BEADING - 1/4" Radius	1/4"	\$13.00
#1318	ROUND OVER - 3/8" Radius	1/2"	\$15.50		#1349	BEADING - 3/8" Radius	1/4"	\$15.50
#1319	ROUND OVER - 1/2" Radius	1/2"	\$17.00		#1350	BEADING - 1/2" Radius	1/4"	\$17.00
#1320	ROUND OVER - 3/4" Radius	1/2"	\$21.00		#1351	LOCKMITRE - 7/8" Cutting Length NEW !	1/4"	\$32.00
#1321	MULTIFORM MOULDING - 15/16" Carbide Height	1/4"	\$40.00		#1352	LOCKMITRE - 1-1/8" Cutting Length	1/2"	\$45.00
#1322	MULTIFORM MOULDING - 2" Carbide Height	1/2"	\$40.00		#1353	OGEE RAISED PANEL - 2" Large Diameter	1/4"	\$28.00
#1323	SLOT CUTTER - 3/8" Deep	1/4"	\$14.00		#1354	OGEE RAISED PANEL - 2-3/4" Large Diameter	1/2"	\$32.95
#1324	RABBETING - 1/4" Deep NEW !	1/4"	\$15.00		#1355	EDGE BEADING - 3/16" Diameter of Circle	1/4"	\$15.00
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#1330	BULL NOSE - 1/2" Diameter of Circle	1/4"	\$16.00		#1361	SPIRAL UPCUT - 1/2" Diameter (solid carbide)	1/2"	\$29.00
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#1332	BULL NOSE - 3/4" Diameter of Circle	1/2"	\$21.00					
#1333	TONGUE & GROOVE - Straight	1/4"	\$29.00					
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