BENCH DESIGN CONTEST

CUSTOM MOLDING ■ DESK CLOCK ■ COPE & STICK JOINERY

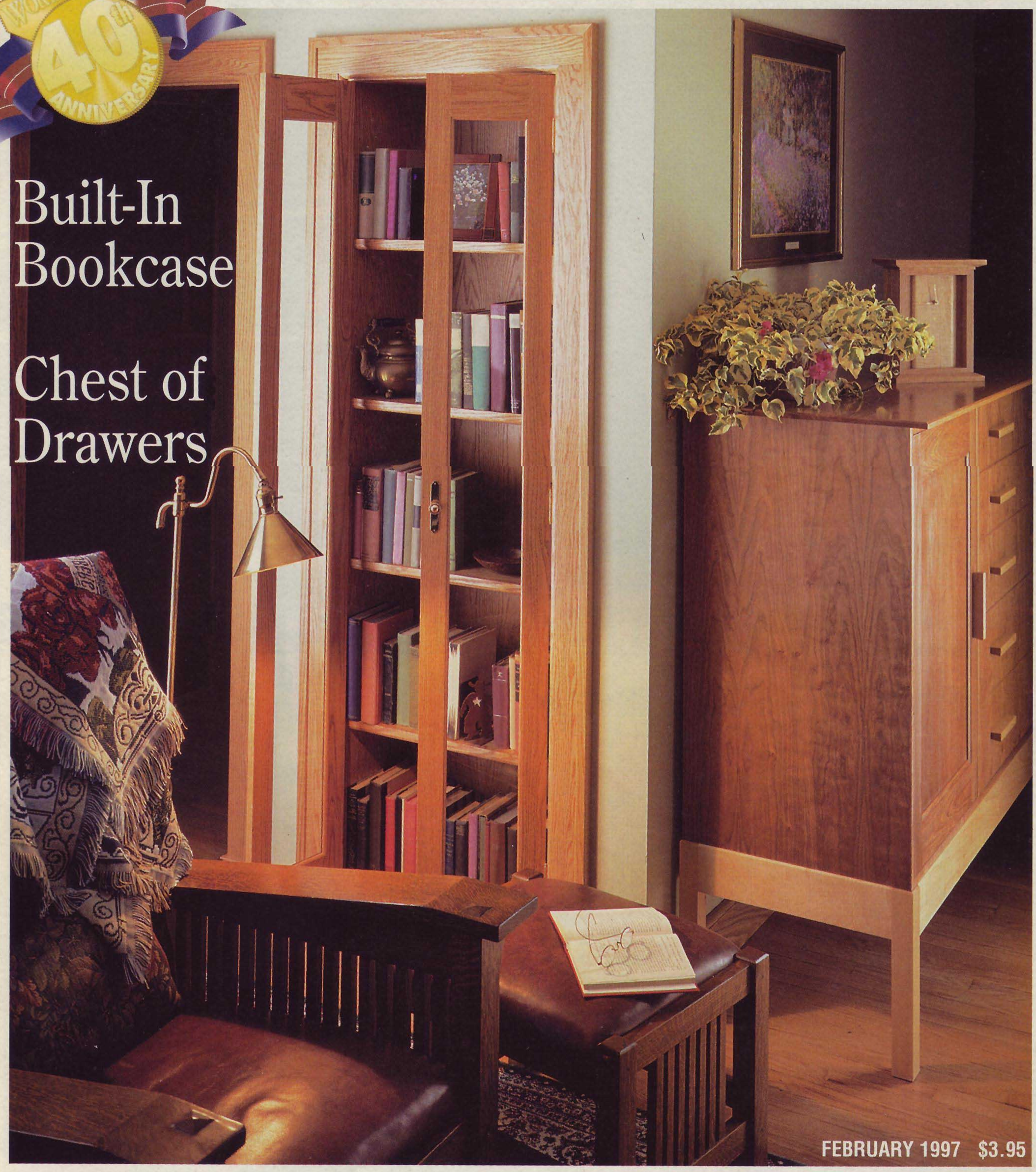
WORKBENCH

THE ORIGINAL HOME WOODWORKING AND IMPROVEMENT MAGAZINE

WORKBENCH 40th ANNIVERSARY

Built-In Bookcase

Chest of Drawers



FEBRUARY 1997 $3.95

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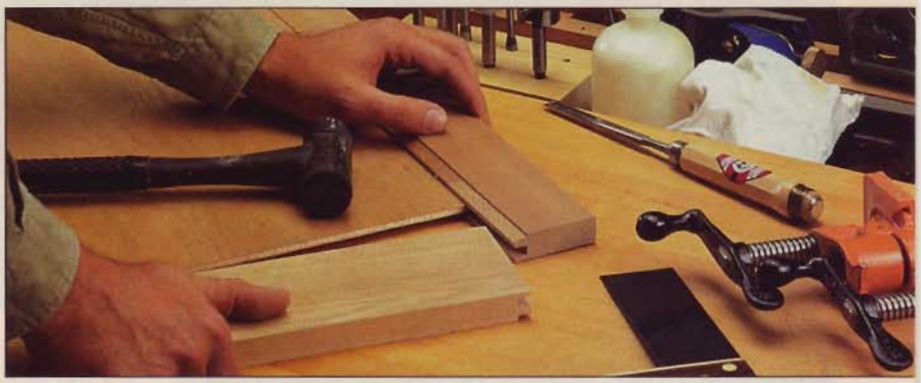

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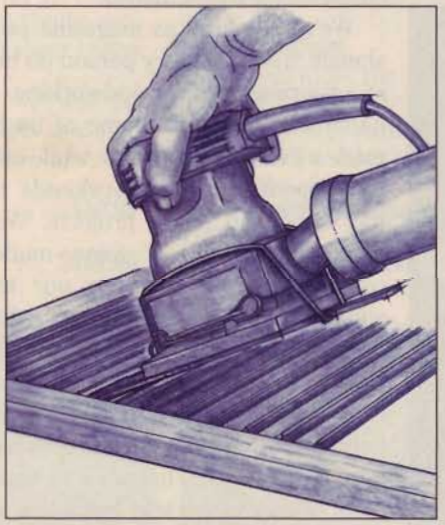

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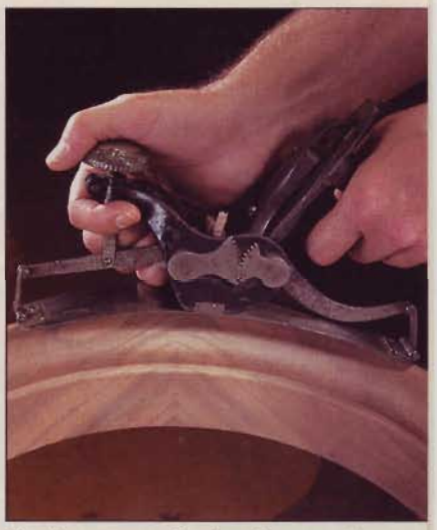

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Welcome Home

Welcome to the new *Workbench*. You can't believe how exciting it is to be writing this letter, my first as Editor of your magazine. It's truly a privilege.

Not only is there a new Editor, a new staff, and a new year that's beginning. It's also the start of a new decade. The issue you have in your hands marks the **40th Anniversary** of *Workbench* magazine. In February of 1957, the first copies rolled off the press and onto newsstands across the country. I have no idea how many articles have been published since then, but I can say that the next 40 years' worth are going to be even better.

What Has Changed

When you picked up this issue of *Workbench*, you may have thought, "this isn't my magazine."

Well, as you may already know, August Home Publishing Company is now the publisher of *Workbench*. August Home is dedicated to bringing you the best how-to hobby magazines, bar none. And we are making *Workbench* every bit as strong and helpful as our other highly regarded publications, *Woodsmith*, *ShopNotes*, *Garden Gate*, and *Cuisine*.

We're making *Workbench* the magazine for woodworking throughout the home, from furniture, to built-ins, to framing decks, walls, and dormers. Along the way you'll also read about other skills you'll need to complete your projects, like laying tile and hanging drywall, for example.

We're Just Like You

Every magazine reflects the people who put it together. For you, a reader of *Workbench*, this means you'll get hands-on, trial-by-fire information.

We're not here as magazine professionals. Instead, every person on board is experienced in woodworking and home improvement. Some of us have made a living in the trades, while others have spent countless weekends tackling shop and home projects. We all have sawdust in our veins, mudding compound stuck between our teeth, and often a mess waiting for us at home — just like most of you.

As a matter of fact, to give you realistic projects, we've purchased an older home here in town that needs some sprucing up. The house was soundly built, but wear and tear has taken a toll over the years. We intend to work our way through the house one project at a time, exactly like you do with your home improvement projects. We'll give you design ideas and show you how we make-over our home into an eye-catching showcase. We've even devoted a special section, called HomeWright, to this series of projects.

With the *Workbench* house, the *Workbench* shop, and the *Workbench* staff, you can bank on getting the best possible magazine on woodworking and home improvement. After all, it's what we like to do . . . .

Chris Inman, *Editor*

WORKBENCH

VOLUME 53 NUMBER 1

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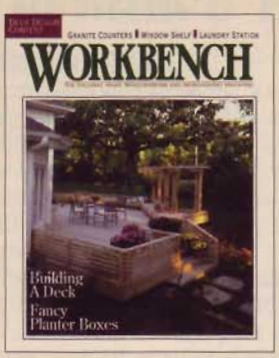
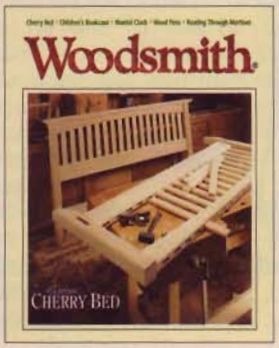
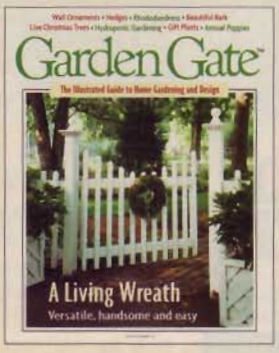
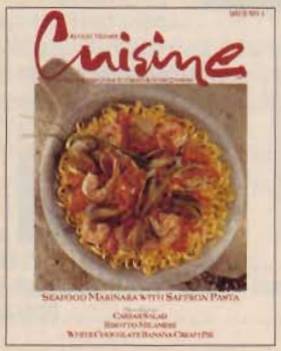








Publisher's Note

Dear Fellow Woodworkers,

This is a true story . . . eighteen years ago I was reading a copy of Workbench, and I got frustrated. I wanted to build one of the projects, but there was only one big exploded view to show the construction. That was the day I decided there ought to be a magazine that showed how to build projects step by step, and explained the whole process.

The result was a new magazine: Woodsmith (shown at left). At least, that's the short story of how the idea for Woodsmith magazine came about. Okay, Don, a nice story, but what does that have to do with Workbench now?

Well, things have come full circle. Last year I was reading a copy of Woodsmith, and got frustrated again. This time, the reason was because I wanted more information on home improvement-type projects.

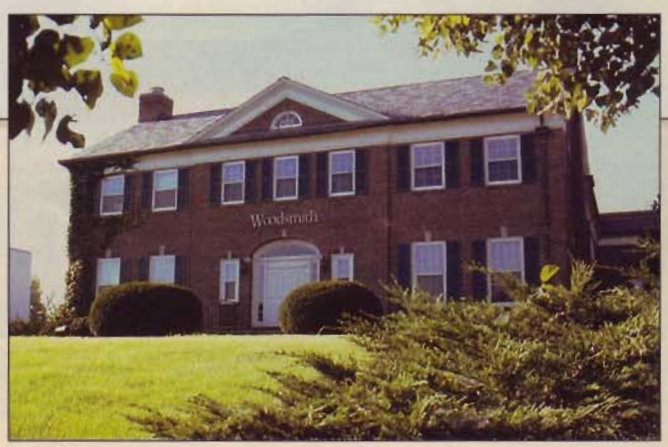
It turned out to be good timing. The opportunity to purchase Workbench came up. Because I always felt a link between the two magazines, I thought it would be great to team them up: Woodsmith for cabinetmaking, and Workbench for "woodworking around the home."

With the change in ownership, we took the opportunity to update the look and editorial approach of Workbench for its 40th anniversary. And, I think Chris Inman and the entire staff have done a wonderful job.

Like our other publications at August Home Publishing (ShopNotes, Garden Gate, and Cuisine), I'm proud of the service they offer to our enthusiastic friends in the areas of home improvement, woodworking, gardening, and cooking.

Thank you for letting us be a part of the enthusiasm you have for your home. And I hope you enjoy the new Workbench.

Donald B. Peschke
Publisher



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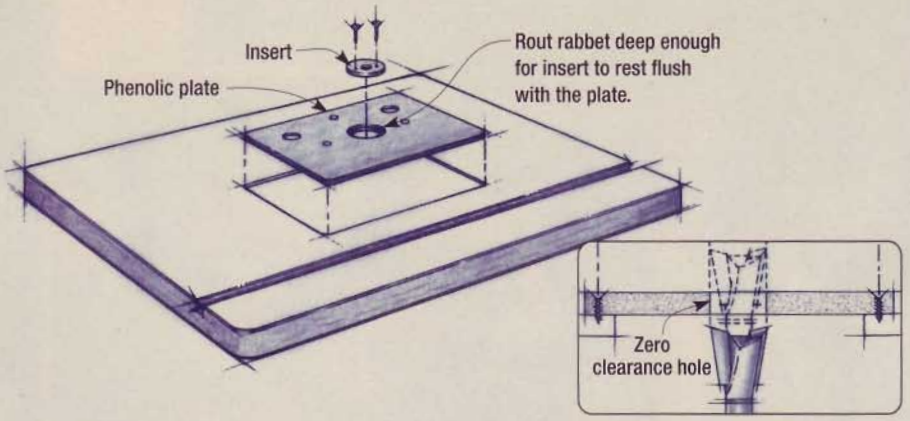


Zero Clearance Router Table

Q *My router table plate has a hole that the bit sticks through. The trouble is, the hole is far too big when I'm using some of my smaller bits. And that seems unsafe. What can I do?*

Greg Brenner
Huntington Beach, CA

A Greg, you're right. This is an unsafe situation. Many pros make custom inserts for every router bit in their shop. This is the best way to get the tightest possible fit.

Replace your current insert, or make a new one from scratch. Buy a piece of plastic or hardboard, no more than half the thickness of your phenolic plate. Rout a rabbet into the current hole in your plate. Trace the outline of your insert on the plate, then bandsaw the new insert to size, and screw it in. Once it's installed, you can slowly raise your router bit (while it's turned on) into the plastic to cut a hole the exact size you need. Bearing bits will require you to drill a properly sized hole first.

Replacing Thermopane Glass

Q *I have a double-paned casement window with a crack in the inside pane. It's low E-glass. Do I have to replace the entire window, or can just the glass in the window be replaced?*

Bob Skrodahl
Frankfort, IL

A First, Bob, it's important to know exactly what type of glass you have. Low E-glass has a transparent metallic coating that admits light but blocks radiation, which improves the insulating value of the glass.

Double-paned glass usually consists of two glass panes with a gas such as argon filling the gap between the panes. Unlike air, the gas won't transmit heat or cold. This sandwich is then sealed and locked in place in the window frame.

You can replace a single pane of low E-glass and keep your existing window frame. Due to the fact that it cuts out the sun's ultraviolet rays, it will still have some insulating value. Replacing double-paned glass is complicated. You're better off replacing this kind of unit with one that's pre-sealed by the manufacturer.

SHARE YOUR QUESTIONS

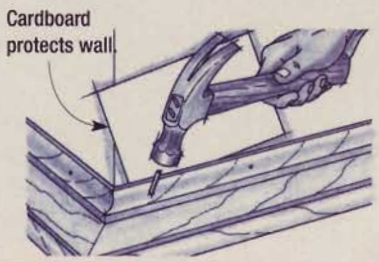
If you have a question about woodworking or home improvement, we'd like to see if we can answer it for you. Just write down your question and mail it to WORKBENCH Q&A, 2200 Grand Ave., Des Moines, IA 50312. Please include your name, address and daytime phone number in case we have any questions for you. If you like, Fax us at (515) 283-2003 or send a message to us at workbench@workbenchmag.com on the internet.

Nailing Molding

Q *I've got a problem. Whenever I nail molding to a wall, either I manage to hit the wall with my hammer, or the molding splits. Any suggestions?*

Charlie Parker
Kansas City, MO

A Charlie, try cutting a piece of cardboard and hold it against the wall. If your aim is off, the cardboard should protect it. To make sure you don't split your molding, try tapping the wood with a nail set first.

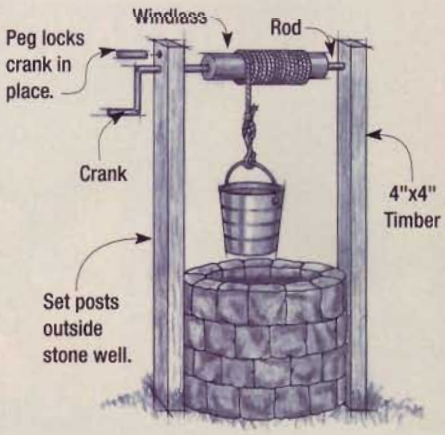


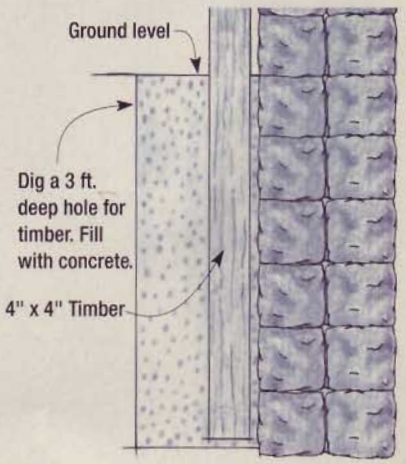
Build a Windlass

Q *I need to build a hand-operated windlass to draw water from a well using a bucket. I like the old-fashioned type. Any plans, tips or information you have would be much appreciated, and might save me from falling in.*

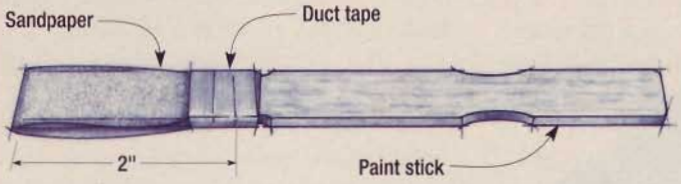
W. Joel Stanly
Stockbridge, GA

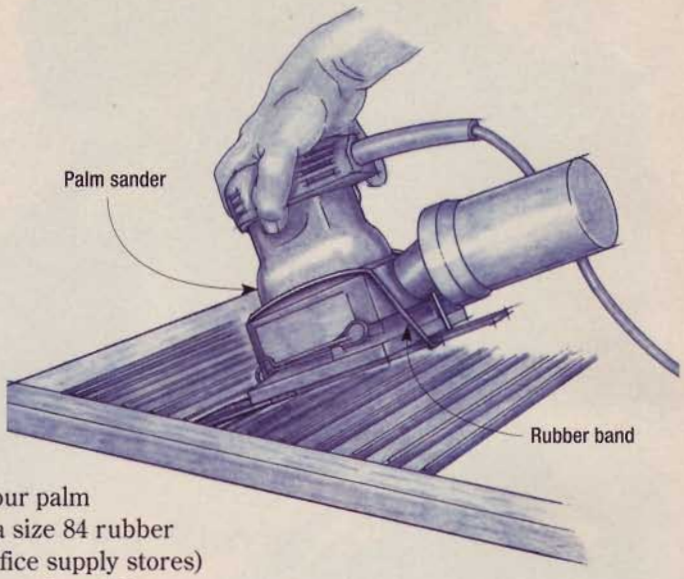
A Joel, a typical windlass resembles a large rolling pin with a crank on one end. It's supported by two vertical timbers on each side of the well. The diameter of the windlass should be about six inches, and a rope winds around it to raise or lower a bucket. Now, assuming you already have a traditional stone well, the challenge is in securing the posts. To avoid damaging the well wall, sink 4" × 4" posts in concrete just as you would a pair of fence posts, on each side of the well. Holes in the posts will support the "rods" on the ends of the windlass.





Shop Tips





Sanding Louvered Doors

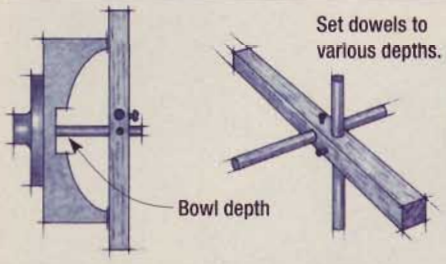
Here's a solution to the time consuming task of sanding slats in louvered doors. All that's required is a simple device on your palm sander.

Take a wooden paint stir stick and cut it about 9" long, measuring from the handle end. Form indentations similar to those on the handle end 2" from the cut end. Cut strips of sandpaper the width of the stir stick and about 6" long. Then fold the sandpaper over one end of the stick, and secure it with duct tape.

Hold the stick against the pad of your palm sander. Next, place a size 84 rubber band (available at office supply stores) onto the handle indentation of the stick and pull the rubber band up and over the edges of your sander. Hook it onto the other end of the stick. When you turn on your sander, the stir stick acts as a thin extension and fits perfectly between the louvered slats and into the corners, eliminating hours of tedious hand sanding.

A couple of hints: keep several large (size 84) rubber bands handy, because they do break. When the sandpaper wears out on one side of the stick, just flip the stick over to the new side.

Britt Marie Storm
Kansas City, MO



4-Way Depth Gauge

I was faced with the job of turning several sets of bowls of different depths. To speed the job, I wanted a quick and reliable gauge.

It was annoying to constantly readjust my regular depth gauge. And I risked an error every time I reset it. So I devised this gauge to work with up to four different bowl depths.

The body of the gauge is a wooden strip about 1" square and long enough to span the largest bowl. Near the center, I drilled two holes for $3/8$" dowel rods. They're locked in position with roundhead screws, then trimmed to length. For quick reference, label or color code the rods.

Percy Blandford
Stratford, England

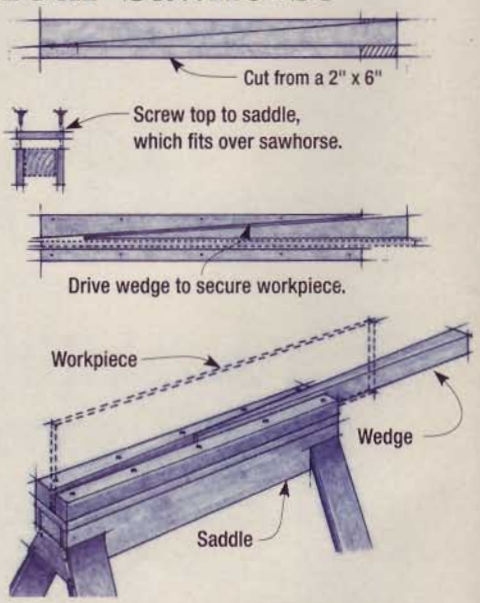
Edge Clamping On Your Sawhorse

At every step in a woodworking project, it seems that I have to somehow secure a board. With conventional clamps, this becomes quite time consuming. So I came up with this quick and easy way to clamp wood to a sawhorse.

The concept centers around a long, tapered wedge running the full length of my sawhorse. One side of the sawhorse frame is counter-tapered, so that the two pieces fit together.

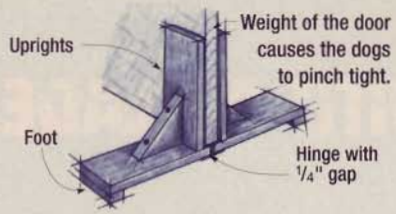
Now when I set a piece of stock on edge in the sawhorse, a quick tap on the wedge with a mallet will secure it. Another tap from underneath the wedge, and the wood is free.

Ivan C. Risley
Overland Park, KS



SHARE YOUR TIPS, JIGS, AND IDEAS

If you have a unique way of doing something, we'd like to hear from you. Just write down your tip and mail it to WORKBENCH Shop Tips, 2200 Grand Ave., Des Moines, IA 50312. Please include your name, address and daytime phone number in case we need to reach you. If you like, Fax us at (515) 283-2003, or e-mail us at workbench@workbenchmag.com on the internet. We'll pay you $50-$150 if we publish your tip.



Clamping A Door

I had a door that was not shutting properly. It was a little tight on the edge and my wife kept after me about fixing it while I was trying to mull over the solution. Finally, I devised these door dogs so that I could support the door in my shop while planing the edges. They're large braces, but the interesting fact is that the feet cause them to lean inward. This means that the uprights cinch the door tight and lock it in place while my plane does its job. The specific dimensions are not important, but they're roughly 12" × 12", with carpet padding on the uprights.

Emil Lage
Des Moines, IA

Outfeed Table

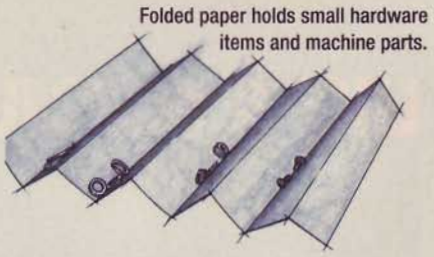
Like many woodworkers, I rely on benchtop tools due to their compact size (and matching price tag). One way to increase their versatility is by outfitting them with portable infeed/outfeed extensions.

Forget those fancy roller set-ups. An ironing board, although not glamorous, serves the purpose quite well.

An ironing board has several advantages: a standard board will handle just about any small shop project; most boards have a wide height adjustment range; it folds flat for easy storage, yet takes only seconds to set up. If you don't have one, check out garage sales.

Although you can use the ironing board as is, I suggest adding an auxiliary top made from 1/4" tempered hardboard. This will allow stock to slide smoothly, and it protects the ironing surface in case you ever want to return the board to its original use.

R. B. Himes
Vienna, OH



Parts Keeper

I often find it necessary to disassemble a tool or appliance in the workshop. It may be extremely important to identify the location and sequence in which parts were removed. I have found that a piece of heavy paper or light cardboard can be most helpful when doing these projects. I fold my paper in an accordion style and place it on the bench where I'm working.

Now the parts can be placed in the valleys as they are removed, thus preventing them from becoming mixed together. This, of course, makes reassembly much easier and faster.

Howard E. Moody
Upper Jay, NY

Coiling Cords

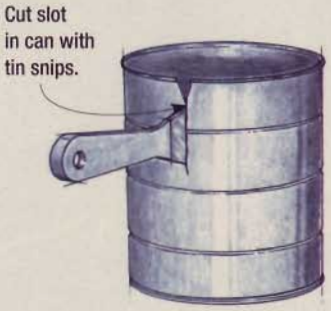
When coiling a rope or extension cord, hold the end of the rope in your hand and make the first loop normally. In making the second loop, pass the free end of the rope behind the loop, rather than in front of it, resulting in a loop of the opposite hand from the first one. Alternate the loops as you coil and you'll get a rope or extension cord that will uncoil without twists in it.

Bill Houghton
Sebastopol, CA

Clean Putty Knife

To clean a putty knife when stripping paint or varnish, I cut a slot in a coffee can. I make the slot a little longer than the knife and cut a V-notch on top of the slot so the knife blade can enter easily. When I draw the knife out of the slot, the junk stays in the can. Use tin snips to cut the notch and slot.

William Robidoux, Jr.
Tiverton, RI



Sawing Wallboard

When I need to cut a strip of drywall under 6" wide, I use my table saw. To protect my saw, I cover the table with a sheet of hardboard, and replace my good carbide blade with an old blade I've got lying around. The cut is clean and I don't have to worry about the narrow strip breaking.

Davis Miles
Canyon Lake, CA

MAILING LISTS

Periodically, we allow companies whose products and services may be of interest to you to mail to our list of subscribers.

We are very careful to screen these companies to be sure the information you receive is of value to you.

Most of our subscribers appreciate receiving these selected materials. However, if you prefer to have your name deleted from the list made available to other firms, simply write us at P.O. Box 37272, Boone, Iowa 50037-0272. (Please include your current mailing label.)

Bench Contest!

Let our Portable Workbench inspire you to design and build something even better. Enter by June 1, 1997 and you'll be in the running for a Delta oscillating sander and recognition in a future issue of *Workbench*.

HOW TO ENTER:

Your entry must be an original portable workbench project, that you designed and built yourself. Submit drawings of your plans, along with a photograph of you and your bench by June 1, 1997. The winner will be announced in a later issue.

The winner will receive a B.O.S.S. Bench Oscillating Spindle Sander from Delta. Runners-up will receive a one-year extension to their subscription (or a new subscription).

In every shop, a workbench is the center of activity. And for us, it has even more significance. After all, *Workbench* is our name and it's what we spend most of our time working on.

So when we were kicking around ideas for our Portable Workbench project (see *Portable Workbench* on page 54), we tried to imagine what features you would want in an ideal bench. In the end, we could only guess. But we know you have ideas on this topic, and we would like to see them. Which brings me to the Bench Design Contest.

To qualify as a portable workbench, we ask that your designs meet a few criteria. Your bench must be lightweight and easy to move, made of durable materials, and, when knocked-down, must fit in the back of a vehicle. The rest is left to your imagination.

So get going. We're anxious to see the best portable workbench you can design and build.

Wood-Mizer's Personal Best

It appears that we're not the only one running a contest these days. Wood-Mizer, known for its portable bandsaw mills, just announced the most recent project winners in their 1996 Personal Best Contest.

Steve Collett, of McCall, Idaho, won top honors for his 3,000 sq. ft. home near beautiful Payette Lake. "After many years working on the farm, I spent a lot of time designing a house for all of us," Collett beamed.

With help from his father and friends, he milled roughly 53,000 board feet on his Wood-Mizer for the house that took five years to build. A variety of woods were used, including juniper, yellow poplar, Douglas fir, ash, maple, elm, hemlock, and Russian olive. His thoughts afterwards? "It's truly a blessing and relief," Steve said.

John Jennings, of Cumming, GA, winner in another category with his 1,288 sq. ft. home, observed, "The pride and satisfaction achieved by being able to construct a home is something few people today will be able to appreciate."

Congratulations from the staff at *Workbench* to all winners and entrants.

WINNERS

Congratulations go to Dale Otto of Bad Axe, Michigan

for winning our "Name the Tools" Contest #18. He wins a Craftsman 10" compound miter saw, a $220 value, for identifying the tools as:

A. Tubing cutter **C.** Pipe wrench
B. Basin wrench **D.** Monkey wrench

We also selected five runners-up, each of whom will receive a one-year extension of their subscription.

Ivan Umphress; Streator, IL
Mike Sutton; Johnston, PA
Donald Clem; Belleville, KS
Gerald Anschwetz; Tawas City, MI
Radko Jonas; Douglasville, GA

Congratulations to all of you!
We look forward to hearing from you again in our new "Workbench Design" contest.

Woods on Disc

Just when you thought everything possible had been developed as a multimedia CD, along comes *Woods of the World.* You'll probably never see it play at the local arcade, or even in a computer store. But for those of us intrigued by the varieties and characteristics of woods, this interactive CD is a gem.

Now it may be true that as woodworkers, we work with only a few basic species of wood, and may have a passing acquaintance with a dozen or so more. So why on earth would we ever want to know about 910 of the world's most important species?

Perhaps the reason we're familiar with only a few species is because we haven't been exposed to more. *Woods of the World* includes words and pictures that open our eyes and ears to information we'd never considered.

Imagine having 35,000 fields of information at your fingertips, collected from over 100 books, periodicals, institutions, and individuals. It exposes you to a new world through concise descriptions of wood and trees: colors, grain, working characteristics, availability, environmental status, and so on. It also includes a one hour video showing how trees are harvested and various forest products are made. The more we learn, the more we're pulled into this fascinating world.

Interactive multimedia CDs like *Woods of the World* are hypnotic in their appeal. They pull us along, exposing us to more about wood than we ever thought possible. Who said learning can't be fun?

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STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION
(Required by 39 U.S.C. 3685)

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A. Total no. copies (net press run)	623,018	595,000
B. Paid and/or requested circulation		
1. Sales through. dealers, carriers, street vendors, counter sales	21,838	22,072
2. Paid or requested mail subscriptions	488,121	459,615
C. Total paid and/or requested circulation	509,959	481,687
D. Free distribution by mail (samples, complimentary, and other free)	30,915	36,650
E. Free distribution outside the mail	0	0
F. Total free distribution	30,915	36,650
G. Total distribution	540,874	518,337
H. Copies not distributed		
1. Office use, leftovers, spoiled	2,751	2,740
2. Returns from news agents	79,393	73,923
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(signed) Donald B. Peschke, Publisher October 1, 1996
I certify that all information furnished on this form is true and complete.

A Crisis in Water

David Brower, former president of the Sierra Club, recently stated that America has used more of the world's resources in the past 50 years than all the rest of the world in all of history combined. Our decreasing water resources supply prompted a spokesman for the World Bank to warn, "There is a huge problem looming out there. Unless current trends are reversed, we will have a worsening water crisis around the planet."

In the United States, a typical person uses about 120 gallons of water daily. This adds up to a total national daily usage of over 3 billion gallons. And even though two-thirds of the planet is covered in water, there is only a scant amount available for human consumption. While experts continue to address this issue, prudent use and management of water continues to take on new significance.

Maytag Appliances has organized a task force consisting of specialists in the laundry, energy, and water industries to study this problem. They've confirmed that use of high-efficiency washing machines can save from 3500-6000 gallons of water per household annually. For this reason, Maytag is investing in the future by developing a high-efficiency washer that tumbles clothes in a shallow pool of water. It meets environmental needs without sacrificing consumer requirements.

For a free copy of their report, *The High-Efficiency Washer: A Situation Analysis,* call (800) 688-9900.

Country Workshop

Drew Langsner's Country Workshops provide an opportunity to step back a century or two and enjoy rustic, country woodworking with handtools and traditional techniques.

The intimate, two-person classes acquaint students with tools like the drawknife, spokeshave, hollowing axe, lathe, carving knife, and hewing axe.

The winter lineup of classes includes Ladderback Chairmaking, Windsor Chairmaking (beginning and advanced), Carving Swedish Woodenware, Swiss Cooperage, and Ladderback Chairmaking.

Drew's interest in woodworking began in 1972 when he studied coopering in Switzerland. Since 1978, he and his wife Louise have run the school on their southern Applachian farm.

Tuition for each five-day class is $750, which includes instruction, as well as meals, and lodging.

For a catalogue and further information, call (704) 656-2280.

Built-In Bookcase

Sunday dinners at my grandmother's house seemed to drag on forever. And when the adults finally got tired of our fidgeting, they excused my cousins and me from the table. In good weather,

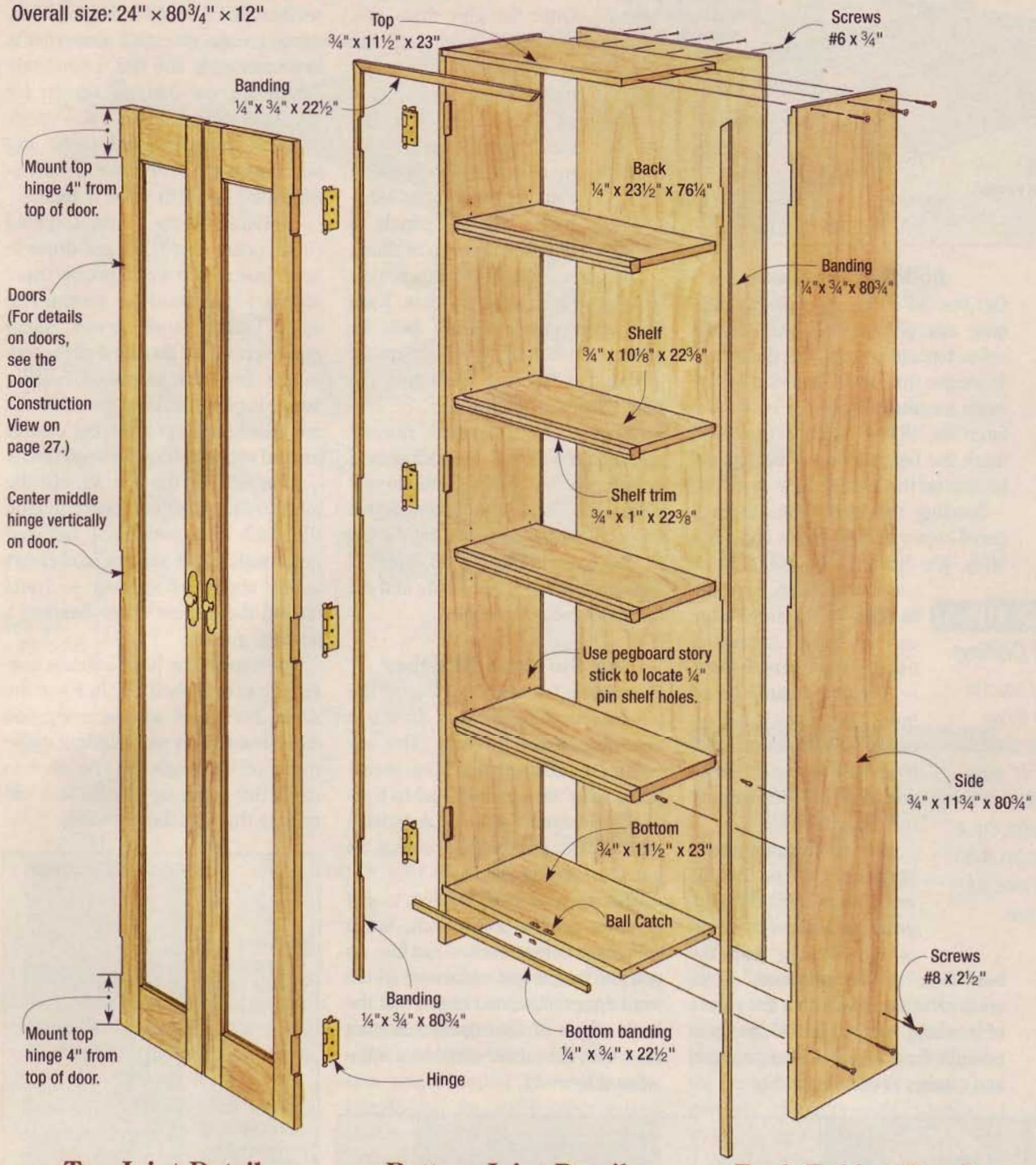
we escaped outdoors, with the screen door slamming behind us faster than Grandma's warning to close it gently. But on rainy days, we always headed for her living room bookcase where we picked out the 1926 edition of the Book of Knowledge. In its dark blue and gold bound volumes, we learned about all the planets and pored over photo essays showing how "modern" steel inkwell pens were putting quill pen makers out of business.

Those memories inspired this bookcase, which I designed for the living room in the *Workbench* house. I gained the space for this valuable built-in by sacrificing only a few square feet in the entry hall closet. I cut through the living room wall into the closet and built the bookcase to fit the opening. You can read about this part of the process in *Framing the Bookcase* on page 30. And, if you want to go all out on your project, you'll find information on making your own trim molding for the bookcase in *Shopmade Molding*, on page 32.

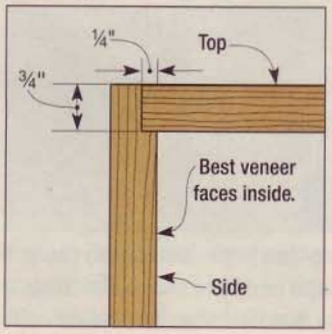
Chances are, you'll have to rework and adapt many of the ideas from my bookcase project. I recommend following the same procedures I did, but tailoring the dimensions to fit your space and circumstances. None of these steps are difficult, and the completed bookcase is sure to add charm and value to your home.

Bookcase Construction View

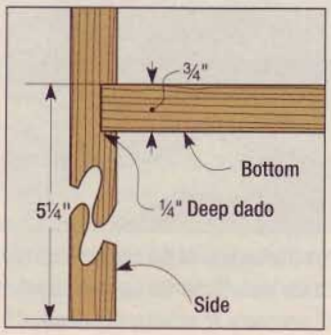
Overall size: 24" × 80¾" × 12"



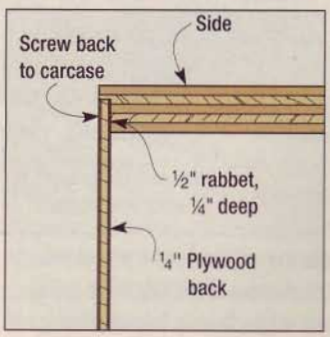
Top Joint Detail

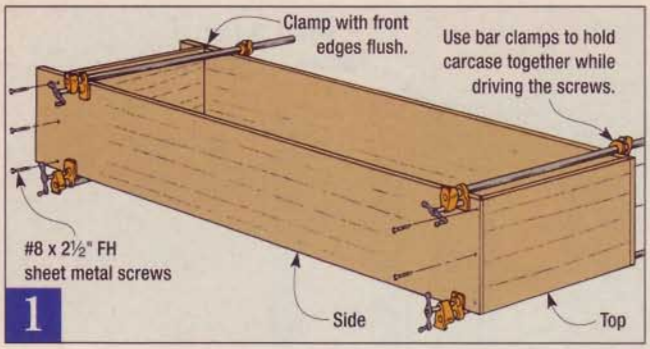


Bottom Joint Detail



Back Rabbet Detail





Building the Case

Get started on the bookcase by ripping oak plywood for the carcase sides, top and bottom. Cut the panels 1" longer than their final size — the extra length will prove to be helpful later on. After making the cuts, mark the best surface of each panel for use on the inside of the case.

Banding the front edge on each panel improves both looks and durability. Rip banding from ¾" thick oak stock. Then, glue the banding to the front edge on each panel. Instead of using yellow glue, however, I suggest using liquid hide glue, which allows more working time. Hide glue also accepts stains and clear finishes without unsightly blotching.

Slide each banding strip back and forth on the plywood edge until the glue grabs, then align one edge of the banding with the best face of the plywood. Next, secure the banding with a few pieces of masking tape. This will give you enough time to add a clamping pad and clamps to each assembly.

PRO TIP

Speedy Drilling

For evenly spaced holes, like those needed for shelf pin supports, ¼" pegboard makes an ideal drilling guide. Cut a strip to length, then label the holes you intend to use.

Carcase Joinery

Once the glue dries, you can easily hand plane the excess banding overhanging the poorer side of the panels. For the other banding edges, be more cautious and use a cabinet scraper or sandpaper. Cut the panels to length when you're done.

The carcase joinery in this project is simple: dadoes and rabbets. Each side panel must receive a dado for joining the bottom, and rabbets for joining the top and back (see the Joint Details on page 25).

Because ¾" plywood doesn't measure a full ¾" in thickness, I installed a ⅝" dado blade in my table saw. Then I made two passes for each bottom dado and top rabbet to get snug fitting joints. Next, I switched to a ¼" dado blade and cut the rabbets for the back.

Put the Case Together

Even when I'm confident that all the pieces are going to fit, I do a test assembly of my projects. The few times I've skipped this step, something went wrong and I had to frantically disassemble the project, wipe off the glue, and fix the problem. So much for saving time!

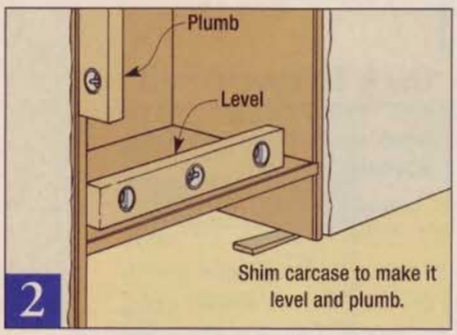
This carcase was too big to put together on my workbench, but a pair of sawhorses worked just fine. As you join the pieces, make sure all the front edges align, and check that the back edges of the top and bottom align with the rabbet shoulders in the sides (Figure 1).

Provided that everything fits correctly, glue the carcase together, using yellow glue this time. On a large assembly like this, I don't rely strictly on my framing square for checking the cabinet — I also check diagonal measurements with my tape measure. When the measurements are equal, the case is square.

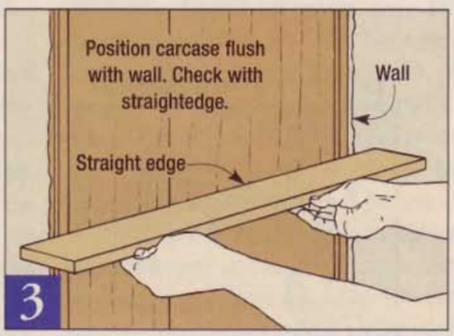
To reinforce the joints, I drilled countersunk pilot holes and drove in sheet metal screws. I prefer these screws for plywood for several reasons. Unlike wood screws, sheet metal screws are threaded all the way to the head for increased holding power in plywood. Plus, their threads are coarse to help them cut cleanly instead of crumbling the wood fibers.

After driving the screws, cut the back to fit. It isn't necessary to glue the back into position. I fastened mine with short screws, and didn't worry about the spacing — I just spread the fingers of my hand as a spacing guide.

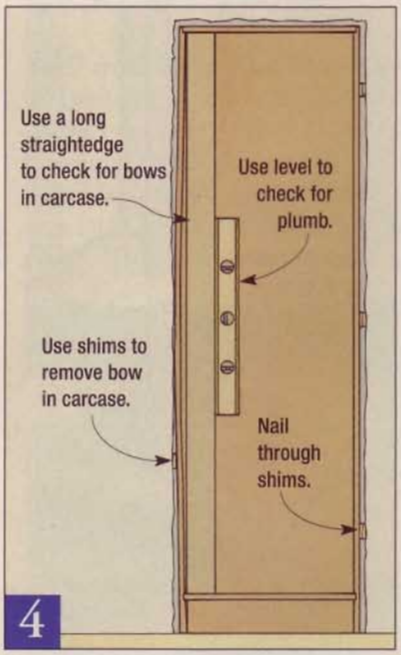
To wrap up the basic carcase construction, drill shelf peg holes in the sides. For speed and accuracy, you can't beat a story stick drilling guide made of ¼" pegboard. Be sure to mark the depth on the bit to avoid drilling through the plywood.



Tap shims under the carcase until it's level and plumb. Once the carcase is set, add more shims along the bottom edges to keep it from twisting.



Ideally, the front edges of the carcase should be flush with the wall. Cheat the carcase slightly out of plumb, if necessary, to achieve this result.



Distortions in the carcase sides can be caught using a long board with parallel edges, and your level. Straighten the sides with shims.

Install the Case

Until now, you've only dealt with the bookcase construction. But to go any further you'll need to frame a hole in a wall of your home. Although I can't predict every situation you might encounter, you'll find some general guidelines in *Framing the Bookcase* on page 30.

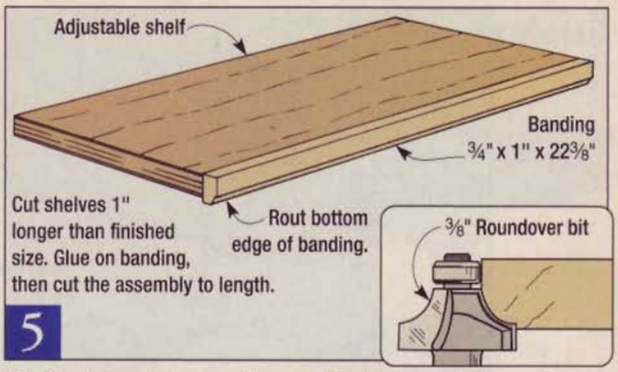
Once you've completed the framing, you can slide the bookcase into the opening. Center it between the studs and slide tapered shims under the case until the sides are plumb and the front edges of the cabinet are flush with the wall (Figures 2 and 3). To prevent racking, the bottom edge of the sides must be fully supported.

When installing my bookcase, I ran into a slight problem. I could not get the case plumb and have all the edges flush with the wall at the same time. To make it easier to install the trim later, I decided to settle for flush edges and let the cabinet remain slightly out of plumb.

With the cabinet positioned, you can put a few shims between the case and studs (Figure 4). Shimming each side will provide ample support and stability. For the inset doors to fit properly later on, make sure you keep the case sides straight and parallel to each other.

I used 8d ($2\frac{1}{2}$") finishing nails, driven through the shims, to secure the cabinet to the studs. Predrilling the plywood helped. Drive the nails about three quarters of the way, again check the case sides, and countersink the nails.

Resist the temptation to break off the shims with a hammer blow — this often splits the shims and can disturb the fit of the case. Instead, cut them with a backsaw.



Hide the plywood edges and increase the load capacity by applying banding. Keep the banding flush with the top edge of the plywood.

Making the Shelves

Like the other plywood panels in this project, the shelves are banded on their front edge with solid wood.

Cut four pieces of plywood to width for the shelves, and leave them 1" longer than ncessary for now (Figure 5). Then, rout the edges of several boards with a ⅜" roundover bit. Rip the boards to width for the banding, and glue them to the panels. Make sure the banding pieces are flush with the top surface of the plywood. Cut the shelves to length after the glue dries.

The Doors are Next

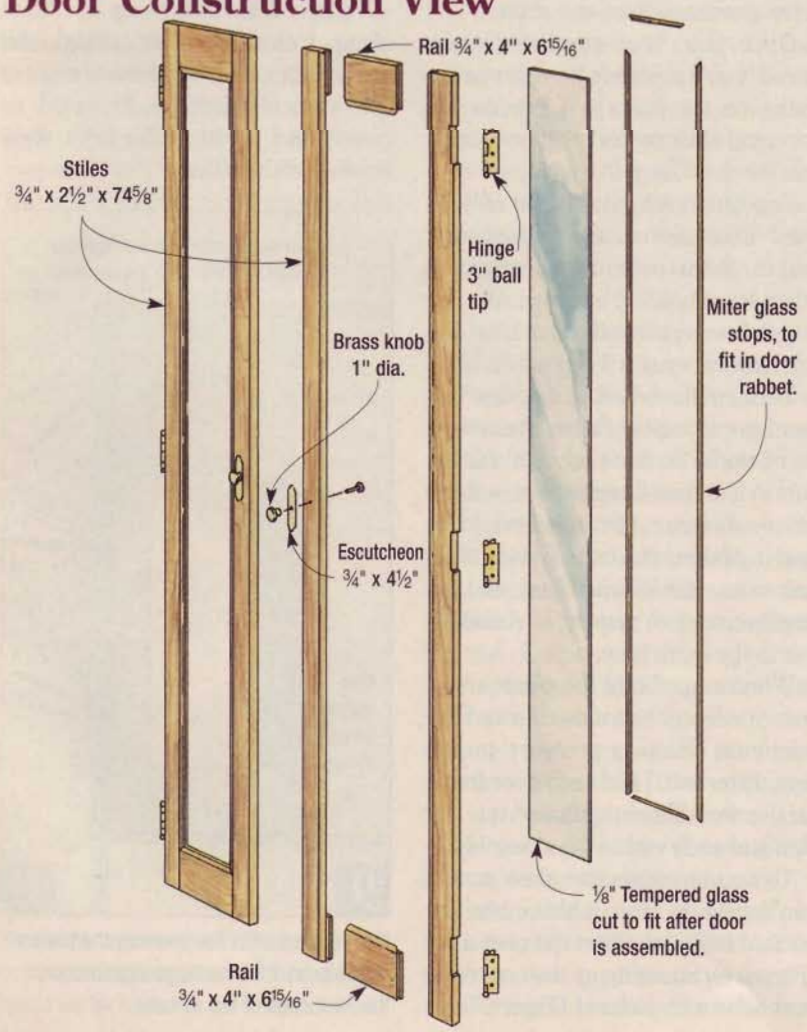
I think the doors on the bookcase give it a real touch of class. You could decide to have an open bookcase by leaving off the doors. For my money, however, this project should receive the full treatment.

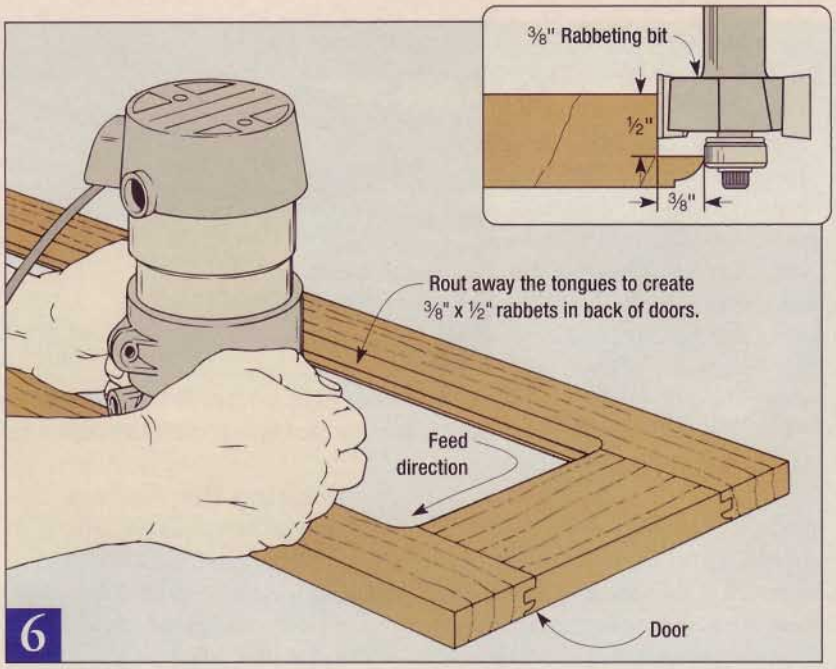
Building these doors was a new adventure for me. This is the first time I've ever used cope and stick router bits to form the joints. You don't have to follow this method, and there are lots of other options. But if you're interested, take a look at *Cope and Stick Joints* on page 39.

Before getting into the routing steps, rip stock for your door frames. I ripped my rails about $\frac{1}{8}$" wider than the final size (see the Door Construction View). This allowed for some tear out, which did occur on one piece. Later, after making the cope cuts, I ripped the rails to final width.

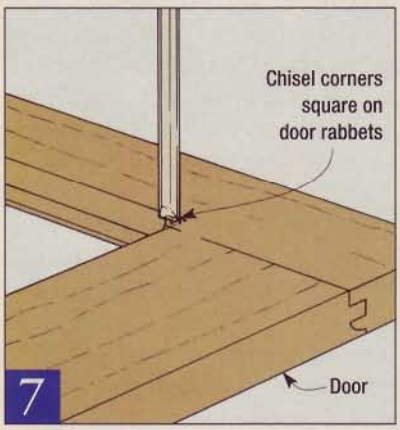
I also cut each stile about $\frac{1}{16}$" wider than their finished size. The extra width gave me a little margin of

Door Construction View

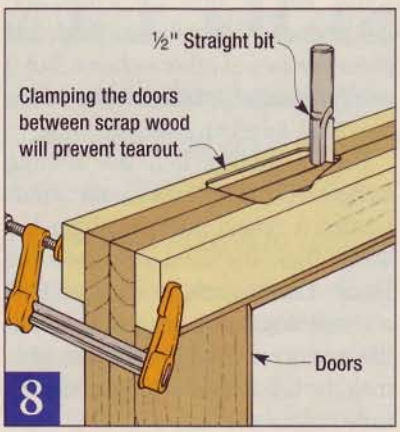




Routing rabbets in the back of each door will open the way for installing the glass and the wooden stops.



The rabbeting bit leaves rounded corners in the back of the door. Chop the corners square with a sharp chisel.



Clamp the doors together and rout the hinge mortises. Be sure to keep away from the layout lines. Clean up the edges with a chisel.

error when assembling the doors. As it turned out, this wasn't necessary, but the insurance is worth it. And, removing the extra 1/16" requires only a few passes with a hand plane.

Once you have your stock prepared, you'll probably be eager to get going on the joinery. If you do use cope and stick router bits, there are a few things to keep in mind.

Cope and stick bits should only be used in a router table. Their size makes them potentially dangerous when hand holding a router. Also, be sure to use a router that's at least 1 1/2 hp. I prefer using a 3 hp router.

With router bits that are this big, you have to expect them to remove a lot of stock. So don't try to make the cuts in less than three passes — three passes became the standard I followed. Making the extra passes takes only a few minutes per door, and the improvement in quality is definitely worth the extra time.

When assembling the doors, make sure you keep the frames flat and use minimum clamping pressure to prevent distortion. I laid each door frame on the workbench and used one bar clamp at each end of the assembly.

To accommodate the glass panels, you'll have to rout rabbets into the back of each door after the glue dries (Figure 6). Squaring up the corners is best done with a chisel (Figure 7).

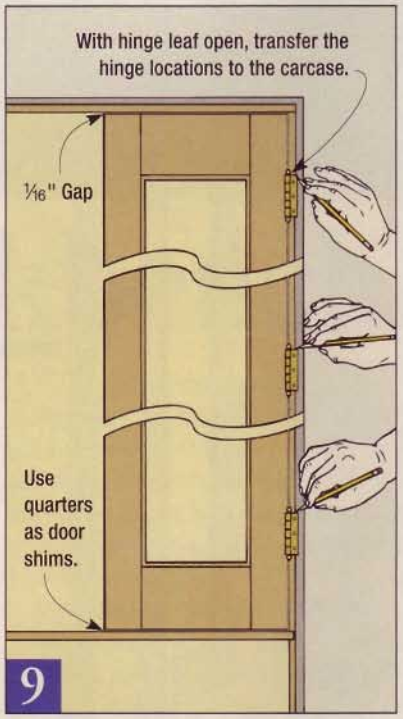
Install the Doors

As long as the doors and the cabinet are square, the door installation is a breeze. To begin, trim the doors 1/8" shorter than the height of the cabinet opening. This will allow 1/16" gaps at the top and bottom.

The 3" brass hinges are mortised into the door stiles and the case sides. Again, I wanted a 1/16" gap, and that's controlled by the depth of the hinge mortises. To determine their depth, measure the diameter of the hinge barrel with calipers — in my case, this turned out to be 3/16". Then, subtract 1/16" for the gap, and divide the remainder in half. I mortised each leaf of my hinges 1/16" deep.

Lay out the mortises on the door stiles with a pencil (see the Door Construction View), then use a square and an X-acto knife to mark the outline. Making several light passes with the knife works better than a heavy-handed approach.

To speed the mortising operation along, I chucked a 1/2" straight bit into a router, and routed away most of the waste (Figure 8). I routed as closely as I dared to the lines, then finished with a chisel.



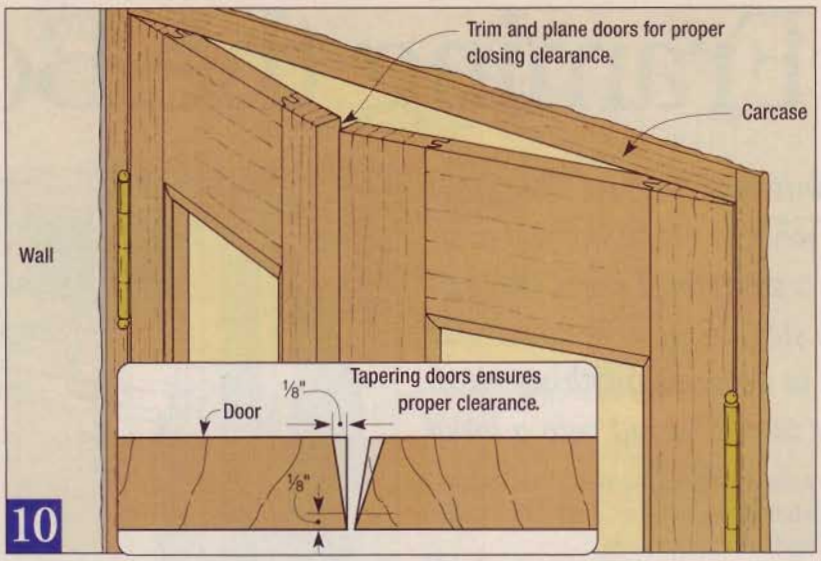
Shim each door in the opening, then use a pencil to transfer the hinge locations onto the front edge of the carcase.

Drill pilot holes and screw the hinges to the doors, then stand them in the cabinet (Figure 9). To get the spacing right, I slipped a couple of quarters under each door. Transfer the hinge locations to the case with a pencil. Then, mark and cut the mortises in the case sides like you did in the door.

If all went well, you'll be able to mount the doors in the case and close each door individually, with an even 1/16" gap on three sides.

But the doors won't close in the middle yet, and that's just what you want at this point. Remove one door, bevel the edge of the unhinged stile and reinstall it (Figure 10). Plane the other door until you get an even 1/16" gap, then plane a bevel on the edge.

When everything fits like you want, install a ball catch at the top and bottom of each door, and add the mounting plates inside the case. You can also install the handles.



Use a hand plane to bevel the inside edges of the doors where they meet. This provides clearance for each door to open, while maintaining the consistent 1/16" gap on the outside edge.

Adding the Glass

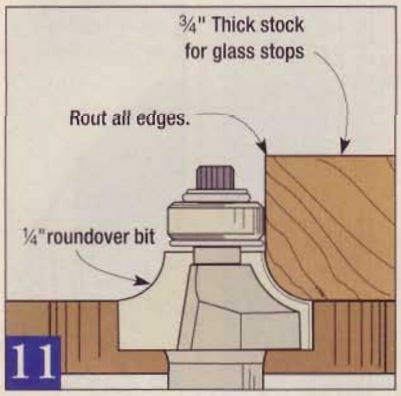
After you get through admiring the perfect fit of your doors, you'll want to remove them one more time to have glass cut to fit. Tell the glass vendor that you want to order 1/8" thick tempered glass, and have them cut the pieces about 1/8" smaller than the door openings. This clearance will make the glass easier to fit and allow for some minor shrinkage of the door.

As for glass stops, I came up with a three step process that allowed me to safely machine the strips from 3/4" thick stock (Figures 11, 12, and 13).

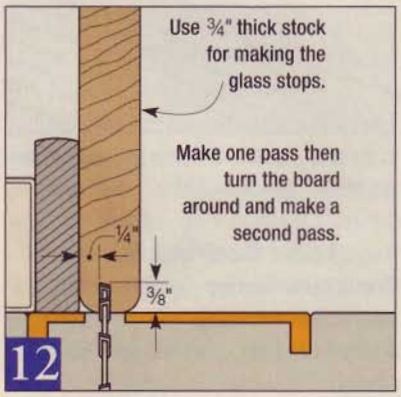
Once you've shaped your stops, take a break from the building process and apply your stain and a couple coats of finish to the strips, as well as to the cabinet and doors. I used a Benjamin Moore stain called Golden Oak, followed by a coat of sealer and two coats of varnish. The sealer and varnish are General Finishes products.

The final step in the bookcase project is mitering the glass stops to length and installing them, along with the glass, in the doors (Figure 14). Secure the stops with brads after drilling pilot holes. Don't glue the stops in place — you'll want to remove them if the glass ever breaks.

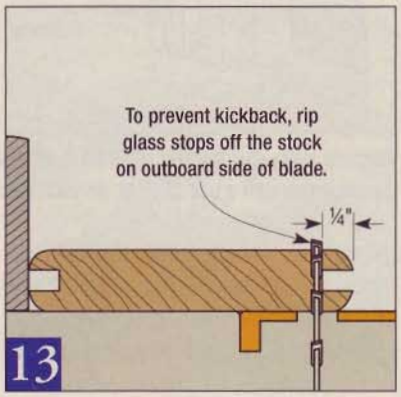
Remount the doors in the cabinet and step back. Your work is done and it's time to fill the cabinet with books. You may not have a Book of Knowledge to anchor your collection, but you probably have a prized possession of some kind that will bring the cabinet to life.



For safety, machine the glass stops from 3/4" thick stock. To begin, roundover all four edges of the blank.



To machine your glass stops to thickness, rip a 1/4" wide groove in each edge. Then rotate the board and rip it again to enlarge the gap.



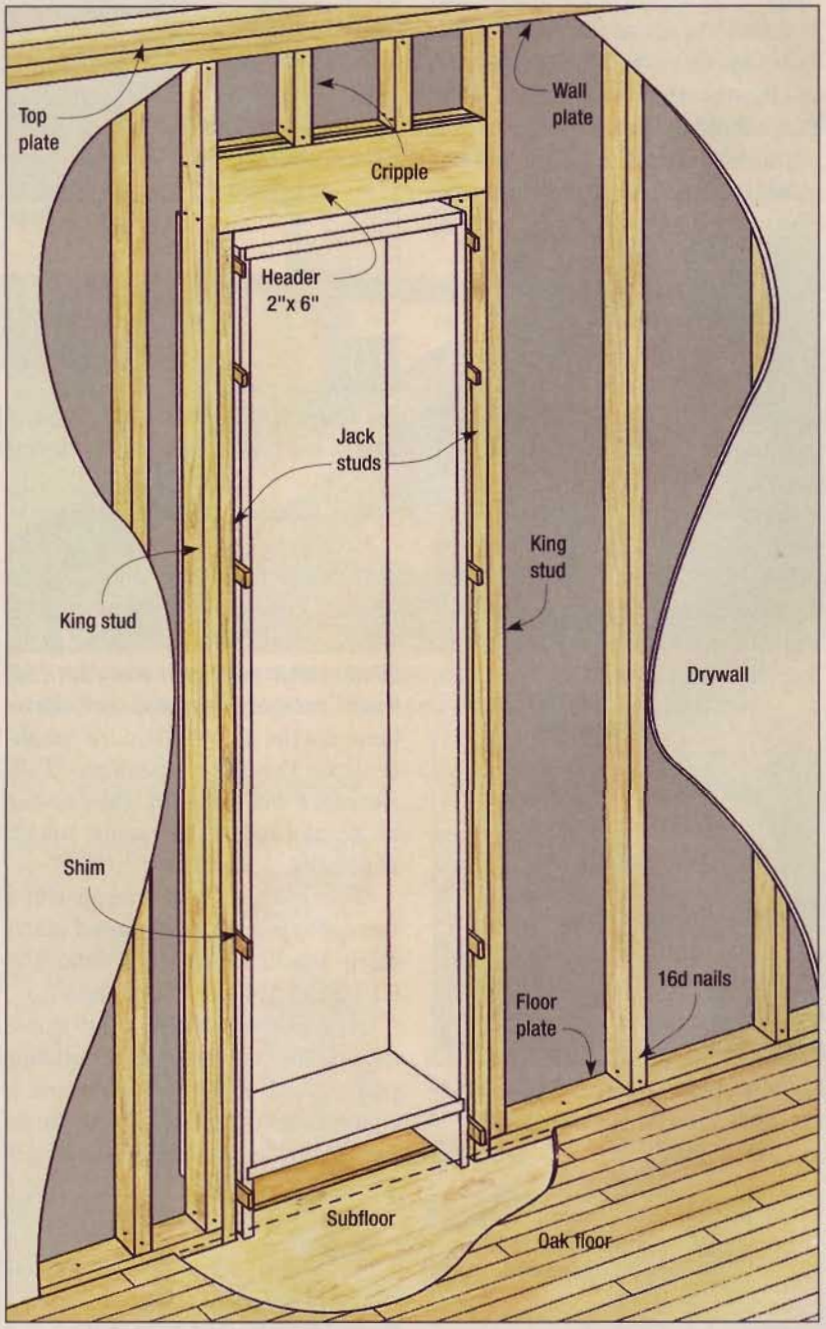
Rip the glass stops from each edge of the blank. You'll need to reset the fence when you cut the stops on the other edge.

Miter the stops to length, then install them with 3/4" long brads. Be sure to drill pilot holes for the brads to prevent splitting.

Framing the Bookcase

I'll admit that the first time I cut into a wall, it made me feel a bit like a surgeon. I crept through each step, being ever so careful not to damage anything vital. Since then, I've cut into a lot of walls in lots of houses. I've learned what to expect, but I try not to take anything for granted.

Breaking into a wall in the *Workbench* house, and framing the opening for the built-in bookcase (see *Building the Bookcase* on page 24) was done very methodically. By taking a step-by-step approach you'll be much more likely to avoid any problems with the structural parts of your house. There isn't anything particularly difficult about this job as long as you don't run into wiring, plumbing, or ductwork. I also recommend staying away from load bearing walls.



Although every wall framing situation is different, in the end you want to frame the opening for the bookcase with a pair of studs on each side and a header above.

Finding Obstacles

If you have blueprints for your house, study them to see if the wall you want to tear into contains any of the obstacles I just mentioned. I chose to open a wall between the living room and the entry closet. The small amount of space the bookcase used up hardly made a dent in the closet. Fortunately, I only ran into one light box, and it was on the closet side of the wall above the bookcase opening.

Once you've determined where you want to install your bookcase you'll need to use some ingenuity to sleuth out the contents of the wall to find any potential obstructions.

A quick inspection on both sides of the wall will reveal obvious warning signs such as duct work, switches, and electrical outlets that are directly in your path. But also look for hints of hidden problems. For example, if your planned location lies between two wall outlets, you'll likely run into a wire connecting them. Also, check the area above and below the wall, if possible, for plumbing lines and other obstacles. It is possible to move wiring or ducts, but for this project, we'll assume you have an unobstructed space behind the wall.

Load Bearing Walls

Walls are either load bearing or non-load bearing. Load bearing walls support the floors or roof above. Non-load bearing walls do not support any significant weight and simply divide the house into rooms. I put my bookcase in a non-

For safety, I shut off all electricity in the living room before cutting into the wall. Power for the saw came from a bedroom outlet.

load bearing wall, which greatly simplified the framing process. I suggest you try to do the same, and avoid load bearing walls. Generally, steer clear of all exterior walls, as they are almost always load bearing. And if a wall stands directly above a beam or wall in your basement, chances are good that it's also load-bearing. You can also look for clues in your attic. Typically, ceiling joists cross over load bearing walls, and any wall lying under places where joists end and overlap should be considered load bearing.

To check out the wall I planned to cut into, I drilled a 1/8" hole through the ceiling right next to the wall. Then, I straightened a coat hanger and pushed it through the hole. After taping it to the wall, I climbed into the attic and found that the wire was far from any structural obstacles.

This coat hanger technique worked so well that I drilled a hole near the wall through the floor. After checking the wire location in the basement I concluded that my wall was ideal for the bookcase.

Let's Get Cutting

Once you've settled on a location, you can get to work. Cut an opening in the wall large enough for the bookcase, with plenty of working space all around. Cut the drywall to at least one stud beyond the opening on each side. Also, remove the drywall all the way to the ceiling so you have access to the wall plate.

I cut the drywall with a reciprocating saw. If you don't own a reciprocating saw, you can probably find one at a tool rental store. A portable circular saw will also work for this operation — just remember to set the blade depth for the 1/2" thick drywall. You don't want to cut into the studs if you can help it.

To be on the safe side, in case there is a wire hidden in the wall, shut off all the power to the living room while making the wall cuts.

Inside the Wall

After removing the drywall, you can see the arrangement of studs in the wall. Depending on where you want to install the bookcase, you may be able to use a stud to establish one side of the opening.

Layout the location of the bookcase opening on the floor plate and remove any studs that fall within the area. A maul will make quick work of this little operation.

Now toenail a king stud to the floor plate and wall plate to define the bookcase opening — leave room for a jack stud plus another 1/2" of space on each side. Cut the floor plate flush with each king stud and remove the waste.

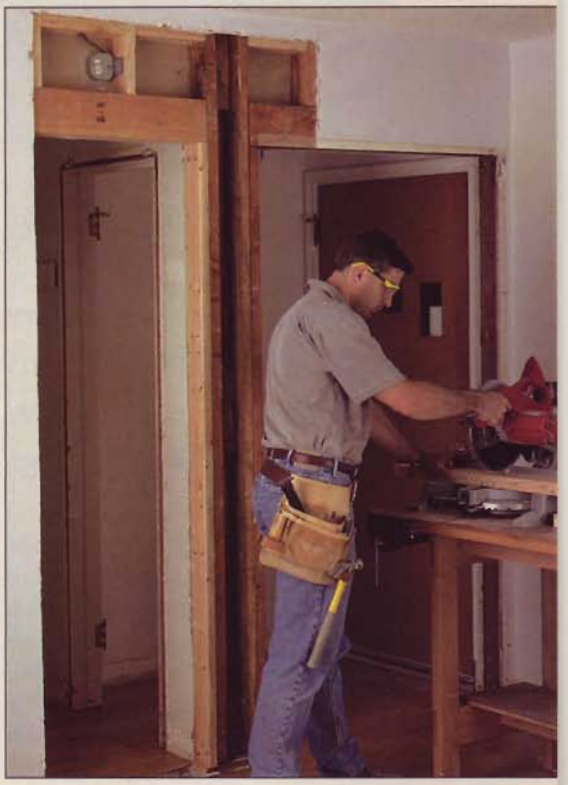
You can cut the jack studs to length next, making sure they extend above the bookcase height an inch or two. Nail the jack studs to the king studs, then make the header assembly. I always slip a piece of 1/2" thick scrap plywood between the header pieces so that the thickness of this assembly matches the width of the studs.

Knock the header into position above the jack studs and nail all the framing together. Adding cripples above the header supports the top plate and wall plate (even though this isn't a load bearing situation, the wall still must support the flooring and people directly above). This completes the framing.

Installing the Bookcase

Before sliding the bookcase into position, you'll want to hang new drywall on the framing. Once this is done, you can maneuver the bookcase into the opening so its front edges are flush with the drywall. The 1/2" clearance you factored into the king stud placement should provide room for adjustments. Use plenty of shims, but be careful not to distort the bookcase sides in the process.

Once you have everything set, drill pilot holes and drive finishing nails to secure the bookcase to the jack studs. Later, you may want to build a wall to hide the back of the bookcase. Meanwhile, you can get to work trimming the bookcase.



A miter saw cuts lumber quickly and accurately. Setting the saw on a workbench saves wear and tear on your back.

Shopmade Molding

I always thought molding was something I had to buy. I'd accepted the fact that prices were high and the selection was limited. But I'm a woodworker! There had to be a better way.

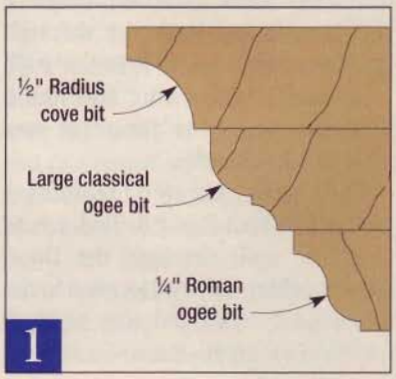
Once I got to thinking about it, I realized I had everything I needed to make my own molding: a router, a router table, and a good selection of bits. In fact, I just recently purchased a 15-piece set of router bits, so this was a perfect opportunity to put them to the test.

During the planning stages, I mentioned my interest in making molding to a friend who works at a millwork shop. He did knock a bit of common sense into me when he said that some profiles might be out of my reach. He showed me a few large cutters used to make complex patterns, and then described the enormous machines that drive the cutters. After that conversation, I didn't kid myself into thinking I could make every possible pattern.

Routing Combinations

Still, the options appeared vastly superior to what I could buy, and I began sketching patterns using my router bits as guides. Graph paper kept everything in scale. Although I'd be embarrassed to show you those drawings, they got me thinking about new ways of making moldings.

For instance, while tinkering with the router bits, it occurred to me to stack several boards after routing an edge on each one (Figure 1). Combining the routed edges in this way created richly contoured moldings that are far more interesting than the single molded edges.



Varying this technique can result in all sorts of combinations, and you can succeed with even the sparsest collection of bits.

Other, more subtle ways of expanding the scope of possibilities include changing the bit's cutting depth, altering the size of the bearing if it has one, and using different cutters in combination on one molding. As an example of the multiple bit approach, I like using bits with a bearing for routing the edge of a board, then one or two bits without bearings for routing its surface.

A Choice of Router Bits

When choosing router bits you might find it helpful to consider their character. Ogees, Roman ogees, and beading bits are classic shapes that are popular in Colonial style homes. Chamfers are closely associated with the Arts and Crafts movement. And many contemporary homes are filled with roundovers and small coves.

Most conventional bits with bearings do have one limitation: their profiles are short and shallow. Due to a new generation of router bits, however, you now have more options. I've tried Amana's Architectural Molding Bits, for example, which include patterns as wide as 1¾". These are all heavy-duty bits with ½" shanks, so they aren't recommended for use in smaller routers. But you wouldn't want to do that anyway. Large bits like these require a router of at least 1½ hp, and typically you'll want to do the work on a router table.

Preparing the Lumber

As with any woodworking project, I go through some preliminary steps before routing my lumber. Whether you're building a cabinet, a deck, or molding, choosing and preparing boards in the beginning always pays off down the line.

First, to get the lowest price on molding lumber, I buy rough stock and mill it to thickness (Figure 2). For most molding applications, I use ¾" thick material.

After the boards are smooth and flat, I joint one straight edge onto each piece (Figure 3). This paves the way for the next step — ripping the boards to width. As I rip the boards, some always bind against the blade, which causes a kickback hazard. Inserting a wedge into the kerf solves this problem (Figure 4).

I do want to mention one exception to this last step. If you're planning to make narrow molding, say 2" or less, I recommend ripping the boards to size after routing the profiles. Balancing a router on narrow strips is difficult, and any wavering will show on the finished profile.

More Molding Tips

I originally thought I'd rout all my moldings on the router table. As it turned out, hand-holding my router was sometimes a better option. Often, it's simply a matter of space — a board 10 ft. long requires 20 ft. of clearance to pass over a router table. This kind of open space just doesn't exist in my shop.

Here's another tip: after routing any molding over 3" wide, cut ⅛" deep by ¾" wide grooves in the back with a dado blade (Figure 5). This helps relieve stress in the board, allows air to circulate behind the molding to keep it in balance, and assures a better fit on the walls.

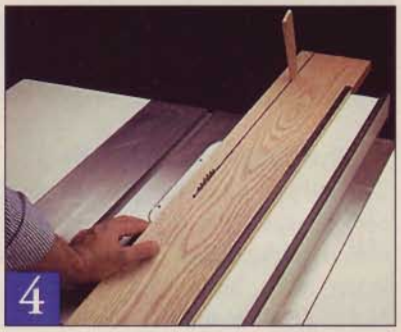
Finally, don't forget the finishing. It's common to push this step to the end, after the molding is installed. Instead, I prefer to stain and seal my moldings before installing them. Not only does this allow me to stabilize the wood better by sealing the back of each board, but it also reduces the mess on my walls (Figure 6).

2

To guarantee uniformity in your stock, plane your rough material down to one common thickness. I use ¾" for most of my moldings.


3

Joint one edge on all your boards before ripping them to width on the tablesaw. A straight edge will reduce the chance of kickback.


4

Rip your molding to width on the tablesaw. If the kerf begins to bind the blade, insert a wood wedge near the end of the board.


5

Dado ⅛" deep by ¾" wide relief grooves in the back of the molding to help prevent warping and assure a better fit on the walls.


6

By staining and finishing both sides of your molding before installation, you'll reduce the mess on your walls and seal the wood better.

The key element in my molding project is the coped joint formed with a cove bit and a matching roundover bit.

The Bookcase Molding

Beyond describing the general course of events for making your own molding, I find the best way to learn is to jump into a project. Making and installing trim for the bookcase in the *Workbench* house provided an ideal training ground.

The casings and baseboards are $3\frac{1}{2}$" wide. Because I wanted a simple, traditional look, I chose to visually anchor the casing to the floor with plinth blocks (see the Molding Detail and the Bookcase Molding Construction View). You'll see plinth blocks, although often more elaborate than these, in many turn-of-the-century homes. Between the casing and each plinth block, I used a filler strip to add interest to the assembly.

I created another interesting effect by using L-shaped outside corners to surround the casing on the bookcase, as well as the doorways and windows in the rest of the room.

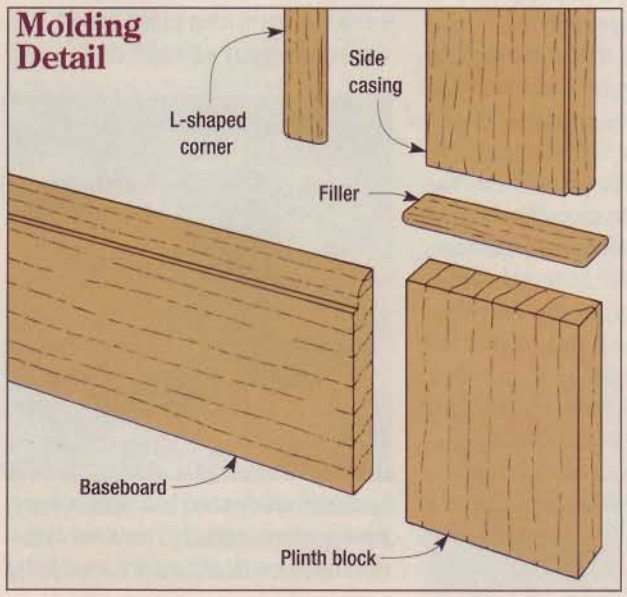
One advantage that plinth blocks offer is the nicely fitting — and easy to make — butt joints that result at the intersections of the casings and the baseboards. The plinth blocks clearly mark the difference between the two molding segments, which helps set the doorways apart from the rest of the room.

To maintain continuity, however, I made baseboards that match the casings. This common molding profile is the link that visually holds the room together.

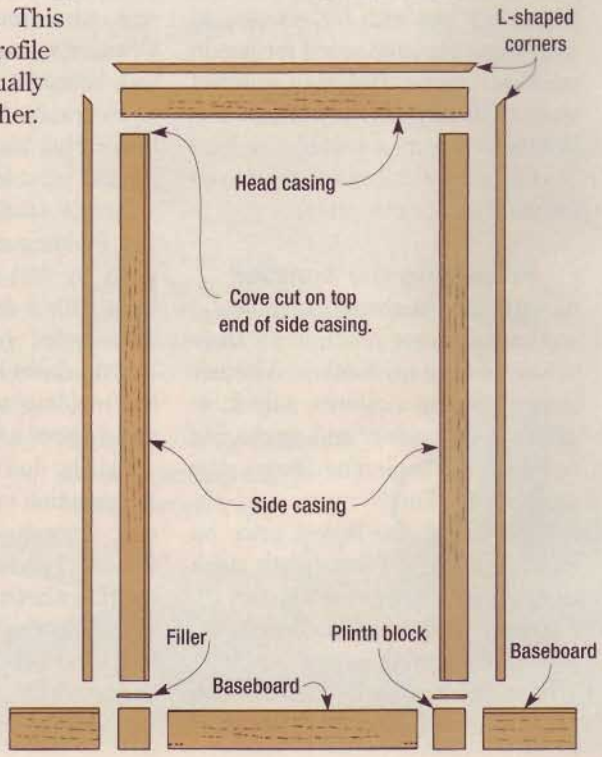
A Unique Joint

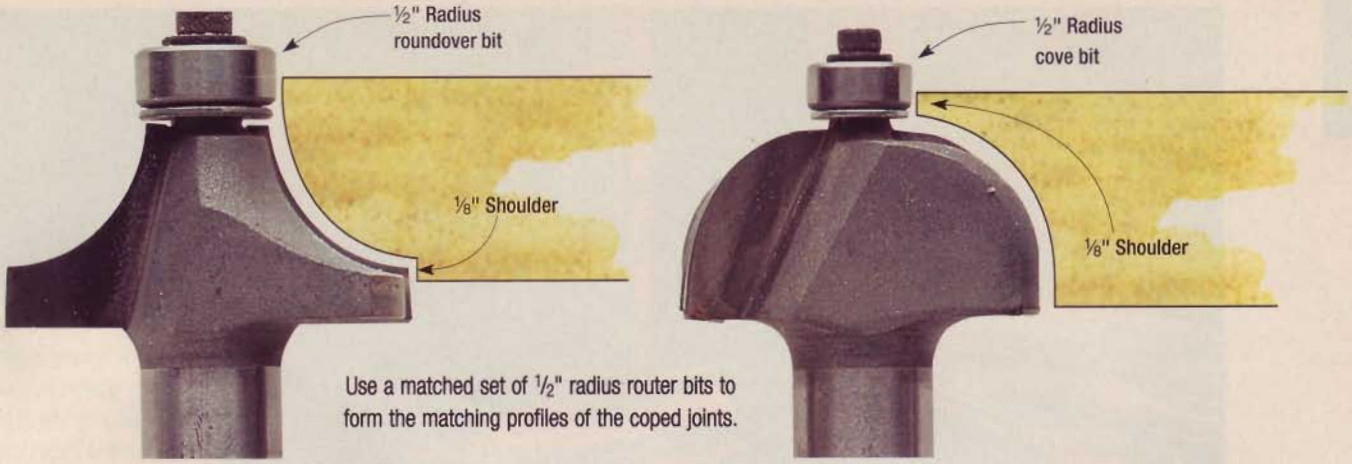
An unusual and interesting feature of the molding in this project is the way the side casing meets the head casing (as shown above). Typically, this joint is mitered or butted together. But I made cope joints using a roundover bit set to cut a $\frac{1}{8}$" deep shoulder on the inside edge of all the casing. Then, on the top end of each side casing, I used a cove bit to rout a matching, but opposite profile that fits the roundover perfectly.

Molding Detail



Bookcase Trim Molding Construction View





Use a matched set of ½" radius router bits to form the matching profiles of the coped joints.

The bits I used include a ½" radius roundover and a ½" radius cove (see the Router Bits above). I routed the roundovers along the edges first, then routed the coves into the top end of the side casing pieces to fit.

For the roundover routing operation, I clamped the long pieces of stock to my bench and hand-held the router (Figure 6). The roundover bit should be set to leave a ⅛" shoulder. I made test cuts in scrap wood until the depth was just right. You'll enjoy more consistent results if you take several shallow passes to reach the final depth.

Don't forget, you'll need to rout mirror image casings for each doorway. One for the right side casing and one for the left side casing.

To rout the coves, I quickly saw that the router table was the easiest and safest way to go about it (Figure 7). I aligned the router table fence (which has a hole cutout so it can slide over a bit) with the bearing on the bit. The bit was set to leave a ⅛" deep shoulder to match the shoulder on the roundovers. But it's not a ruler measurement that really counts here — the cove must fit the roundover when the pieces are pushed together. So rather than measuring, I made a few test cuts until I got the depth just right.

Here's a tip: routing end grain can leave some nasty tearouts. By supporting the back side of your casing with scrap wood, you can prevent any significant tearing. Since the router bit will exit some casings on their profiled edge, I routed a matching cove into one back up piece.

Accenting with Trim

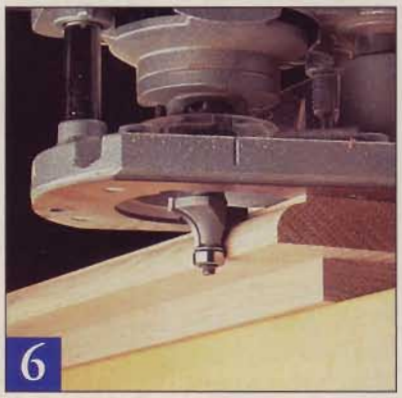
Making the L-shaped corner trim begins with a planer, which I found was the best tool for milling rough stock into the 1" square strips.

Shaping these strips requires a router and a table saw (Figure 8). First, using a router table, rout two adjacent edges on each strip with a ⅛" roundover bit. Next, cut the strips into an L-shape by ripping a rectangle from the back of each piece. For safety, use a push stick during this ripping operation.

Installing the Molding

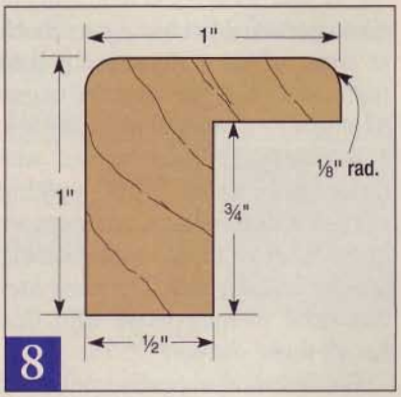
Once I sanded, stained and brushed on a coat of sealer, the moldings were ready to be trimmed to length and mounted on the walls. I can't tell you how pleasurable it was working with trim I had made. This is when the preparation work done at the beginning of the process paid huge dividends. The pieces were all the same thickness and they matched in width, and I wasn't struggling with twisted or warped stock.

Planning and making the bookcase trim demonstrated to me how easy it is to customize the woodwork in my home. Any woodworker with a little imagination can do even more.



Due to the length of the stock, it's best to rout the roundover using a hand-held router. Use a back up board to lift the stock off your bench.

Back-up the casing with a miter gauge and scrap wood to prevent tear out. By making shallow passes you'll avoid burning the end grain.



Make the L-shaped molding by first rounding over two edges, then cutting away the waste in two passes using your tablesaw.

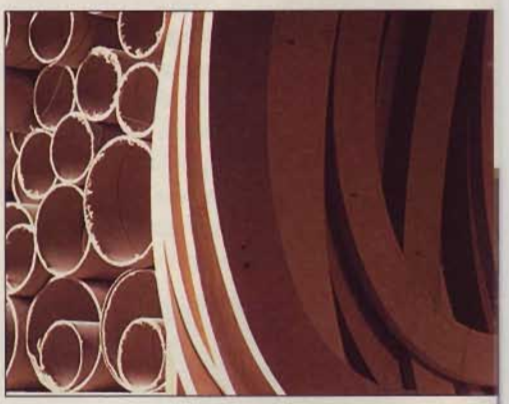
Millwork Specialists

If you thought that home builders cut corners in the past, you haven't seen anything yet. But when today's builder cuts corners, he's responding to one of the latest design trends, and his

customers couldn't be happier. Look at some of the homes being built today, and you'll see what I've begun to notice — more and more curves. You can readily buy curved windows and doors. And making curved walls, ceilings, and corners is fairly easy to do with framing lumber and drywall. The hard part has been making wood trim that fits all these curves.

For instance, a nearly completed home I saw a few months ago was filled with archways trimmed out with elaborate frame and panel jambs. The windows were topped with stunning half-moon shaped glass, framed with matching curved casings. And in several rooms, rather than typical square corners where walls meet, each corner was built to a 9-inch radius. These were fitted with curved wood corners that connected the straight sections of the baseboard and crown moldings.

Needless to say, I was curious to find out how all these curved moldings were being made, and who was making them.



Following a Curved Path

Well, as we all know, there are lots of creative people out there. Tracking down the person responsible for these moldings led me to one of them. The man behind this cutting edge woodworking technology isn't a degreed engineer, a machinist, or even a formally-trained woodworker. He's just a guy with a lot of ideas and the drive to figure out how to make things out of wood.

Don Friend got his start as a house framer, and then decided that kind of work was too seasonal — and involved working on some very cold days. So he turned to finish carpentry for a while. Another turn in his career path led him to start his own cabinetmaking business. But within a few

years the stiff competition wore down his enthusiasm. "Everyone was competing to build basically the same box for the same customers," Don said. "I wanted to get away from the crowd, find a unique niche, and be out front with new ideas."

Watch Out For Curves

Although Don was searching for his place in the woodworking market, he didn't limit his survey of design trends to wooden objects. He reviewed the evolving architecture of residential and commercial buildings. He studied cars, industrial machinery, and even household appliances.

Don's keen powers of observation paid off when he realized that many products were featuring more and more curved shapes.

Curved objects are often called organic because they are more like natural shapes than man-made straight lines and rectangles. Nature abounds with curved forms — from hills and trees to animals and humans. Objects manufactured with square corners often seem harsh. But softened edges and round corners can make these things more user friendly.

"For woodworkers," Don said, "a trend toward ergonomic handles (which usually means more curves) is easy to see on a visit to your local hardware store." Another reason for more curves is safety. "As we understand how to make our living areas safer, bullnosed edges and curved corners are becoming more common, especially if you have kids around," Don noted. "Even concrete structures are taking on a more rounded appearance."

The Concept Takes Shape

Don had the basic concept for his emerging millwork business, but now another set of challenges arose. Most non-wood materials are pliable enough to be formed into curved shapes during the manufacturing process. Plastic, concrete and metal, for example, easily conform to different shapes. Wood is a lot more difficult.

Don was able to craft individual pieces of curved wood molding, but the process was often painstakingly slow. To make the business successful, he would have to find — or create — woodworking technology that make production run items possible.

Take a Turn Into the Shop

When you mention innovative manufacturing technology, most people think of computer-guided machinery that whirs in response to the keyboard tapping of a skinny kid with a pocket protector.

So you can imagine my surprise when I first drove up to Don's shop. I expected a warehouse filled with machines as big as boxcars. But the truth is, if you moved the wood racks

Rounded blanks go through many steps of refinement before ending up as ornamental details on tall pillars and columns.

An operator feeds curved stock past shaper cutters that are custom ground to precise tolerances for a client's design.

A shop-made trammel jig makes bandsawing arcs fast and accurate. It quickly adjusts to any radius for cutting sections of an arc.

Workers laminate layers of special bending plywood between steel platens to make a curved jamb. This requires lots of clamps.

Coaxing peak performance from the bandsaw requires constant attention to its adjustments. Bent shapes are often bandsawn and laminated.

outside, you could fit Don's shop into a few double bay garages.

Computers do play a role in the business — by helping to figure out how the molding should be made. But they don't guide any cuts. Good old-fashioned human ingenuity takes over at that point.

The methods are not always high-tech, but they get the job done. This application of appropriate technology helps find straightforward solutions to curved problems.

Bending the Rules

The shop uses every trick in the book, and has written a few new chapters of its own. Don demonstrated a few of the shop's broad range of techniques. Some pieces are machined to a curve, others are made up of many thin strips laminated together against a curved form. Still others are boards spliced together and then later bandsawn and clamped to shape.

I studied a few pieces of curved molding that seemed to defy the usual rules of woodworking. I turned to Don and started to ask how they were made, but I could tell that his smile would be the only response I would get.

Ugly Machines

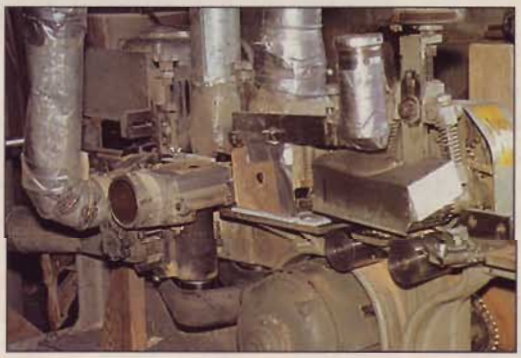
The shop's machines — originally meant for common woodworking tasks and metal working — have been adapted for use in this specialized trade. Although the moldings they produce are beautiful, some of the machines are downright ugly. Several machines look like they are 90% cast iron and 10% duct tape.

Most of the jigs weren't much to look at either. Vacant screw holes showed that the jigs are well used. They had evolved through many stages before reaching their final shape.

The jigs symbolize the spirit of the business, which is constantly changing. Don's product line always adapts to accommodate the needs of his wholesale-only clientele of architects and builders.

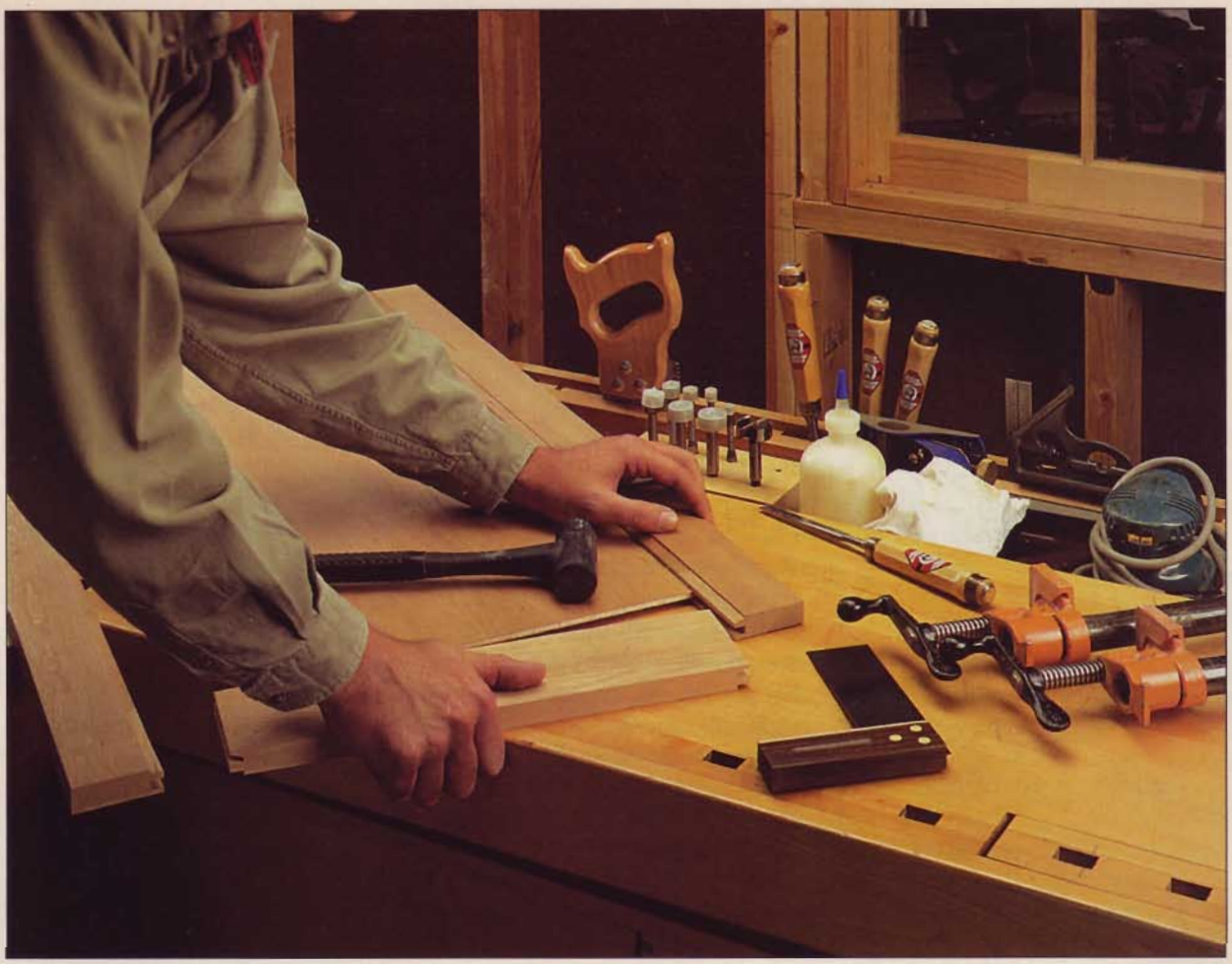
Eventually, the company may get its products into the mass markets of home centers and lumberyards. But it's difficult to predict exactly what the future holds for professional millwork. Because even in the world of curved moldings, you never know what's around the next corner.

Many custom forms are created for these specialized moldings. Very large ones such as this bending form and crossbar, which stands over 52" tall and 70" wide, will be constructed, only to be used once, then discarded.



This beast of a molding machine produces beautiful profiles on straight lengths of stock. As the duct tape suggests, a "can do" attitude permeates this shop.

Common woodworking machines can produce uncommon results when they are modified to fit the task.



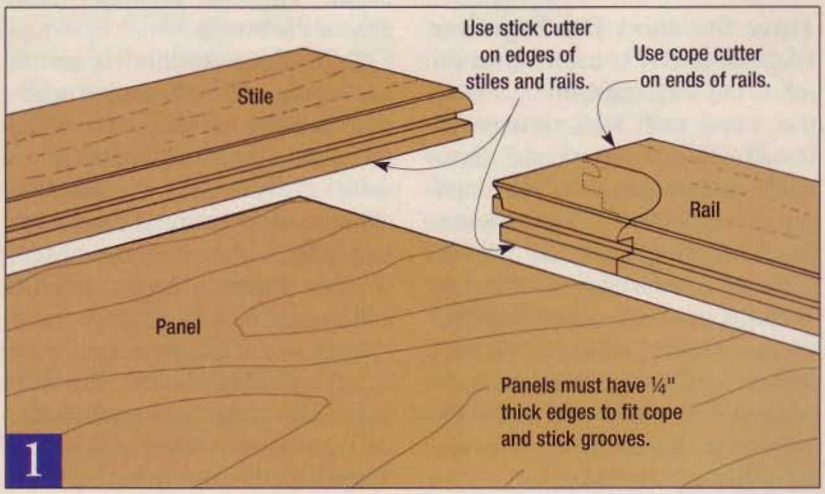
Cope and Stick Joints

It's hard for me to ignore the beautifully contoured frame and panel technique that graces the doors of fine kitchen cabinets and case work. Perhaps it's the fact that the pieces all fit together like a puzzle that keeps me intrigued.

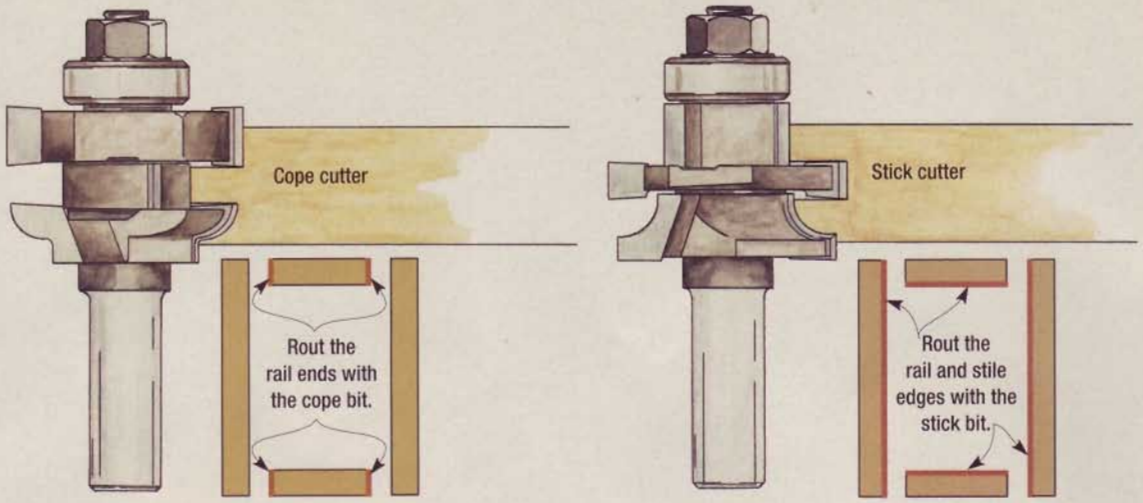
Although this method is usually associated with traditional styles, it is also right at home with more contemporary projects, such as the *Chest of Drawers* and *Built-In Bookcase* projects featured in this issue.

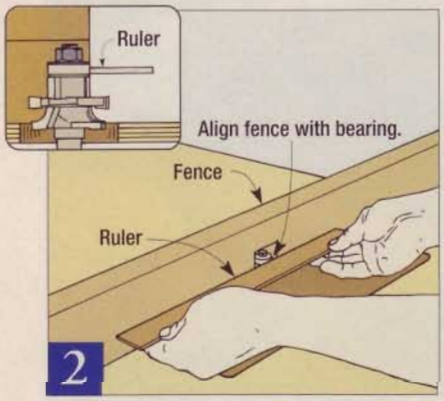
Interlocking Joinery

It wasn't long ago that all we could do was admire doors with their cope and stick joinery. The technique was traditionally the exclusive domain of professionals who had access to large shapers. Cope and stick cutters for the home shop didn't exist. But recently, with the introduction of larger 2 and 3 hp routers with 1/2" collets — as well as the popularity of router tables — manufacturers began redesigning these hefty cutters for small shop use.



Cope and Stick Router Bit Detail





Aligning the router bearing with the fence provides additional support, safety, and accuracy when routing joints.

Now, there's an enormous variety of cope and stick router bit sets to choose from. You can recognize the distinctive profiles of these bits and cutters on the inside edges of doors, and at the joints where rails and stiles meet.

How the Joint Fits Together

Each set of bits is made up of two router bits with multiple cutters (see the Cope and Stick Router Bit Detail). The cutters create mirror image profiles that include a tongue and groove joint. It's a clever system that enables the ends of the rails to fit perfectly into the edges of the stiles.

The bit that produces the profile on the inside edge of a frame is the stick, or stile, cutter. Use this bit on the edges of both the stiles and the rails. This cutter also creates a $\frac{1}{4}$" groove for the panel to fit into.

The bit used on the ends of the rails is the cope, or rail, cutter. It creates a profile that fits the edges, so that the sides of the stiles and ends of the rails interlock together in the corners. At the same time, the cope cutter forms short tenons on the ends of the rails, which fit into the grooves in the stiles.

Choose Your Router Bits

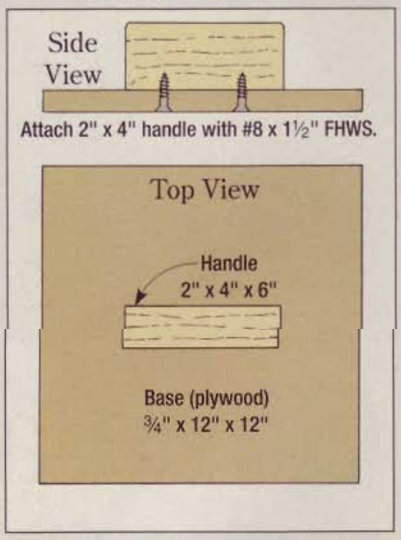
There are two types of cope and stick sets that you can choose. One choice is a matched set of router bits (see the Cope and Stick Router Bit Detail). You can also go with one bit that is reversible.

With the reversible bit, you can rearrange different parts to rout both the cope and stick elements. As you might expect, the matched pair of bits is the more expensive choice. But there's more to it than just more metal. The set produces more dependable results.

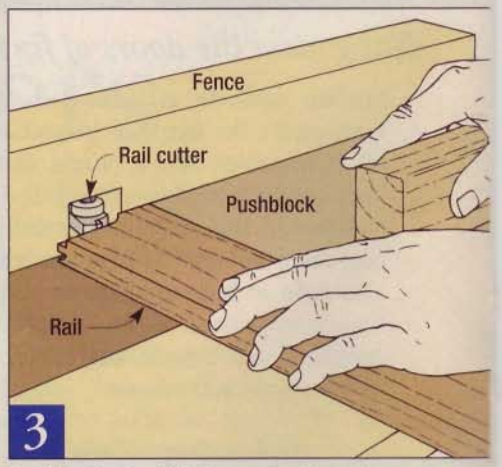
While the reversible bit usually costs less, you risk getting a less than perfect fit when you switch the cutters back and forth. You can solve the problem by inserting shim washers between the cutters, but this trial and error testing requires a healthy dose of patience and can eat up a lot of time.

After careful consideration, I chose a matched set of bits. The Amana set I used cuts a roundover and bead profile with the stick cutter, and a mirror image with the cope cutter.

Pushblock Detail



To make the pushblock, screw a 2" × 4" × 6" handle to a ¾" thick plywood base. Be sure to countersink the screws.



Carefully align the bit before routing the ends of the rails. For safety, support the rails with the pushblock during the cuts.

Start With the Cope

When I made my door frame, I made the coping cuts first. This does two things. First, it cuts the tenons on the ends of the rails. Second, it also makes a cope cut, the reverse image of the visible pattern that runs along the inner edges.

Chuck the cope (rail) bit into your table-mounted router. Be sure to check your height adjustment. Then use a ruler to align your fence with the bit's bearing (Figure 2). Clamp the fence securely, then double check to make sure that the fence didn't move during the setup.

To guide the end of the rail squarely past the cutter, I made a pushblock (see the Pushblock Detail). It's simply a 12" square of $^3/_4$" plywood. To make it easier to use, I made a handle from a 6" length of 2" × 4" and attached it with screws.

The pushblock has another advantage — it virtually eliminates tearout when the bit exits the rail (Figure 3). Any minor tearout on the inner edge of the rail will usually be removed by the stile cutter. To resolve tearout on the outer edge, I ripped the rails about $^1/_8$" wider than their finished size. Then, I planed or jointed the rail to remove the tearout.

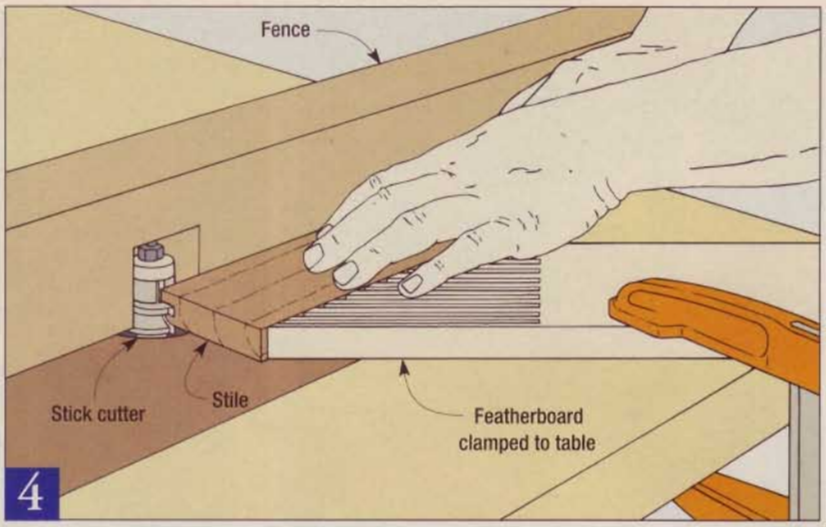
PRO TIP

A great way to save set-up time

Save sample pieces of both the rail and stile cuts, and store them near your router bits. Then, the next time you want to set up your router for these cuts, you can use the samples as gauges to quickly set the height of the bits.

All the rails and stiles are machined face down on the router table. To avoid mistakes, I usually mark the back of each piece with tape.

I always make it a point to have some test stock around that matches the dimensions of my real rails and stiles. After adjusting the router table setup, I'll run a test piece through to check the bit height for the cope cuts on the ends of the rails. I never rout my real stock until I get a perfect test cut.



Rout a profile with the stick cutter on edges of rails and stiles after first making cope cut on ends of rails. Properly adjusted, the rails and stiles will interlock with a flush surface.

Rout the end of each rail. Make each cut in three or more passes to reduce the chance of burning the wood. For the first pass, hold the rail firmly against the push block, with the end of the rail about $^1/_8$" away from the fence. Then, push the rail through the router bit. Move the rail and push block away from the router bit, and return to the starting position. Continue making passes in this manner, a little at a time, until the rail contacts the fence.

Finish with the Stick

After you cut the ends of all the rails, it's time to switch bits. (Or, if you're using a reversible bit, change the arrangement of the cutters.) Chuck the stick (stile) cutter into the router. Make sure that the bit's bearing is flush with the fence.

Then, carefully adjust the bit's height, matching the panel groove portion of the cutter with the tenon on the end of a rail you just finished. Height adjustment is critical. Make very fine adjustments, testing the setup on scrap wood. Your goal is to ensure that the front edges of the stiles align perfectly with the ends of the rails when they fit together.

For safety, clamp a featherboard to your router table (Figure 4). This will help hold the rails and stiles firmly against the fence. Next, rout the inner edges of the stiles and rails, then dry assemble (without glue), and lightly clamp.

Assembling the Door

Many kinds of panels can fit into this type of frame: raised panels, flat panels such as plywood, and glass. Whatever you use, the panel must fit into the $^1/_4$" groove formed by the stick cutter. Double-check the size of the frame's opening before cutting your panel to size.

A solid wood panel can fit fairly snugly from top to bottom, but must have some expansion room from side to side. I usually allow about $^1/_{16}$"-$^1/_8$" on every side. That way, I can be sure the panel won't interfere with the door frame assembly as the joints are clamped tight. Don't worry about gluing your panel in place — it can't go anywhere.

Brush glue into the joints, but be stingy — cleaning up glue in the inner corner of a door frame is a tough job. Insert the panel, and clamp until the glue dries. Make sure the door is flat and square.

As my familiarity with cope and stick joinery improves, I seem to notice its use more and more. It truly is a distinguishing feature that's found on better quality furniture and cabinetry. And I'm pleased that it's a technique that is now within the grasp of many home shops.

Chest of Drawers

Could anything be simpler than building a box? If you think about it, that's what cabinet making is all about. Small boxes like drawers fit into big boxes like cabinets. But just because one box is bigger doesn't mean it's more difficult to build.

This chest of drawers is a perfect example. Despite its size, all the joinery can be easily completed with a table saw, a router and a biscuit joiner. The only tough part is the carcase assembly, which is awkward to clamp. Although with the help of a friend and some long pipe clamps, even this step will go as smoothly for you as it did in my shop.

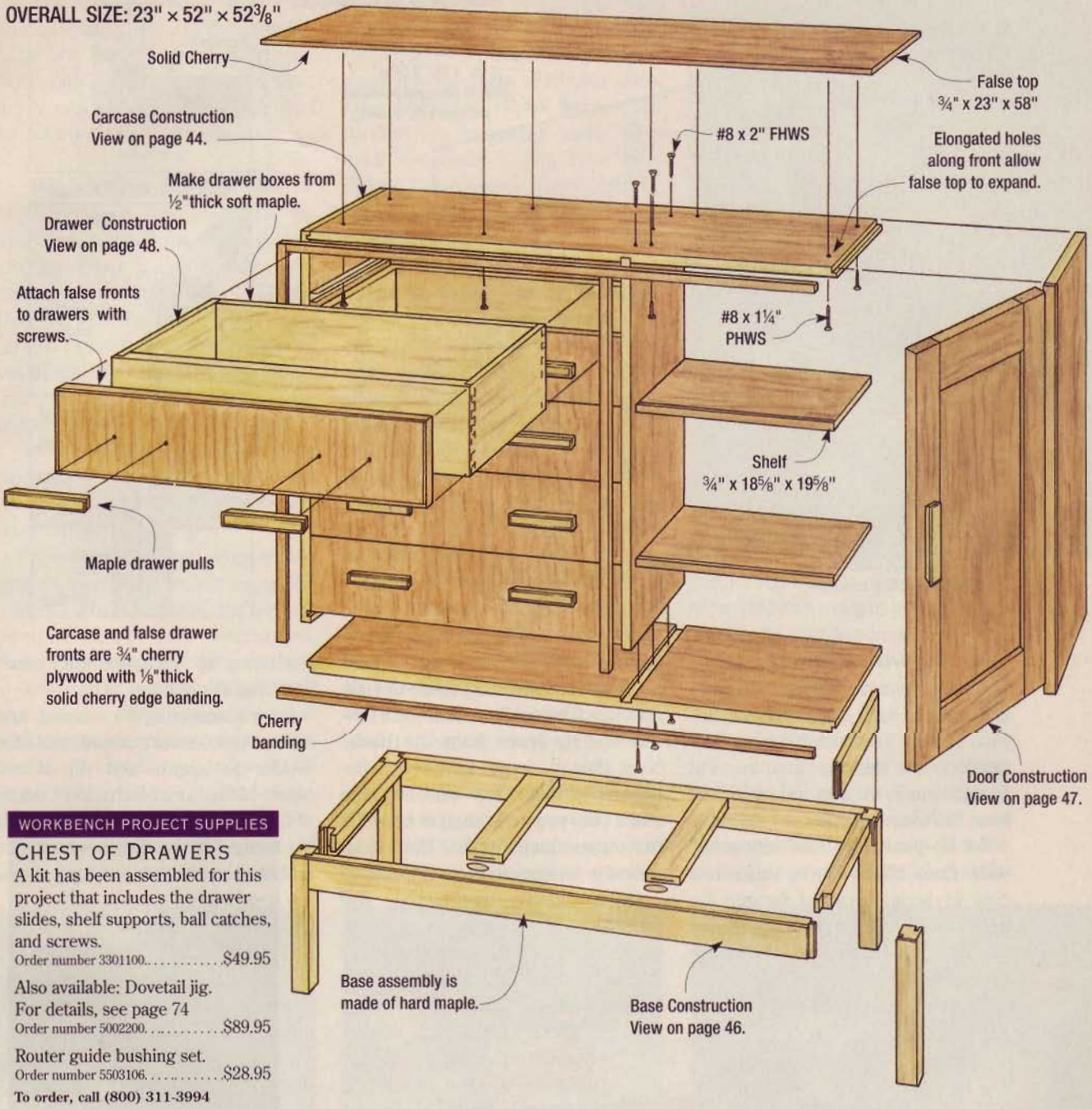
But building the chest of drawers is only half the story. This is a beautiful cabinet with storage space to spare. I ended up using mine in a bedroom for clothes. I think it could work equally well in a dining room for storing linens and table settings, or it could hold a stereo if you like.

Perfect Plywood Panels

Unlike many traditional cabinets, I chose to build the carcase for this chest of drawers using cherry plywood. It saved me from having to glue up lots of boards into panels, and it's a more economical use of material.

Chest of Drawers Construction View

OVERALL SIZE: 23" × 52" × 52 3/8"



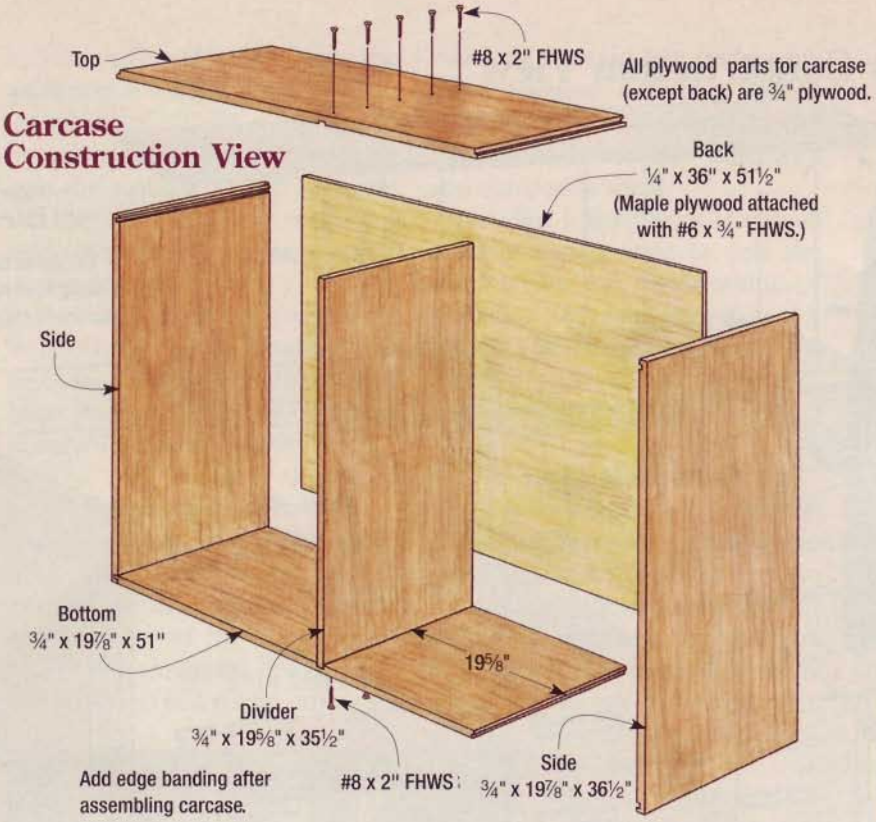
Start by ripping cherry plywood for the carcase top, bottom, and sides. Next, nudge the fence over 1/4" and rip a piece to width for the divider.

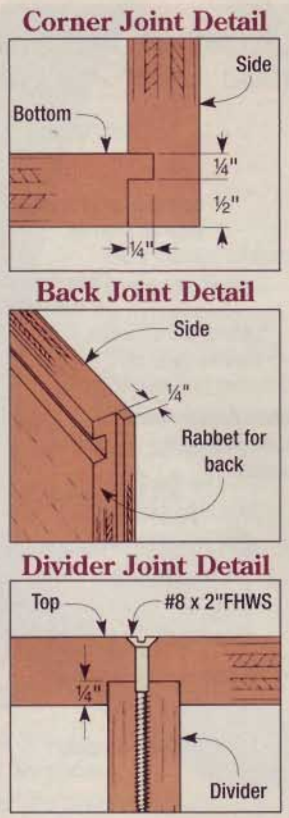
Cutting these panels to length is one key to getting your cabinet square — that will be important later when fitting the door and drawers.

For the sides, I recommend a two step cutting sequence. First, using your table saw and rip fence, cut the panels 1/4" longer than their final length. Then reset the fence and cut the other ends for the final pass.

Because the top and bottom are longer than my rip fence capacity, I had to be creative when cutting these pieces to length. Fortunately, a technique came to mind that I learned from a veteran cabinetmaker. Mark the length of the panel and cut 1/8" outside the line with your circular saw. Next, carefully clamp a straight edged board along the layout line, check it for square, then rout the panel to length with a flush trim bit. You can then use this panel as a template. Clamp it to the second piece and rout it to exactly the same length. There's hardly a better method for precisely matching two or more pieces.

For now, don't cut the case divider to length. You'll want to double-check this dimension after putting the carcase together for a dry run.





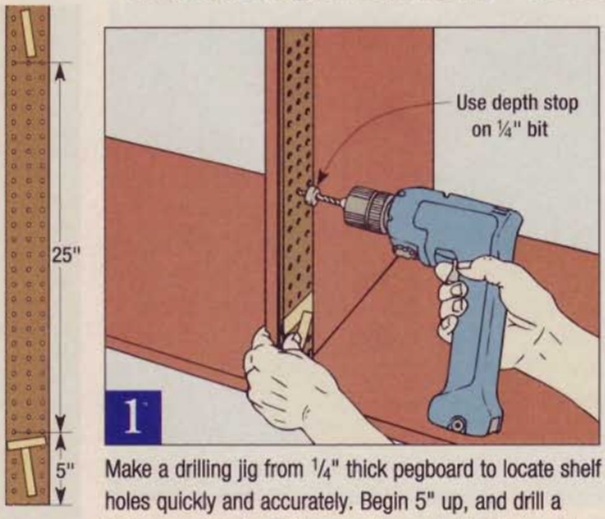
Plywood Joinery

The carcase corners feature a dado and tongue joint (see the Corner Joint Detail). To make this joint, I cut the dadoes in the sides first, then cut the rabbets in the top and bottom to form the tongues.

Set up your table saw with a 1/4" wide dado blade. Then, make test cuts in scrap plywood to get the depth and location of the dadoes exactly right. When you are satisfied, cut the dadoes.

To form the tongues in the top and bottom, use the same blade and clamp a wood auxiliary fence to your rip fence. The auxiliary fence will protect the rip fence from the blade. Now, slide the fence right next to the blade and make test cuts in scrap stock until you get a snug fit between the tongue and a dado. Then complete the tongues in the real stock.

Once you've completed the tongues, keep your saw set up exactly the same and cut a rabbet along the back edge of the sides, top, and bottom (see the Back Joint Detail). These rabbets will accommodate the back later on. Finally, you can switch to a 3/4" wide dado blade and cut a dado in the top and bottom for the divider (see the Divider Joint Detail).



Make a drilling jig from 1/4" thick pegboard to locate shelf holes quickly and accurately. Begin 5" up, and drill a hole every inch for 25" for maximum shelf adjustment.

Fitting the Divider

Experience has taught me to always run through a dry assembly of my projects before the final glue-up. Checking the fit of the pieces early makes it much easier to fix any problems. In this case, it also gave me a chance to measure the exact length of the divider.

After assembling the carcase and taking the measurement, cut the divider to length, and slip it into place. Make sure all the front edges of the carcase are flush, and that the back edge of the divider meets the rabbet shoulders in the back of the top and bottom.

While the carcase is together, make a jig for drilling the shelf peg holes, and drill the holes in the divider and one side (Figure 1). At this time it's also a good idea to drill countersunk pilot holes for screwing the top and bottom to the divider.

Now comes the awkward part, so call a friend and get some long pipe clamps ready. Take the carcase apart and spread yellow glue in the divider dadoes. With the top and bottom panels standing on their back edge, slip the divider into the dadoes and screw the assembly together.

Next, put glue in the corner joint dadoes and clamp the sides to the carcase. Double-check for square. I found that cutting the back for a snug fit and setting it into the carcase also helps square the cabinet.

Applying Banding Strips

For the sake of durability and appearance, I covered all the front edges of the plywood with 1/8" thick solid cherry banding. Ripping banding strips is simple enough, but be sure to use a pushblock and a featherboard to prevent kickback (Figure 2).

Gluing banding to the carcase can take a while, so I recommend using liquid hide glue, which has a long setting time. As you mount each strip (Figure 3), gently rub it back and forth until the glue grabs, then align it with the inside surface of the plywood panel whenever possible. Protect the banding with scrap wood pads and apply clamping pressure.

I cut the banding for the top and bottom just a hair long. This caused the banding to bow about 1/4" when the pieces were installed. But once the clamps were tightened, these pieces sprung against the side panel banding, resulting in very tight joints.

Use a hand plane, cabinet scraper, and sandpaper to even the banding with the plywood surfaces. The banding should be flush with both sides of the plywood panels.

Glue Up the False Top

Even though I used plywood for the carcase, I felt that a solid cherry top would look better. I selected four handsome boards, and glued them edge to edge in pairs. Biscuits were helpful for aligning the boards during the glueups. After the glue dried, I lightly planed each pair by running them through my thickness planer. Then, I glued the two pairs together.

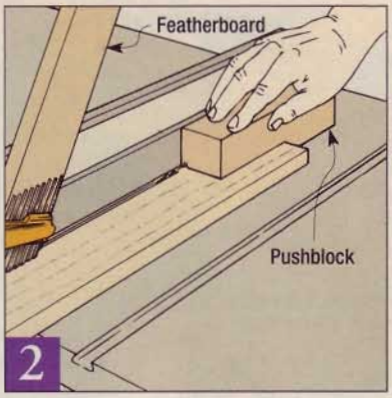
After the false top is cut to size, you can prepare your tablesaw for cutting the large chamfers on the false top's ends and front edge (see the False Top Detail). To balance such a large panel on edge, I did two things. First, I made a 12" tall auxiliary fence to cover the saw's rip fence. And second, I screwed a 2" × 6" to the underside of the panel before each cut (Figure 4).

Now tilt the blade 8°, set the fence 1/2" from the blade, and raise the blade so it just barely sticks out of the top as it cuts. If you're working in a basement shop with a low ceiling, you may have to jockey your table saw so the panel fits between two floor joists.

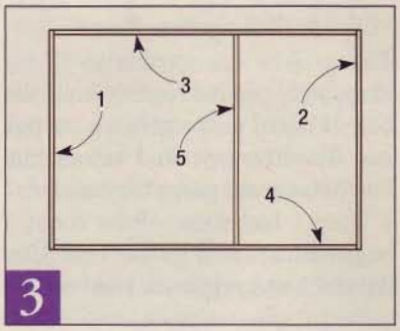
Take your time cutting the large chamfers, then use a hand held router and a chamfering bit to form the smaller chamfers along the top.

As you know, solid wood moves with changes in moisture content, and fastening the false top to the carcase must allow for this movement. I prefer to secure the false top to the carcase with screws. Screws along the back of the assembly keep the false top stationary, while screws slipped through slots along the front of the carcase give way when the false top moves (see the Screw Detail).

To form the slots, first drill a series of small holes in a line, then blend the holes together with a small round file. After completing the slots, position the false top on the carcase, and drill pilot holes — be sure to use a depth stop on your drill bit to avoid drilling too deeply.



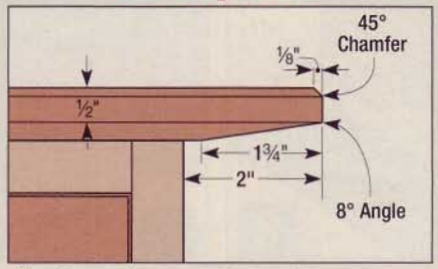
To rip thin banding strips evenly and safely, use a push block and featherboard. You can make both accessories in minutes.



Use this sequence to glue banding to the front edges of the carcase. Keep waste to outside, then plane and sand the edges.

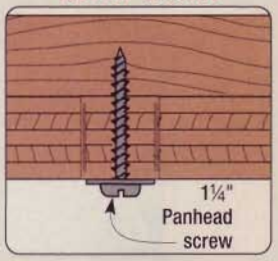
Screwing a 2" × 6" to the underside of the top makes cutting the chamfer easy. The high fence also aids stability.

False Top Detail

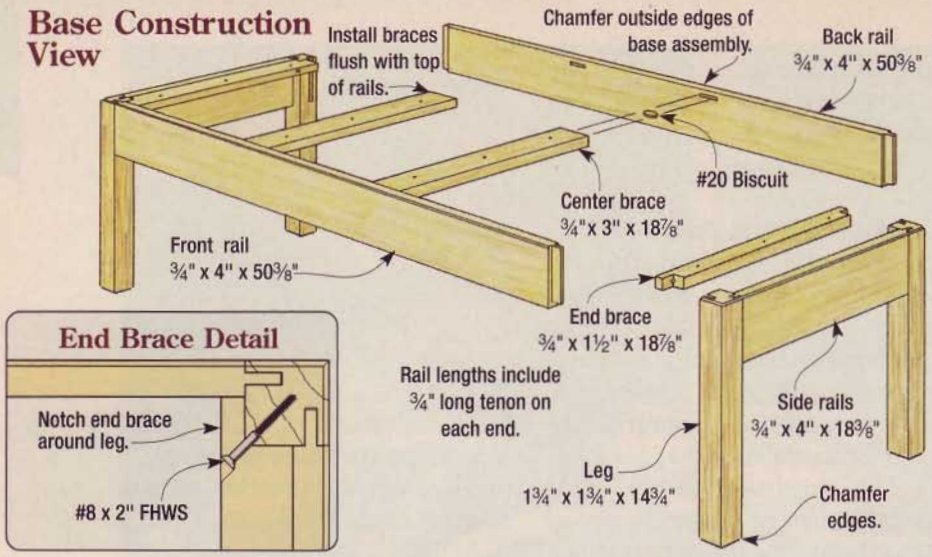


Chamfers on the top and bottom help define the false top. Use the tablesaw to make the large chamfer, and a router to make the small one.

Screw Detail



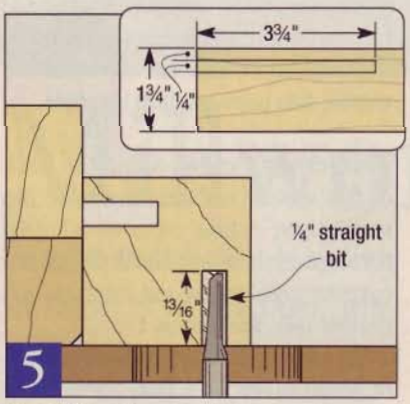
Screws in slots in the carcase top allow the false top to expand and contract.



Building the Base

This project was starting to fill my shop, and I needed room to build the base. I heard my neighbor's car pull into his driveway. So I talked him into helping me move the carcase.

Once I had some elbow room, I began sizing stock for the legs. After the stock was prepared, I laid out the mortises (Figure 5). For clarity, mark the mortise locations on the end of each leg. This will help you align the stock with the bit. I also clamped a stop block to the router table fence so that every mortise ended up the same length (Figure 6).



Rout ¼" mortises into the legs for the rail tenons. Be sure to mark the mortise positions carefully to avoid error.

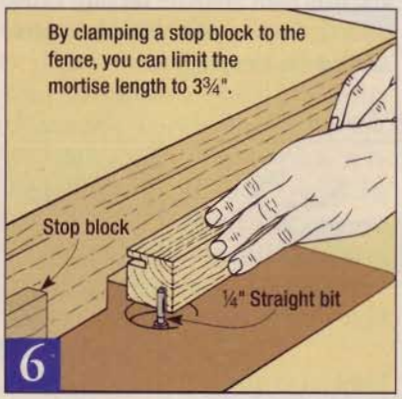
Now, rout the mortises with a series of shallow passes, using a ¼" straight or spiral bit. A final depth of 13/16" will easily accommodate the rail tenons, which are ¾" long. Before moving on, rout chamfers on the bottoms of each leg.

Next, rip and crosscut all the rails, then form the tenons using a ¾" wide dado blade (Figure 7). Clamp a setup block to the fence to make the repeat cuts. As always, form a tenon in scrap stock first, and make sure it fits properly in a mortise. After cutting the tenon cheeks, adjust the blade and cut each tenon's bottom shoulder (Figure 7).

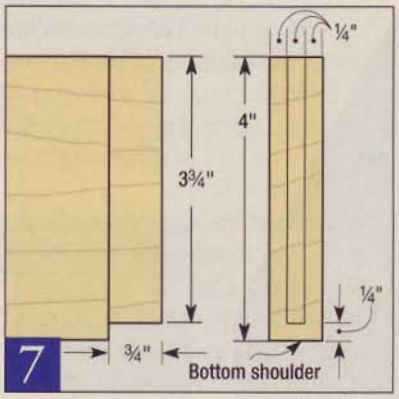
Like you did with the carcase, I suggest putting the base together without glue, then measuring for the end and center braces. Cut the braces to fit, and cut notches in each end brace so they can wrap around the legs (see the Base Construction View). Slip all the braces into the base and mark locations for the biscuit joints. Cut the biscuit slots after disassembling the base.

Gluing the base together is best accomplished in a series of small steps. Start by gluing the end rails to the legs, then add the end braces. Drill a pilot hole, then drive a #8 × 2" flathead wood screw diagonally through the brace into the leg (see the End Brace Detail). Clamp each assembly, and let the glue dry.

After unclamping the end assemblies, use biscuits and glue to join the center braces with the front and back rails. Lightly clamp this assembly while gluing the front and back rails into the leg mortises. Now, clamp the entire base, making sure it's flat and square. Leave it undisturbed while the glue dries.



Use a straight or up-cutting spiral bit to rout the leg mortises. Avoid stressing the bit by routing a series of ¼" deep passes.



The thicknesses of the tenons on the rails should be ¼", but to assure a tight fit, make cuts on scrap wood first.

Adding the Carcase

Having the base completed is an exciting step, because now the carcase and the base can be brought together. Before setting the carcase in place, however, give your 45° chamfering bit another workout by routing the outside edges of the base assembly.

It's important for the base to sit level on the floor when you attach the carcase. This will ensure that the completed cabinet will be level when it reaches its new home. Set the base on your shop's floor and, if necessary, slide shims under its feet. Use your longest level to check the base., then position the carcase on the base. By now, your friend may be wondering if this will ever end.

Slide under the cabinet, and drill pilot holes through the four braces in the base and into the carcase. Be sure to wrap tape around the bit to mark the hole depth, or you may drill through the bottom panel of the carcase. Countersink the holes, and screw the assemblies together.

One Minor Detail

With the carcase and base now joined together, it's a good time to step back from the heavy duty building chores and wrap up a small detail. I made shelves using cherry plywood and banding strips. Cut the plywood pieces for the shelves a little longer than needed and glue banding strips to their front edge. After the glue dries, plane and sand the banding flush with the plywood surfaces, and cut the shelves to their final length.

Just in case you think I never make mistakes, let me tell you that I blew it on one of my shelves. I forgot to double check my miter gauge to make sure it was cutting square to the blade. Consequently, the first shelf I cut to length was out of square. Trimming the shelf square made it too short. Well, live and learn.

Building the Door

It used to be that making frame and panel doors with cope and stick joinery was done only by professionals. It required a shaper and some very large cutters. With the new router bit sets designed for use on router tables, all that has changed.

To make my cabinet door, I used a two-piece router bit set that included one bit for cutting the ends of the rails, and another bit for routing the inside edges of the stiles and rails (Amana no. 55420). For details on this process, take a look at *Cope and Stick Joints* on page 39.

After cutting the door frame joints, I assembled the pieces without glue to check the fit. If you take time to set up the bits properly, you won't have any surprises at this point.

As for the door panel, I looked for $\frac{1}{2}$" cherry plywood with two good sides. Failing to find any, I decided to make my own by laminating two $\frac{1}{4}$" thick pieces of cherry plywood, with the best side of each piece facing out.

Cutting the plywood a little oversize will give you a margin of error, and it's easy enough to trim the lamination to size after the glue dries.

Once the panel is sized, you'll have to rabbet the edges so that it can fit into the door frame's $\frac{1}{4}$" grooves (Figure 8). Cut the rabbets wide enough to allow a $\frac{1}{16}$" gap between the door frame and the rabbet shoulders.

Another dry fitting of all the door parts will show whether you managed to get this gap just right. If all is well, glue and clamp the door parts together. I recommend using just a spot of glue in the rail grooves at the center of the panel. This will keep the panel centered in the frame.

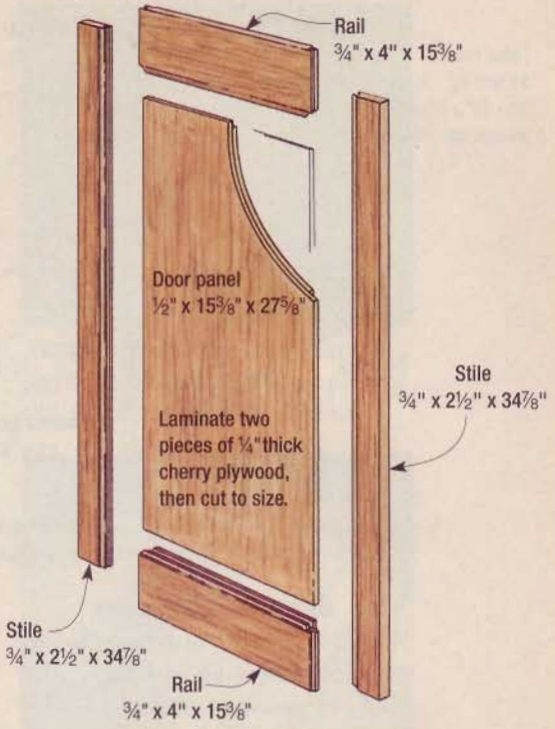
Mounting the Door

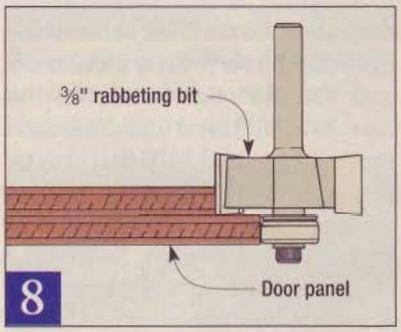
Making the door pulls is simple enough (see *Making The Pulls* on page 49). As for the European style hinges, their installation requires a precise layout and accurate hole boring (Figure 9). But nothing that's all that difficult. You'll need a 35 mm. hinge boring bit and a drill press for the installation. Be sure to center the hole $\frac{7}{8}$" from the edge of the door. In a pinch, a $1\frac{3}{8}$" Forstner bit will do the job, but the hole will be slightly wide.

I've used Blum hinges for many similar applications with great results. This time I chose a clip-style hinge that opens a full 125°. The clip style hinge allows you to mount the hinge cup to the door, and the mounting plate to the carcase, then snap them together. It's an improvement over older European style hinges, which often required a bit of juggling to complete the installation.

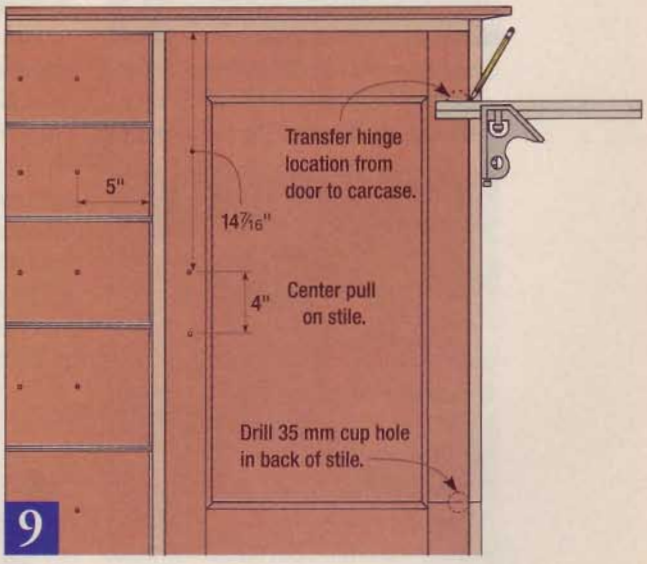
I'm kind of fussy, and I like an even gap around the door on all sides. One trick I use to help set this gap is to put quarters under the door after it has been slipped into the cabinet. Now the hinge locations in the door can be transferred to the carcase for an exact fit. A combination square is the ideal tool for marking the centerline of each hinge mounting plate location.

Door Construction View



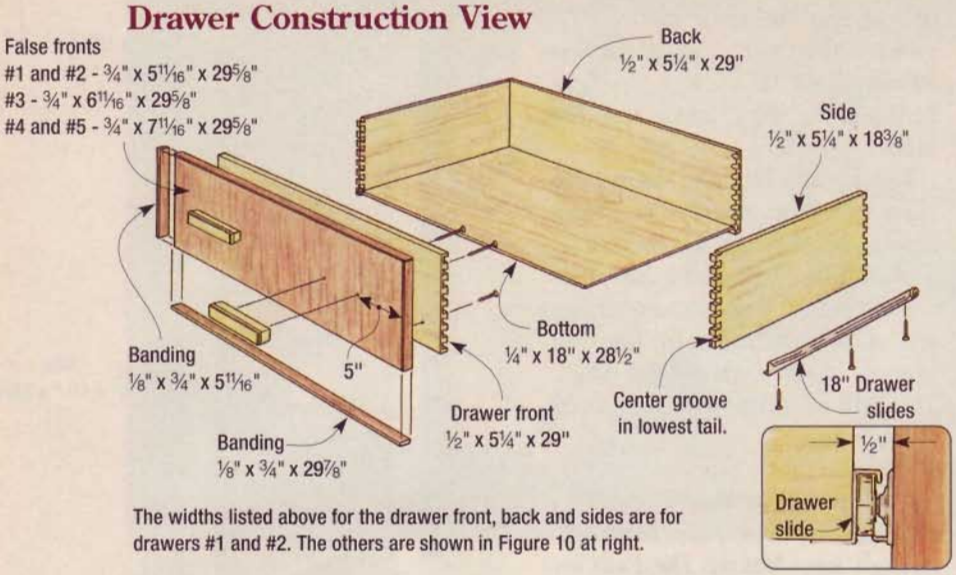


Rabbet the back edges of the door panel with a ⅜" rabbeting bit. The panel should fit the grooves in the door rails and stiles snugly.

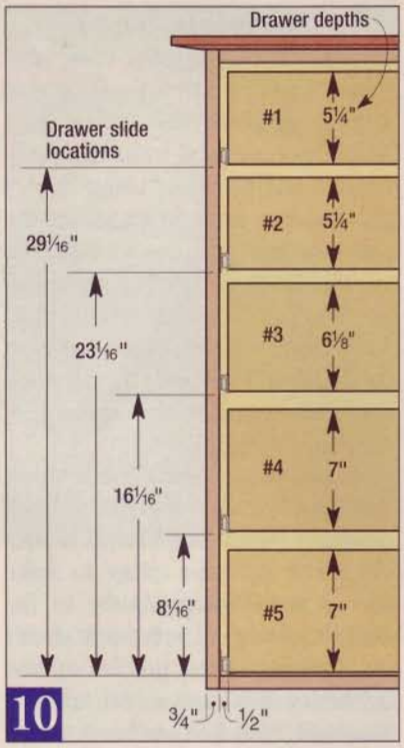


European hinges require precise layouts. Mark the center of the cup hole on the back of the door, and line this up with the center of the hinge plate in the cabinet.

Drawer Construction View



The widths listed above for the drawer front, back and sides are for drawers #1 and #2. The others are shown in Figure 10 at right.



Dimensions shown are to bottom of drawer slides. Carefuly install the slides at the same height on each side of the carcase.

Stack of Drawers

Whenever I make drawers, the first question that comes to mind is: what kind of joinery should I use? Traditional cabinets usually feature dovetailed drawers, but hand cutting dovetails is very time consuming, and seemed unnecessary in this case. Instead, I used my router and a dovetail jig to rout half-blind dovetail joints. Many inexpensive jigs will work for this purpose. I made a jig from a Woodsmith kit, and used a 7/16" guide bushing in my router.

I made the drawer boxes out of 1/2" thick soft maple — an inexpensive wood suitable for cabinet parts that aren't seen much. The top two drawers are identical in size, the middle drawer is 7/8" deeper, and the two matching bottom drawers are deeper still (Figure 10).

Rip all the drawer pieces to width, then measure the width of the drawer opening in your carcase. Cut the drawer fronts and backs exactly 1" shorter than the opening to allow room for the drawer slides.

Every type of dovetail jig has its individual quirks, so it's a good idea to practice cutting dovetails on some scrap wood before you get going on the drawer pieces. I know I've gone through my share of wood setting up these sorts of jigs.

The drawer bottoms fit into grooves that run around the inside of each drawer. To make the grooves, set up a 1/4" dado blade on your table saw, and raise the blade 5/16". Adjust your fence so that the groove is centered in the lowest tail on the sides. That way, the groove won't show on the outside of the completed drawer.

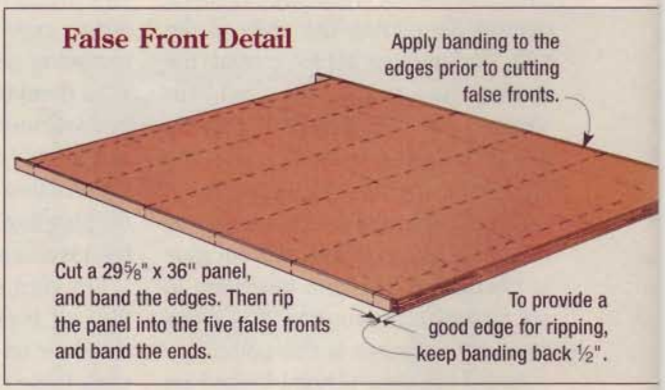
I ran through a dry assembly of the drawers to check the fit of all the joints. This also gave me the opportunity to measure and verify the size I needed for the 1/4" maple plywood drawer bottoms.

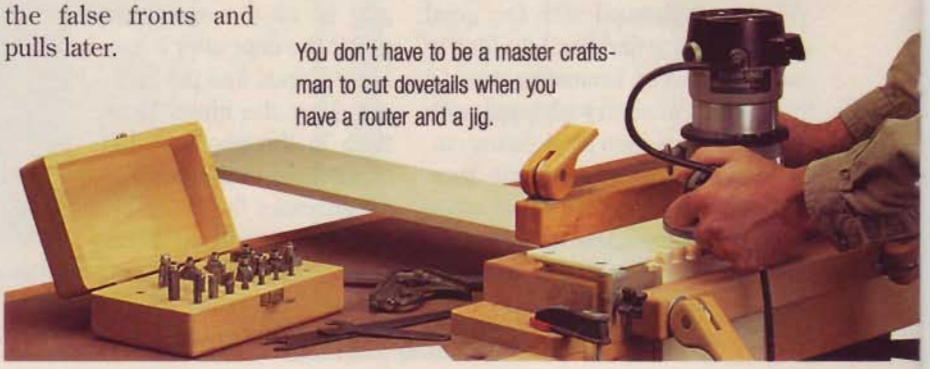
I took the drawers apart, then carefully drilled the holes in each front for mounting the false fronts later. With my drill press, I was able to set up for repetitive hole drilling with a minimum amount of measuring.

To assemble the drawers, begin by gluing the front and back to one side. Then, slip the bottom into the grooves. Add the other side, and clamp. Make sure that every drawer is flat and square. Add the false fronts and pulls later.

I mounted the drawers in the carcase using Blum 18" slides, marking all the mounting locations as shown in Figure 10. Then, I attached the slides to the carcase and drawers, starting at the bottom of the case.

False Front Detail





You don't have to be a master craftsman to cut dovetails when you have a router and a jig.

Making The Pulls

I decided to make the pulls before tackling the drawers.

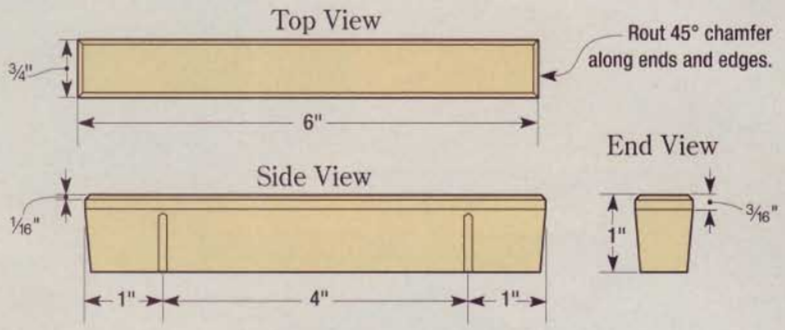
Begin by ripping $^3/_4$" thick stock into three blanks measuring 6" × 14". Each will yield four handles. Rip bevels on the edges of each blank (Figure 1). Be sure to leave a $^3/_{16}$" flat along each edge. Then, square the blade, reset the fence, and rip the handles from the blank (Figure 2).

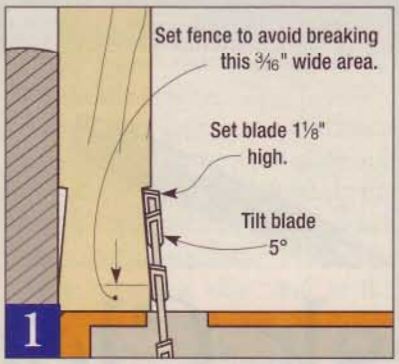
Crosscut the handles to 6" in length, then bevel each end to the bottom of the flat (Figure 3). Chuck a 45° chamfer bit into your table-mounted router, and machine a $^1/_{16}$" chamfer along the top ends and edges of each handle (Figure 4).

I completed the handles by sanding them lightly to preserve the crispness of the angled cuts

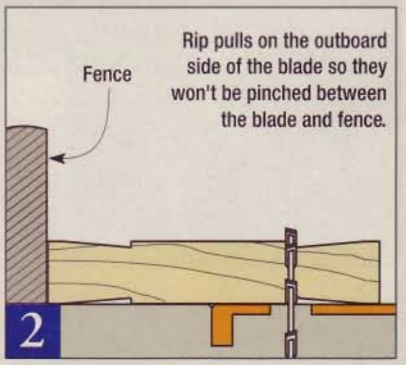
Each pull needs $^7/_{64}$" pilot holes, $^3/_4$" deep, one inch from each end. Attach them from the inside of the drawer with #8 × 2" FHWS.

Drawer Pull Elevations

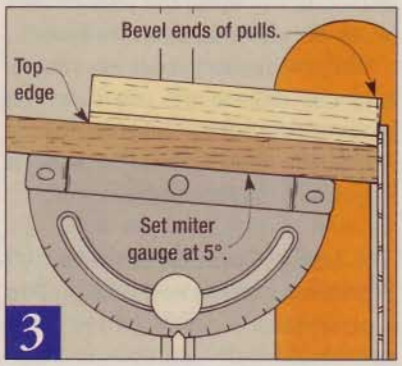




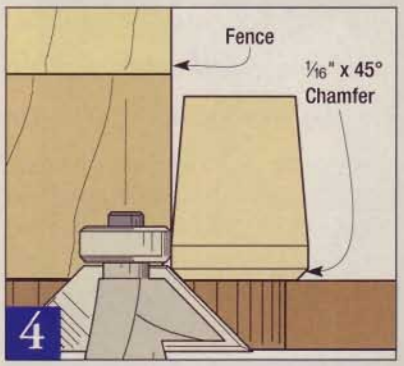
Test this setup on scrap stock until you get the fence adjusted just right to produce the bevel on each pull.



Rip the pulls on the outboard side of the blade, away from the fence. This will avoid any chance of kickback.



Crosscut pulls to length, then set the miter gauge at 5° and trim the pulls with the top edge against the miter gauge.



Rout a chamfer around the top edges of the pulls, only 1/16" deep to knock off the sharp edges. Sand lightly to retain crisp edges.

Making Drawer Fronts

Because I wanted the grain pattern on the drawer fronts to look continuous, I selected an attractive area on a plywood sheet, and centered the pattern (see False Front Detail).

As a time saving technique, I glued $^1/_8$" banding to the edges of the panel. When I glued on the banding, I stopped each strip about $^1/_2$" from the end. After the glue dried, I scraped and sanded the banding flush with the plywood.

I ripped the false fronts to width by following the dimensions in the Drawer Construction View. After they were sized, it was a simple matter of adding banding to the top and bottom edges to complete the false fronts.

Ideally, the space between each drawer should be $^1/_{16}$". But woodworking projects are seldom perfect. I double-checked and had to make a few adjustments. I started with the bottom drawer, marking the position of the drawer on the back of the false front. I then removed the drawer, clamped on the false front, and drove the screws. I followed this process for each drawer, from the bottom to the top.

At the Finish Line

With the construction completed, there were two remaining steps. The first was the finish. After removing the hardware, I lightly sanded the entire cabinet with 220-grit sandpaper, and applied three coats of varnish.

I called my neighbor to help with the second step; a final visit to move the chest of drawers into a bedroom. When it was in place, I could see he was relieved, and also impressed.

He began poring over the cabinet, inspecting every joint, skimming his hand over the finish, and noting the use of plywood and solid wood in the construction. Before long I was answering all sorts of questions, and I could tell, now that he was seeing the completed project, he wanted to build one for himself. Once he saw the dovetailed drawers, I knew he was hooked.

The Desk Clock

The inspiration for this clock sprang from a unique source. The beautiful curly maple used for the front and back was given to me by a friend after he built a stunning reproduction of an antique grandfather clock. I visited his shop as he was completing work on the clock and preparing to give it to his wife on her birthday. He was proud of his work, and rightfully so, for he is a fine craftsman. Not that every joint was perfect, or that there weren't things he would change if he made the clock again. In fact, in my eyes, the minor flaws made his effort seem more human.

Well, I've made a short story into a long one only to tell you how this piece of wood came into my hands. And now you also know why using it in a clock is so meaningful to me.

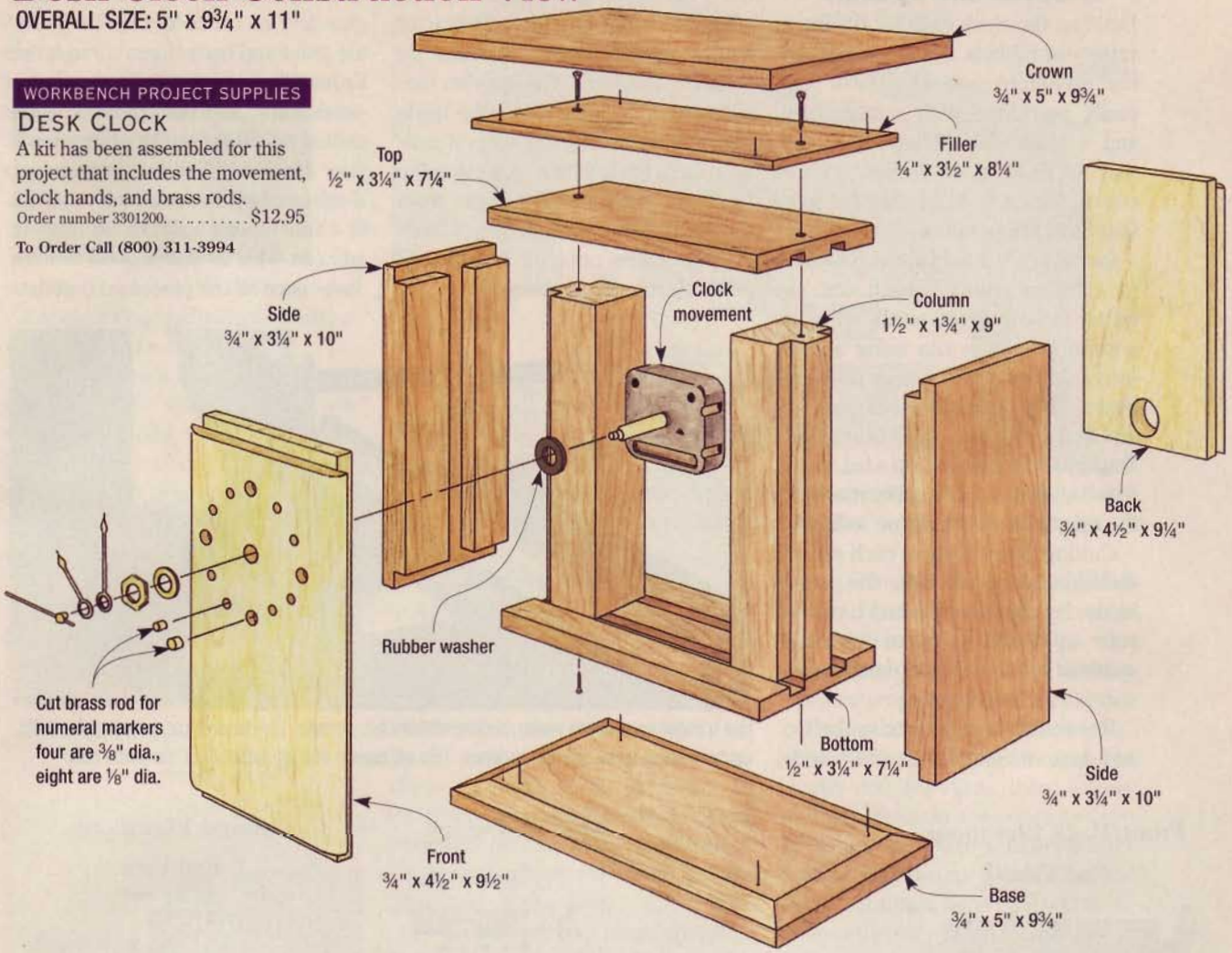
Early Considerations

Whenever I start a new project, I do a performance check on my table saw. I make sure that the saw blade is parallel with the fence, that the blade is square to the table, and the miter gauge is square to the blade. Once you're confident in your saw's accuracy, you can start cutting the clock's parts to size.

Begin by cutting $^3/_4$" thick cherry stock for the crown, base, and sides. For the top and bottom, cut $^1/_2$" thick cherry, and you'll need $^1/_4$" thick stock for the filler. If you don't have $^1/_2$" and $^1/_4$" cherry on hand, you can resaw $^3/_4$" thick material — a process I'll explain shortly. The last cherry pieces you'll need are the $1^1/_2$" thick columns, which I made by gluing $^3/_4$" thick cherry together face to face. I used the curly maple for the front and back.

Desk Clock Construction View

OVERALL SIZE: 5" x 9¾" x 11"



Resawing the Filler

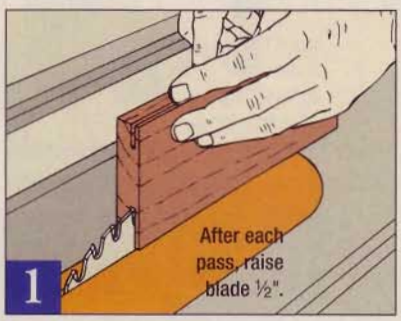
Resawing is the process of ripping thick stock into thinner material. You can resaw with a band saw, but with stock this small and narrow, I've found that a table saw does the job quickly and easily. The key is to make multiple shallow passes in each edge of the stock until the kerfs meet in the middle.

Lock the fence on your table saw for a cut slightly thicker than you need. Raise the blade about 1/2" high, and slice both edges (Figure 1). Keep the same face of the board against the fence for each cut — this ensures that the cuts are aligned.

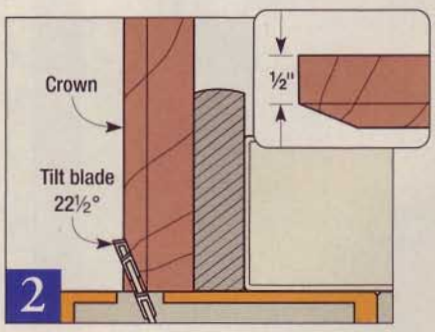
Raise the blade a little for each pass, until 1/4" or so remains between the kerfs. Now separate the pieces using a handsaw, and cleanup the surfaces with a hand plane.

Cutting Chamfers

Before getting into the real meat of this project — cutting all the grooves and rabbets — I decided to chamfer the crown and base while a standard blade was still in the table saw. You've already cut these pieces to size, so now tilt the saw blade 22 1/2° and set the fence 1/2" from the blade (Figure 2). Cut chamfers on the ends of the stock first, then cut the edges. The reason I follow this sequence is because the blade often tears out the wood on the end cuts. Cutting the edges then removes any tear out.



When resawing, cut into both edges of the stock until the kerfs are ¼" apart. For safety, use a pushstick as the blade gets higher.



Use your tablesaw to cut chamfers on the crown and base. For safety, keep the blade projection to a minimum.

Grooves and Rabbets

Building the clock calls for cutting a variety of rabbets and grooves (see the elevations below). These are easily machined with a table saw and a stack dado blade set. This type of dado blade leaves square edges, which is important for getting tight fitting joints.

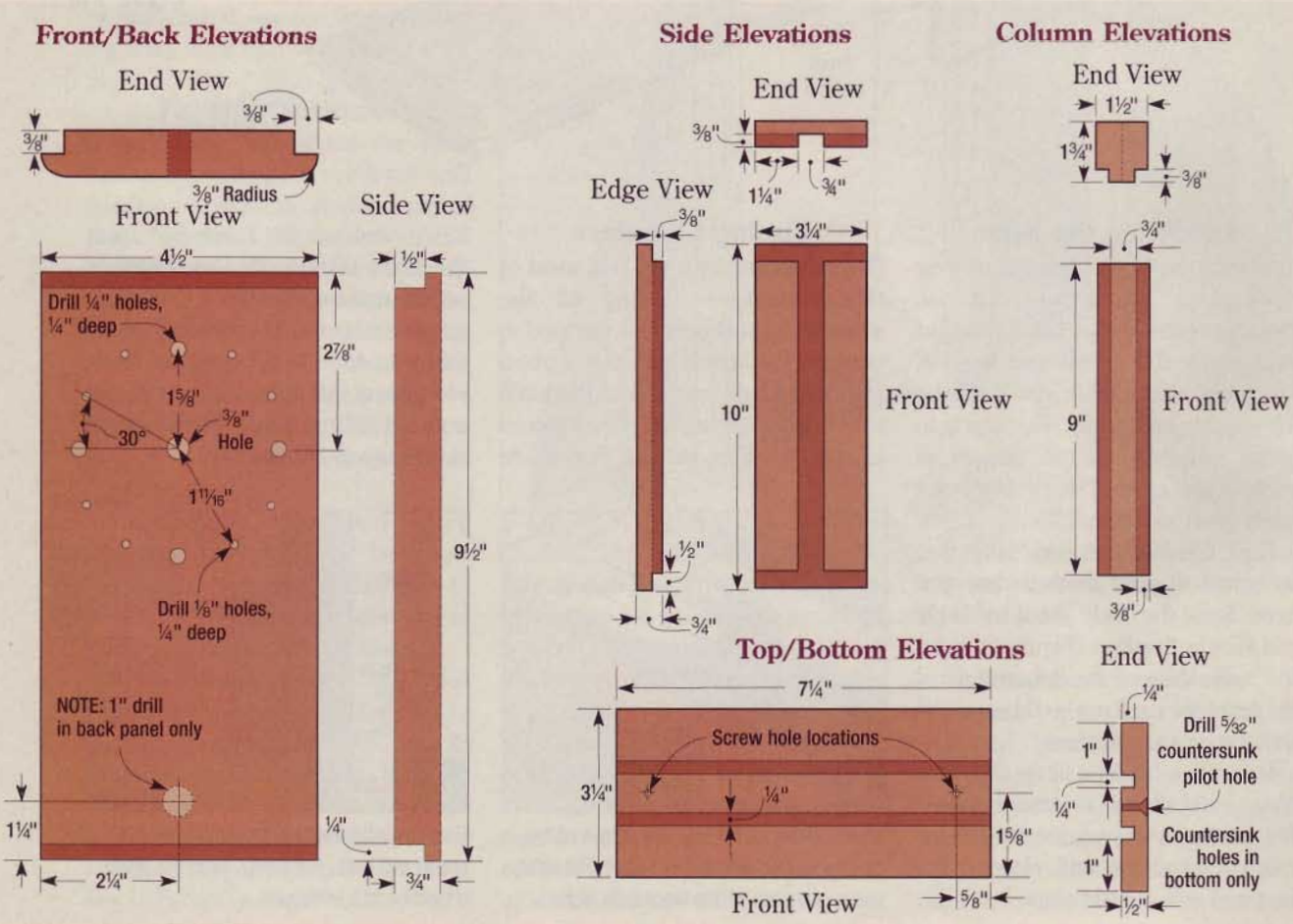
Install a 3/4" dado blade in your saw for cutting a groove in each side. To center these grooves, set the fence as accurately as you can using a tape measure, and make a pass over the blade. Then turn the stock end for end and run it over the blade again. Your grooves may end up a tad wider than 3/4", but you can easily machine the tongue on each column to fit.

Cutting the rabbets at each end of the sides is done with the same blade. By clamping a setup block to your rip fence, you can limit the width of cut to 1/2" and ensure consistent results (Figure 3).

For cutting the grooves in the top and bottom, switch to a 1/4" wide dado blade. Rip these grooves, then clamp a wooden face to the fence for cutting rabbets on the columns (to form the tongues). The wooden face will protect the fence from the blade during these cuts. Make several passes to form the tongues by moving the fence in small amounts away from the blade between passes. Check your progress until the tongues fit perfectly into the grooves.

Now, assemble the clock without glue and measure the openings for the front and back. Even though the Front/Back Elevations give measurements for the rabbets, you should adjust the width of the cuts if your clock is different from mine. Keep in mind that the back needs to fit a little loosely so it can be taken in and out. This is also a good time to make sure all the pieces go together

Use a stack dado set to make rabbets with square corners. For dependable, consistent results, clamp a setup block to your rip fence. This wil assure that all rabbets are the same size.



as they should, and to make corrections if they're needed.

Cut the rabbets around the front and back pieces to fit your clock. Check the fit of the pieces in the assembly and re-cut if necessary. On the back, I sanded the surfaces of the tongues until they slid in and out of the grooves easily.

The Clock Face

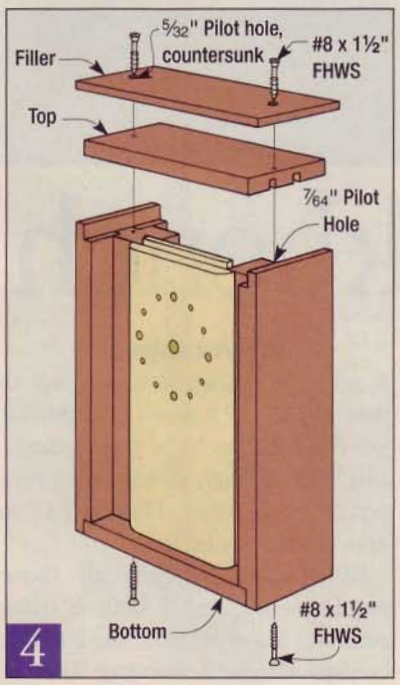
Drilling holes for the clock face is mostly a layout challenge (see the Front/Back Elevations). Take your time and use an awl to mark the hole locations so your bits won't wander when you drill the holes.

The brass rods I used for the clock numeral locators will age to a handsome patina, just as the cherry and curly maple will become more beautiful with age. Cut short pieces from the rods with a hacksaw and epoxy them into the holes. Then file the brass level with the wood. I found out the hard way that belt sanding the brass produces burn marks.

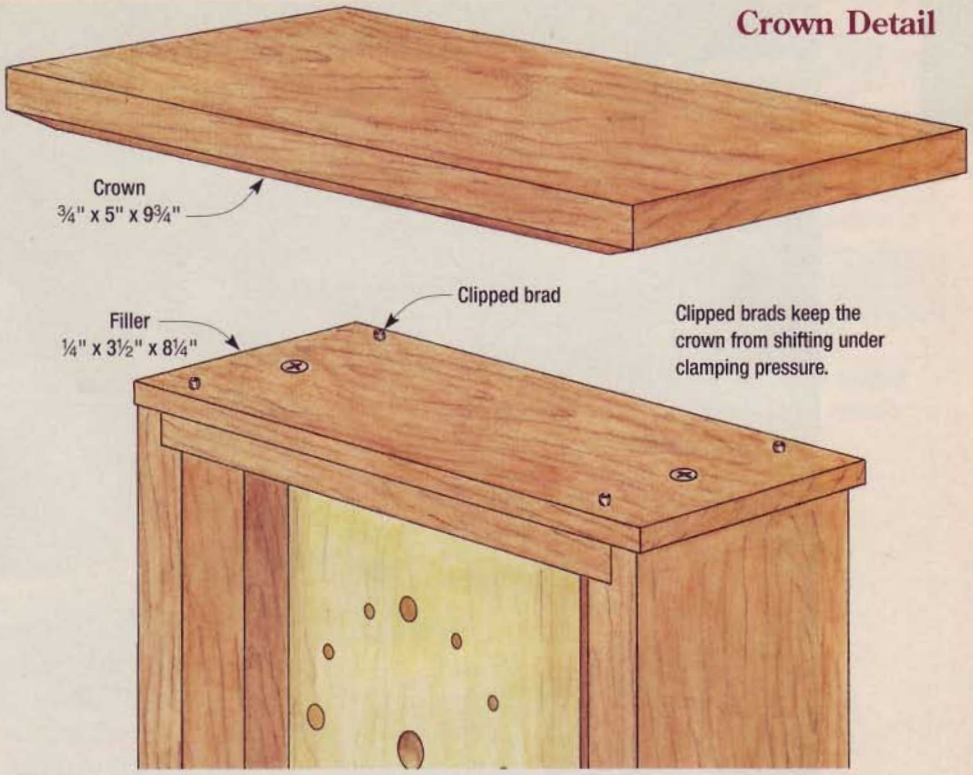
Final Details

Like other figured woods, curly maple is brittle and tends to chip when it's routed. So I suggest that you make a series of shallow passes when rounding over the edges of the front and back (see the Front/Back Elevations). Use a 3/8" roundover bit in your router table for this step.

Drilling the 1" finger hole in the back is best done with a drill press. Be sure to back up the maple with scrap wood to prevent tearout.



Secure the bottom, top and filler to the columns with glue and screws. The screwheads will be hidden by the crown and base.



Assembly

Sand all the clock pieces prior to the final assembly. And don't hesitate to sand curly maple with every grit up to 220. This is how you'll bring out the maple's unique glow.

Begin assembling the clock by gluing the sides to the columns, bottom, top and front. Make sure the assembly is square before tightening the clamps.

Now hold the filler in position and drill two countersunk pilot holes through the top and into the columns. Secure the filler with glue and screws (Figure 4). Follow the same procedure for securing the bottom to the columns.

Gluing the crown and base to the assembly could be a little tricky without one preliminary step. I tapped brads partially into the bottom and filler, then used wire cutters to cut them so less than 1/16" stuck out of the wood (see the Crown Detail). Next, I positioned the crown and base on the clock assembly and pressed them against the brads to indent the wood. After spreading glue on the bottom and filler, I replaced the crown and base on the clock in the same position I had them before. The clipped brads mated with the indents in the crown and base to prevent the pieces from slipping under clamping pressure.

Wrapping Up

A hand-rubbed oil finish brought out the beauty of the wood in my clock. To get a satin luster, apply the coats of finish with wet-and-dry sandpaper, beginning with 320 grit and ending with 600. Don't forget to finish the inside of the clock, too.

The instructions that come with the clock movement make it easy to install. But before you add the movement, buff the last bits of sawdust off your clock. As I completed this final step, I again thought of my friend's clock, and how a piece of wood can unite two projects — and the people who built them.

A Portable Workbench

Tell me if this happens to you. You're working on a project somewhere in the house, and you have to trim a board to length.

You can't figure out how to hold the board firmly, so you lug it back to the shop, clamp it to your workbench, make the cut, and trudge on back to the job site. Then the fit isn't exactly right, so you have to make the whole round trip again. If this happened just once in a while it would be annoying enough, but it happens to me all the time. Sometimes it seems like I spend more time walking than working.

I got to thinking how ridiculously inefficient this marathon is, and how simple it would be to solve. The missing piece is a workbench that can be moved easily to the job site. With a sturdy bench nearby, I could handle routine woodworking operations quickly, accurately, and without unnecessarily wearing out my shoes — or my temper.

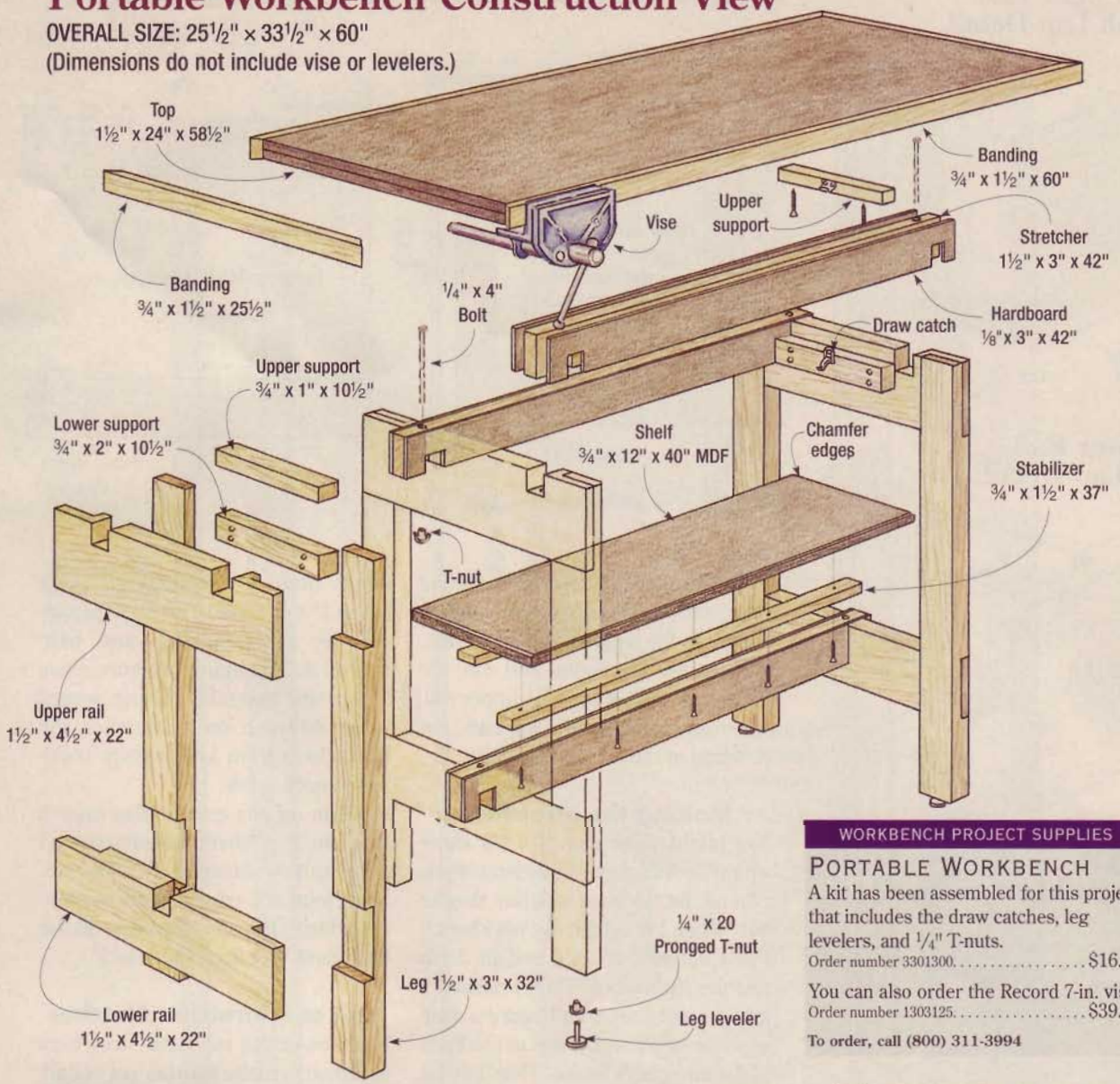
Advantages

A portable workbench still has to pass muster, or it won't help get the job done. It has to be rigid, sturdy, and large enough to support a variety of workpieces. Plus, it has to knockdown easily.

My design satisfies all those requirements. And I built it using common materials from the building center: standard framing lumber, hardboard, one sheet of medium-density fiberboard (MDF), a vise, and some hardware.

Portable Workbench Construction View

OVERALL SIZE: 25½" × 33½" × 60"
(Dimensions do not include vise or levelers.)



Half-lap joinery in the leg assemblies provides great strength and rigidity, and the use of hex head bolts and T-nuts allow quick assembly and disassembly of the bench.

Besides the broad work surface, the feature I use most is the vise. It's not as heavy-duty as the one in my shop, but for on-site work it's more than sufficient.

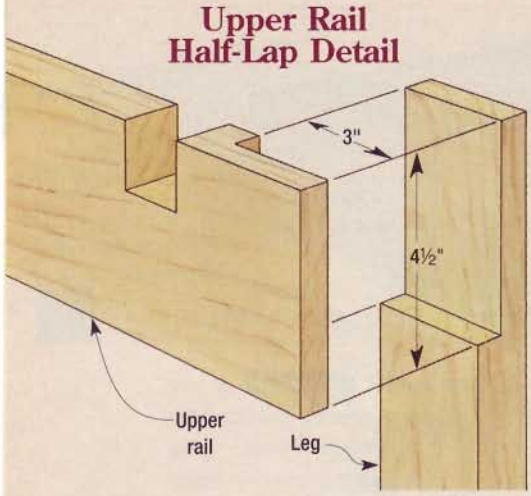
Building the Leg Frames

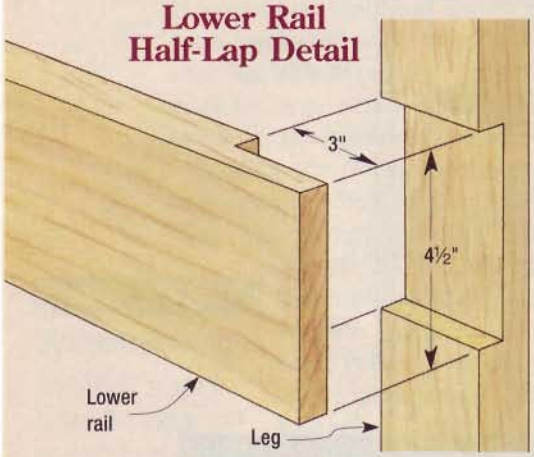
To get your portable workbench underway, I recommend starting construction on the leg assemblies. To keep the cost and weight down, I built mine using common softwood framing lumber. Select 2" × 4" stock for the legs and stretchers, and 2" × 6" stock for the rails. For now, cut the pieces an inch or so longer than their final size.

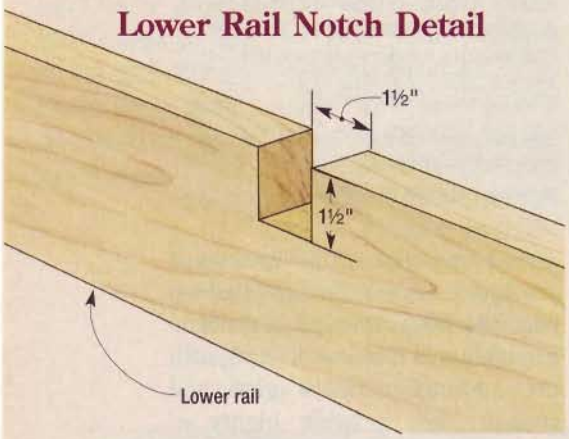
All of us who work with construction grade lumber know it can be rough, and the width often varies. But a workbench is more refined than the framing for a wall, so I wanted crisp, uniformly sized wood. Therefore, to square up the stock, I ran one edge of each piece over my jointer, then trimmed the opposite edge on the table saw. I suggest doing this to your leg and rail stock now. But leave the stretchers until later, after completing a few other preliminary steps. Once you've squared these pieces, cut them to length.

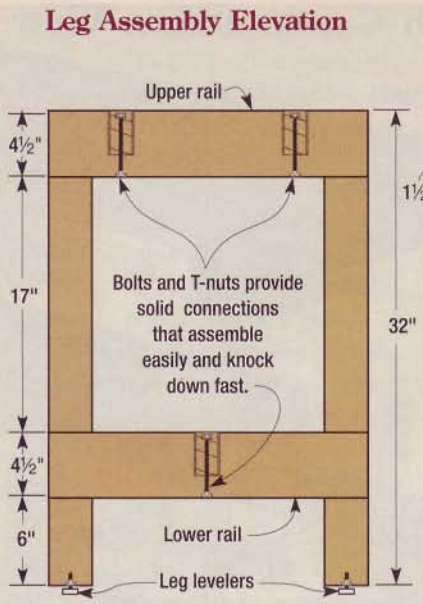
As I mentioned, the leg frames are held together with half-lap joints. Half-laps are one of the simplest joints to cut and fit. And, with the addition of both glue and screws, they provide plenty of strength for this application.

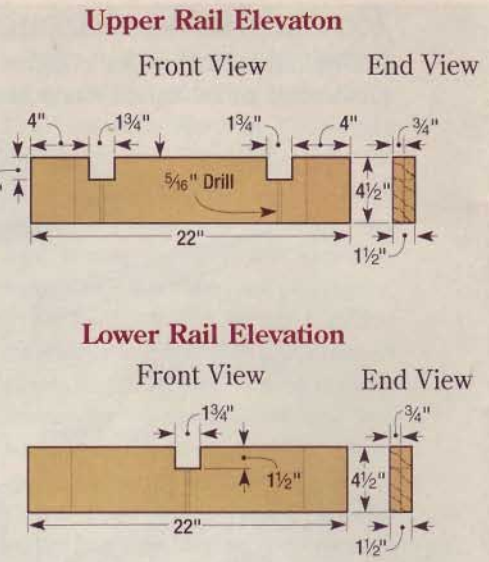
As the name implies, the depth of each half-lap should equal half the thickness of each joint member. Although these half-laps are wider than any dado blade, making multiple passes with a ½" wide blade goes quickly enough. Install the blade in your table saw and, before ever cutting into your actual project stock, cut half-laps into a spare 2" × 4" until you have the blade height set perfectly.











Continue ignoring the stretchers for the time being and focus on cutting half-laps in the legs and rails (see the Upper Rail and Lower Rail Half-Lap Details). Lay out the half-lap locations on the legs (see the Leg Assembly Elevation) and cut the joints. Begin with the half-lap for the lower rail joint. Clamp a set up block to the fence and cut the lower shoulder of each half-lap first (Figure 1). Then, move the fence a little further from the blade and make a second pass, and so on, until your cutouts snugly fit the width of the lower rail.

Now, set the fence and cut the half-lap in each leg for the upper rail. After you complete the leg cuts, cut half-laps at the ends of the rails.

Making the Stretchers

You might think that 2" × 4"s alone would be sufficient for the stretchers. I found out the hard way that they're not. When I first built my workbench I just notched 2" × 4"s and fit them into the leg frames. Then I pushed a little on one frame, and heard a snap as some of the small tips at the ends of the stretchers broke. That little bit of long grain in the tips just couldn't hold up to any stress.

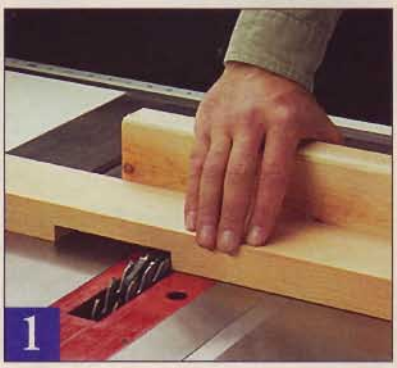
So I went back to the drawing board and came up with the idea you see in this plan (see the Stretcher Detail on page 58). By sandwiching the 2" × 4"s between pieces of $\frac{1}{8}$" thick hardboard, I reinforced the small tips and added lots of rigidity to the stretchers overall. This construction has proven to be very strong on my workbench.

Rip a half dozen $3\frac{1}{2}$" wide strips of hardboard and glue them to the lumber you selected earlier for the stretchers. Since I have a limited number of clamps, I grouped all three assemblies into one large sandwich and clamped them at the same time. I recommend using scrap 2" × 4" pads to protect the outside of the sandwich and help spread the clamping pressure evenly on the assembly. Using waxed paper between each stretcher will keep them from accidentally bonding to each other.

Clean off any excess glue once it dries to a rubbery consistency. A putty knife will usually do a fine job. Next, joint one edge of each stretcher and trim the opposite edge on the table saw. The final width is 3".

Rail and Stretcher Notches

Notches in the rails and stretchers combine to make another set of half-lap joints. Cutting these notches is easily done with a standard blade in your table saw — just make multiple passes to remove the waste.



Cutting half-laps is easily done with a dado blade. Raise the blade to half the thickness of the stock and make multiple passes.

Lay out the notches on the upper and lower rails and set the height of the blade (see the Upper and Lower Rail Elevations on page 56). While you're at it, lay out the notches on the stretchers as well (see the Stretcher Detail). Cut notches in the rails first, checking their fit on a stretcher after every pass until the fit is snug. I recommend cutting one end of each notch with your first pass, then nibbling your way on pass at a time to the other end. Complete the rail notches and move right into the stretcher cuts.

Drilling Accurate Holes

The stretcher-to-rail joints are the central knockdown feature of this workbench. Each of these joints is held together with a bolt and a T-nut. The key to making this system work is accurately boring the holes for the bolts so they pass through the rails and stretchers easily. Holes that aren't plumb or square to the joints will bind the bolts and cause frustration — you'll have to mess with a hammer for driving the bolts into place, and you'll need a pair of pliers to pull them out.

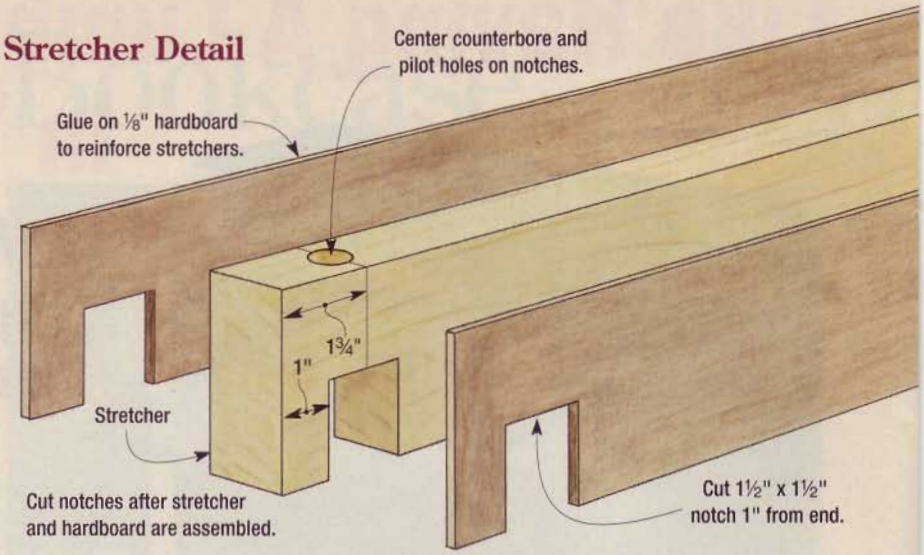
Begin by marking centerpoints for the holes on the back edge of the stretchers. Make sure the mark is directly opposite the center of each notch (see the Stretcher Detail). Next, using a drill press and a $^3/_4$" bit (a Forstner bit works best), drill counterbores $^3/_4$" deep. Then, change to a $^5/_{16}$" brad-point bit, and drill the rest of the way through the stretchers (Figure 2). Don't forget to back up your stretcher notches with a piece of scrap wood, which will minimize the chance of tear out as the bit exits the wood.

For future reference, I used an indelible marker to write a number on each joint member so I could always put them together in the same order. After marking the pieces, position the stretchers on the rails.

Now, you can mark the hole locations on the rails. Remove the $^5/_{16}$" drill bit from the drill press and put it through a hole in the stretcher. Then, tap it gently with a hammer to mark a centerpoint. Repeat this procedure for each joint.

Next, re-chuck the $^5/_{16}$" bit in your drill press and bore the holes through the rails. Here again, remember to position scrap wood under the workpiece to prevent tearout. After drilling the holes, drive a T-nut into position (Figure 3).

Stretcher Detail



Leg Frame Assembly

I always enjoy the assembly part of my projects. This is the time when all my hard work pays off, and the pieces slip together perfectly (or at least they do in my dreams).

Assembling the leg frames for your workbench is a very straightforward operation. First, clamp the rails and legs together, making sure the assemblies are square. Then, drill countersunk pilot holes for four screws at each half-lap joint (see the Leg Assembly Elevation on page 56).

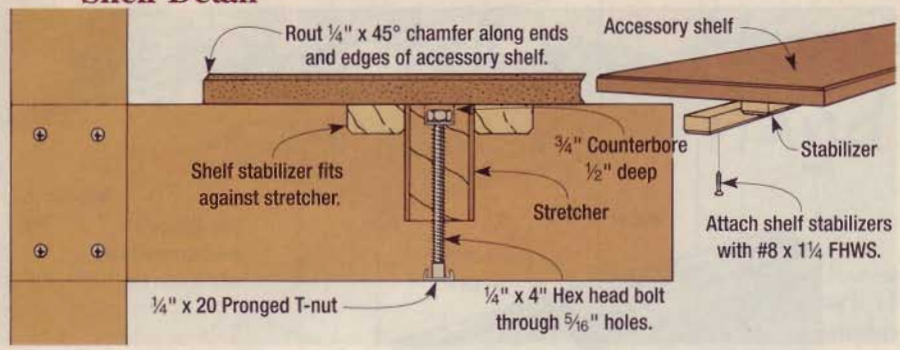
Now, remove the clamps from the frames and spread glue on the joints. After repositioning the pieces, drive a screw into each half-lap and check the assemblies for square (Figure 4). Once you're satisfied that everything is set, drive the remaining screws and lay the frames aside for a few hours while the glue dries.

For each stretcher to rail joint, drill the counterbore first, then drill the $^5/_{16}$" pilot hole. Use a drill press to accurately align these holes.

Tap a pronged T-nut into the hole in the bottom edge of each upper and lower rail. The T-nuts provide strong connections for the hex bolts.

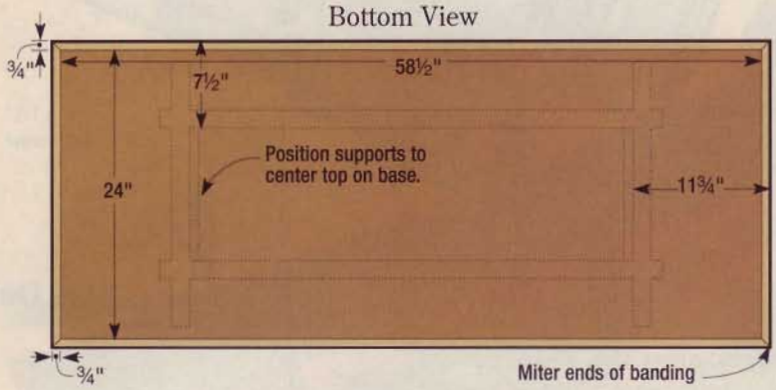
Spread glue on the half-lap joints and drive one screw into each joint. Square the assembly, then drive the remaining screws.

Shelf Detail



Top Elevation

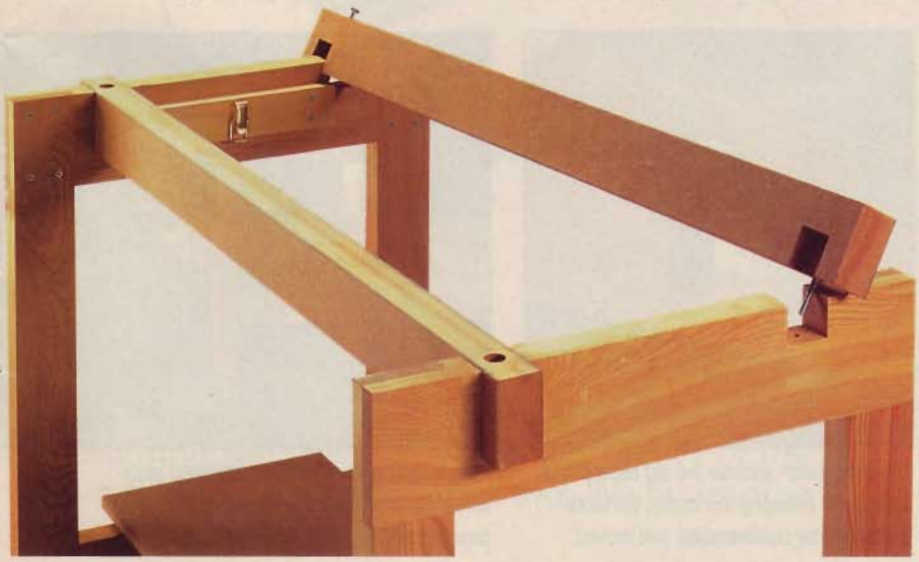
Bottom View



Making the Top

Building a top like I did requires two layers of medium density fiberboard (MDF). This construction is very solid, and does not allow much "bounce" — an important quality whenever you're banging on your workbench with a mallet or hammer. The downside is weight — MDF is heavy. For a lighter, but bouncier, top, you can use plywood or a single thickness of MDF.

If you decide you want a top like mine, cut two MDF panels about 1/2" larger than their final size, then lay one panel on top of the other. Now, drill countersunk pilot holes in rows about 10" apart along the length of the panels. After drilling all the pilot holes, separate the panels and spread glue on both pieces. A short-napped paint roller will make quick work of this chore. Reposition the panels and drive #8 × 1¼" screws into the holes.



In a few hours, after the glue dries, trim the top assembly to size and rip the maple edge banding. Cut the banding to length, miter the ends, then glue and nail it to the MDF — be sure to drill pilot holes for the finishing nails. Routing chamfers on the edges gives the top a finished look.

The Accessory Shelf

Cut the remaining MDF to size for the shelf (see the Shelf Detail). I routed chamfers on the edges to match the workbench top.

The shelf sits on the lower stretcher with help provided by a pair of stabilizers — they keep the shelf from slipping off the stretcher. Cut 2" × 4" stock to size for the stabilizers and, for good looks, chamfer the edges on one surface of each piece.

Now, lay the shelf upside-down and center the lower stretcher on it. Once you're sure the stretcher is perfectly centered, clamp the stretcher to the shelf and set the stabilizers alongside. I like to slip playing cards between the stretcher and the stabilizers to allow a small margin for wood expansion and to ease the fit. Drill countersunk pilot holes into each stabilizer, then glue and screw them to the shelf.

Final Assembly

Drill holes for T-nuts into the bottom of each leg. Tap them into place, then add the leg levelers. Erecting the workbench is now a simple matter of connecting the leg frames with the stretchers, then adding the top and shelf. Begin by slipping the stretchers into the notches in the leg frame rails and tightening the bolts. The base assembly should now feel solid.

Next, lay the top upside-down and center the base on it (see the Top Elevation). Cut 2" × 4" stock for the supports, and screw the upper support to the top after drilling countersunk pilot holes (see the Support Detail). Set the lower supports into position and screw them to the leg frames. Install the catches and you have an ideal knockdown mechanism for the bench top.

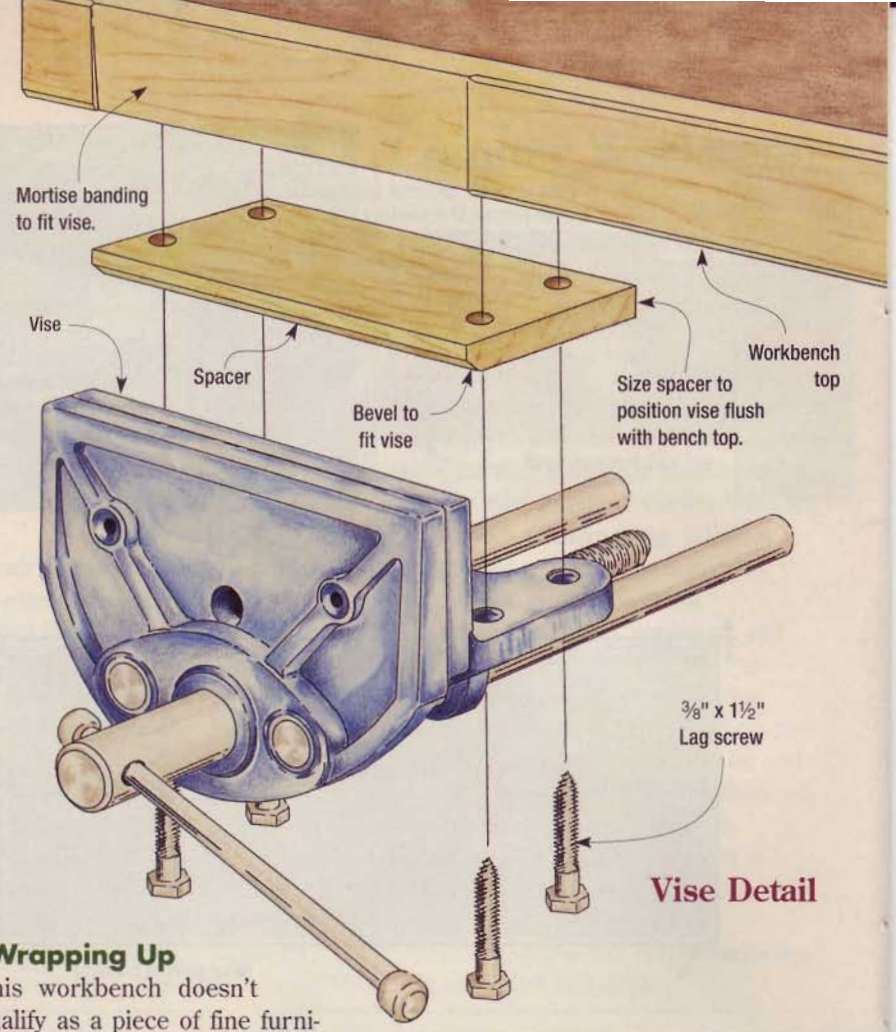
The Vise

While the workbench is still turned upside-down, you can easily install the vise. The model I chose does have a couple of features that require some accommodation on the bench top. But once these details are completed, the vise will be flush with the surface of the top, allowing an unobstructed space for laying a sheet of plywood or a door.

The first item to attend to is a spacer. The spacer positions the top edge of the vise jaws flush with the bench top surface. The spacer thickness in this plan allows for two layers of MDF in the top. You will need a thicker spacer if you made a single layered top.

Machine the spacer to size, then position it with the vise on the underside of the top. Now you will notice the second accommodation for installing the vise. The back of the rear vise jaw is slanted. So to install the back tight against the bench top, you'll need to excavate a shallow mortise. Use a knife to mark the vise location on the banding, then remove the waste with chisels. Be sure to slant the mortise to match the shape of the vise.

Now, press the vise tightly into the mortise and drill pilot holes for the lag screws that hold the vise and spacer to the top. I recommend using a stop collar on your drill bit to make sure you don't drill through the top. Secure the vise to the top and turn the project right side up.



Vise Detail

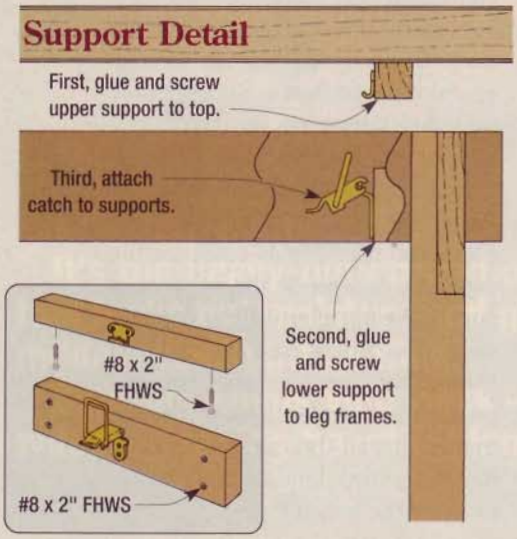
Wrapping Up

This workbench doesn't qualify as a piece of fine furniture, but after all the work I put into it, applying a couple coats of varnish seemed more than justified. The varnish seals the project and protects it from moisture and dirt.

Within weeks of completing the workbench, and after moving it several times, I came to appreciate just how valuable the knockdown feature is. The catches are especially easy to operate (Figure 5). And the bolts take just minutes to dismantle.

Although I don't always set up the shelf, it still comes in handy when the bench is moved to a site for a long period (Figure 6). It's a good place for keeping tools off the floor where they could be damaged.

No matter where I work, the portable workbench more than earns its keep. In fact, when it's nearby, I've even used mine as a serving table in the dining room. Now that's versatility!



The draw catch secures the leg assembly to the top. By releasing the catch, the workbench can be disassembled and moved.

The accessory shelf, with its attached stabilizers, fits over the lower stretcher. The shelf provides an ideal place for setting tools.

New Tools

Extreme Durability Cutting Blade

Imagine yourself working with wood that has been used, painted, left sitting outdoors, or otherwise looks like it belongs in a fireplace rather than on your circular saw. If you're a framer, deck builder, or remodeler, you may already know the importance of buying inexpensive carbide blades for tough jobsite conditions. You know they won't last long, and will have to be thrown away after they've become knicked and chipped the first time out.

DeWalt's new Rock Carbide circular saw blade may be what you're looking for. The 7¼" combination framing saw blade has 18 carbide teeth for greater durability. The teeth resist chipping and breaking when they encounter nails, rocks and dirt.

In a demonstration, I was impressed with how quickly and easily the blade cut through 16d nails and ¼" lag bolts with no damage. Flush-ground teeth and a reinforced shoulder design, which provide greater tooth support, extend blade life up to ten-times longer than conventional blades when used under extreme conditions.

Professionals said they usually buy low end carbide blades for sawing lumber under tough conditions. In response, the Rock Carbide blade, with an anti-stick rim that resists build-up, cuts faster while retaining its cutting edge — even in the face of sand, gravel, or loose nails.

The single unit blade, model DW3191, retails for $14.99. It's also available in bulk packs.

For more information, contact DeWalt, at (800) 433-9258.

All it takes is three VISE GRIPS to replace dozens of standard and metric combination wrenches. Note its firm grip on a hex nut.

3-in-1 Vise Grip

The VISE GRIP folks devised a great solution for those times you can never find the right wrench: they've introduced locking wrenches in three sizes, replacing more than 48 standard wrenches. These vise-grips would be good for those times when you can't lug around every wrench you own.

They're a natural for the glove compartment, fishing tackle box, kitchen drawer, or when camping or cycling. Prices range from $13 to $18. For more info, contact American Tool Companies at (513) 382-3811.

HorsePower Handy Clamp provides vertical and horizontal clamping positions for drilling, sawing, planing, and routing, with 180° rotation.

Clamping Stations

The HorsePower Handy Clamp transforms ordinary work surfaces into solid clamping centers. Screw the brackets to a saw-horse, workbench, or even a tool box. Then add a length of black pipe and the clamping jaws. Twisting the handle generates up to 350 lbs. of clamping force. Made from the same resins as Quick-Grip bar clamps.

For prices or more information, contact American Tool Companies, Inc., at (414) 947-2440.

Heavy-Duty Tool Belt for Pros

Portable Products, creators of Bucket Boss soft-sided tool-storage organizers, has introduced a professional-model tool belt — the Contractor's Rig. The belt is made of tough Anso-tex nylon, a material that offers more abrasion resistance than leather.

The belt has a tunnel loop design that allows the pockets to be easily moved along the belt. With 30 fully padded pockets, the belt can carry numerous tools and parts while remaining comfortable against your legs.

Included are left and right speed square pockets, a cat's paw sleeve, backwall pockets for planes and chisels, and a security-flap pocket for small items. Also included are pleated pockets for nails and screws, and other tools. The belt retails for about $70.

To learn where you can buy the belt, call Portable Products, (800) 688-2677.

The fully-padded Contractor's Rig belt has an integral spine to prevent crushing under a heavy load. It fits waists from 28 to 52 inches.

Precision Carving

If you enjoy carving fine details, you'll want to take a look at the new power carving tool from Ultra Speed Products. Called the Turbo Carver, this airpowered, lightweight tool, which is about the size of a writing pen, spins a bit at up to 400,000 rpm. And the lack of any noticeable torque makes the Turbo Carver extremely controllable and smooth.

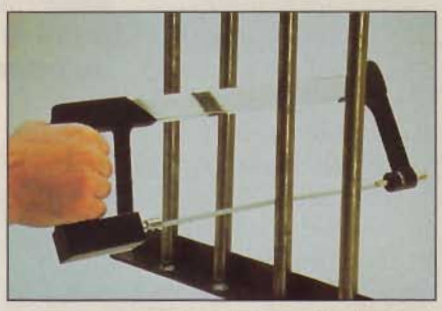
You may feel an urge to don a lab coat, for the Turbo Carver is based on the miniature, precision tools used by dentists. It is best suited for precise applications, like carving on bone, eggshells, knife blades, gunstocks, and adding fine details to wood projects. It's also useful for engraving, polishing, filigree, inlay, and relief carving. Don't expect to carve very deeply — the 1/16" diameter bits won't stand up to much stress.

Attach the Turbo Carver to your air compressor and you'll have an ideal tool for carving precise details in hard materials like bone and metal.

The $115 price includes the carving pen, four bits, stencil samples, an instructional video, a lubricant, and a foot control. For more information, call Ultra Speed Products, (503) 622-4387.

360° Hacksaw

Nicholson, known for its files and saws, is introducing a new hacksaw. Designed for 360° maneuverability, this saw employs a blade holding fixture that can be rotated to any angle. To change the blade angle, you turn a spring-tensioned adjustment screw with your fingers. The saw cuts up to 2 3/4" deep using standard 12" hacksaw blades. For more information, fax Nicholson Saws at (800) 423-6175.



Nicholson's new hacksaw features a blade that pivots 360°. This capability permits the use of this saw in very tight situations.

New Skil Line

Skil is introducing a new line of portable power tools, and to kick off the event, they gave a tour of their circular saw plant.

What a marvel it was to see the saws being made. It all starts with raw aluminum bars that go into the furnace. The molten aluminum is poured into molds for saw blade guards and some other parts. After trimming off the rough edges using an enormous press, the metal parts are stacked high onto pallets.

A similar process is used for making the plastic handles, triggers and motor housings. The plastic parts are all marked for future recycling, and many of the parts in the saws are already made from recycled materials.

In yet another area of the factory, motors are built for all the different saw models. You'd be stunned to see the speed at which the copper windings are automatically spun onto the motors.

The saw parts go together one piece at a time on the assembly lines. Can you believe this plant made over 1.5 million saws last year? They shipped them all over the world.

To test the endurance of the top two saw models, Skil engineers ripped 5 miles worth of particleboard. As for features on the saws, the new blade guard lever stands out as the best innovation. With this lever, you can rotate the guard out of the way from the left side of the saw blade cover — great for safety and convenience.

On the jigsaw, Skil has borrowed some technology from its partners at Bosch and added a linear counterbalance to reduce vibration. All the new tools have ergonomic designs commonly found on more expensive models.

The new Skil tool line includes seven new drills ($25-$60), five jigsaws ($25-$60), and three circular saws ($40-$80). For more information, call S-B Power Tool Corporation; (800)301-8255.

Wagner Cordless Drills

Wagner, known for its line of painting products, has expanded into a new market with the Pro Gold contractor series of cordless drills.

These drills have many impressive features, beginning with their low prices. One of the biggest complaints with cordless drills is never knowing how much power is left in the battery. So the Pro Gold battery pack gives a readout on remaining battery life. It also features a keyless chuck, electric brake, and soft-touch trigger.

Wagner's new cordless drills have a keyless chuck, soft-touch trigger, and one hour recharger. The battery power light and the built-in compartment for screwdriver bits are great features.

While testing the drills, it took only a moment before all the yellow-highlighted controls and adjustments became second nature to operate.The drills have plenty of torque, which became clear when a screw was accidently driven halfway through a 2"× 4". Adjusting the clutch took care of that.

The drills come packaged with a one hour recharging power pack and an extra battery. Especially useful is the built-in compartment for carrying screwdriver bits.

Wagner's cordless Pro Gold drills range in price from $79.99 to $199.99.

For more information, contact the Wagner Spray Tech Corporation, at (800) 328-8251.

Ergonomic Tools

Stanley's new ergonomic hand tools offer improved grips designed to reduce fatigue and strain caused by repetitive motion.

The Stanley Works has introduced a new line of tools designed for ergonomic comfort.

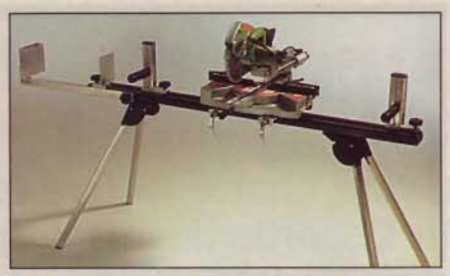
Ergonomically designed tools help maximize job performance, enhance work quality, and minimize physical stress and fatigue. Stanley's initiative should also help reduce musculoskeletal injuries in the workplace.

For more information, contact Stanley Tools, (860) 225-5111.

Tool Mounting

The TracMaster looks like a fancy sawhorse. But it's actually a unique and versatile tool-mounting system that's a great aid in the shop and on a jobsite. By using the tool mount provided with the system, you can install a variety of benchtop tools such as miter saws, jointers, vises, and grinders.

The TracMaster has a triple-track beam that allows fast and accurate



mounting and adjustment of tools. The suggested retail price is $319.

For more information about the TracMaster, call (800) 501-1587.

Spiral Cutting

RotoZip, the inventor of the SpiraCut system, has a new Cordless Spiral Saw. Now electricity need not be available for cutting holes.

The SpiraCut was originally developed for contractors, but it quickly became apparent that the tool had a wider range of use for the rest of us.

The SpiraCut is an effective system for cutting drywall, wood, plaster, and tile.

The new cordless RotoZip SpiraCut needs no pilot hole for cutting holes in drywall, wood, tile, and other solid materials.

Just place the bit where you want to start, push it into the material, and begin cutting. Suggested retail, $219.

For more information, contact RotoZip Tool Corp., (608) 798-3737.

Tool Protection

Rubbermaid has come up with new power-tool storage cases that provide long-lasting protection and easy portability. Three storage cases are available. Model 7749, shown here, has an easy-to-open clear lid that allows you to view the contents without opening it. Prices range from $16.99 to $19.99.

For more information, contact Rubbermaid Inc., at (330) 264-6464.

New Home Products

The Right Colors At Home

Apple Red is one of 42 spray colors available in Rust-Oleum's new Painter's Touch series. Quart and half-pints come in 16 colors.

Painter's Touch is a new multipurpose, high-quality paint by Rust-Oleum. It's truly multipurpose, with colors that can be used indoors and outdoors on wood, metal, wicker, and craft projects.

"We found that home decorators are focused on color now more than ever," stated a spokesman. Rust-Oleum's contemporary palette of spray colors includes primary, classic, contemporary, and decorator finishes, as well as fluorescents, metallic colors, and primers.

For more product information or for helpful decorating tips, call Rust-Oleum Corp. at (847) 367-7700.

Electric Skylights

The Ventilating Skylight by Velux looks great in lofts and cathedral ceilings. Skylights suffer from one common problem, so Velux designed an easy solution to open this hard-to-reach light.

A separate control system enables their windows to be opened and closed from a wall-mounted keypad. For prices and a copy of their guide to roof windows and skylights, call (800) 283-2831.

Catalytic Fireplace

Superior's FireCat applies catalyst technology to gas combustion fireplaces with "wood fire." An oxygen depletion sensor improves safety.

The FireCat is a new gas fireplace by Superior that applies proven catalyst technology to ordinary gas combustion. Catalysts dramatically improve the efficiency and safety of wood fireplaces. Superior now incorporates that technology into a gas fireplace with their Superior Catalytic Flame.

The fireplace also comes equipped with an oxygen depletion sensor and carbon monoxide sensor. According to Superior, the FireCat is the cleanest burning, safest, and highest efficiency gas fireplace offered to consumers.

An independent testing laboratory found, "Not only does it produce no CO while operating, it actually removes CO, hydrocarbons, and other harmful particulates already present in room air." With its advanced sensing device, the fireplace is designed to shut down before indoor air quality can be compromised. What's more, it's designed to alert occupants to any buildup of CO from any malfunctioning gas appliance or other source in the house.

FireCat has a 30,000 BTU per hour fuel input and its burning efficiency is greater than 99.9 percent. It can be installed as an insert in an existing fireplace, as a built-in fireplace, or as a free-standing unit. Optional features include a forced air blower, a wireless remote control, and a choice of porcelain or brick-pattern interior panels. For prices and more information on the FireCat, call Superior at (800) 854-0257.

Plastic tabs called The Nailer simplify drywall construction. Staple the plastic tabs to the stud, then drive screws through the drywall and tab.

Corner Supports

Installing drywall can be difficult when you have no support for screws at the edges or corners. Now there is a solution — The Nailer. This product consists of plastic tabs that you can easily attach to studs and top plates with a staple gun.

These tabs are designed to hold against the side of the framing member. Screws then go through the drywall and into the tab. Packages of 100 sell for $17-$18 in lumberyards.

For more information, call The Mellennium Group at (800) 504-0043.

A Glue for all Seasons

Searching for the perfect glue is like the quest for the Holy Grail. Neither may exist, but the pleasure is in the search. So when PL Premium Wood Glue crossed our desk, we gave it a close look.

PL glue is a one-part polyurethane that the manufacturer claims will bond almost anything, including wood, stone, plastic, metal and ceramic. It's also paintable, stainable, sandable, and waterproof.

The gap-filling properties are perhaps its most unique feature. Typically, a glue only bonds two surfaces like wood, but its strength breaks down when a joint is not tight. With PL, a gap-filling foam appears as it cures, creating a strong bond.

Polyurethane glues have long been favored by contractors because they have superior bonding features, and are storeable at temperaturess down to 0° F.

One note of caution: you're advised to wear gloves when working with PL Premium Wood Glue to avoid staining your hands. A 16 oz. bottle sells for $9.99.

For more information, contact ChemRex Inc. at (800) 433-9517.

Sparkle Light for Yards

Designed to add sparkle to front yards, a clear faceted Post Light bulb was recently introduced by Osram Sylvania. The attractive outdoor bulb includes jewel-cut faceting, which creates a sparkle with 75 watts of long-lasting, natural looking halogen light.

Sylvania's Post Lights recently lit up New York's Times Square on New Year's Eve, adding glow to the festive occasion. They provide a decorative way for homeowners and neighborhoods to dress up yards and walkways. This direct screw-in replacement for ordinary incandescents also lasts three times as long. One Post Light bulb sells for $3.99.

For more information, contact Osram Sylvania, Inc., at (508) 777-1900.

Compass Plane

To shape a curve in the days before power tools, a cabinetmaker or wheelwright had to have strong arms and plenty of wooden planes. Not only was this task labor intensive, but each compass plane had to be custom made. And even after all that effort, the rounded bottom on each plane only worked on one fixed radius.

A shop could never have enough planes considering the demand for different curves and arcs. So when Leonard Bailey invented the first adjustable compass plane around 1868, the impact was far reaching. This one plane could be purchased off the shelf to replace dozens of handmade, single purpose wooden compass planes.

Stanley Tool Works purchased the rights to manufacture Bailey's plane, and introduced their improved version in 1871. The no. 113 had a flexible steel sole hinged at both ends. The sole could be adjusted by turning one knob, which controlled a set of levers and gears. This system flexed the sole in a continuous curve — a remarkable technical advancement. Planing a wide range of concave and convex shapes was now greatly simplified, and a whole lot more practical.

Even with a compass plane, however, a woodworker needed to keep a close eye on the ever-changing grain direction of the wood in a curve — planing still only worked going with the grain. Perhaps it was this limitation, and a pair of tired arms, that led to the invention of the router.