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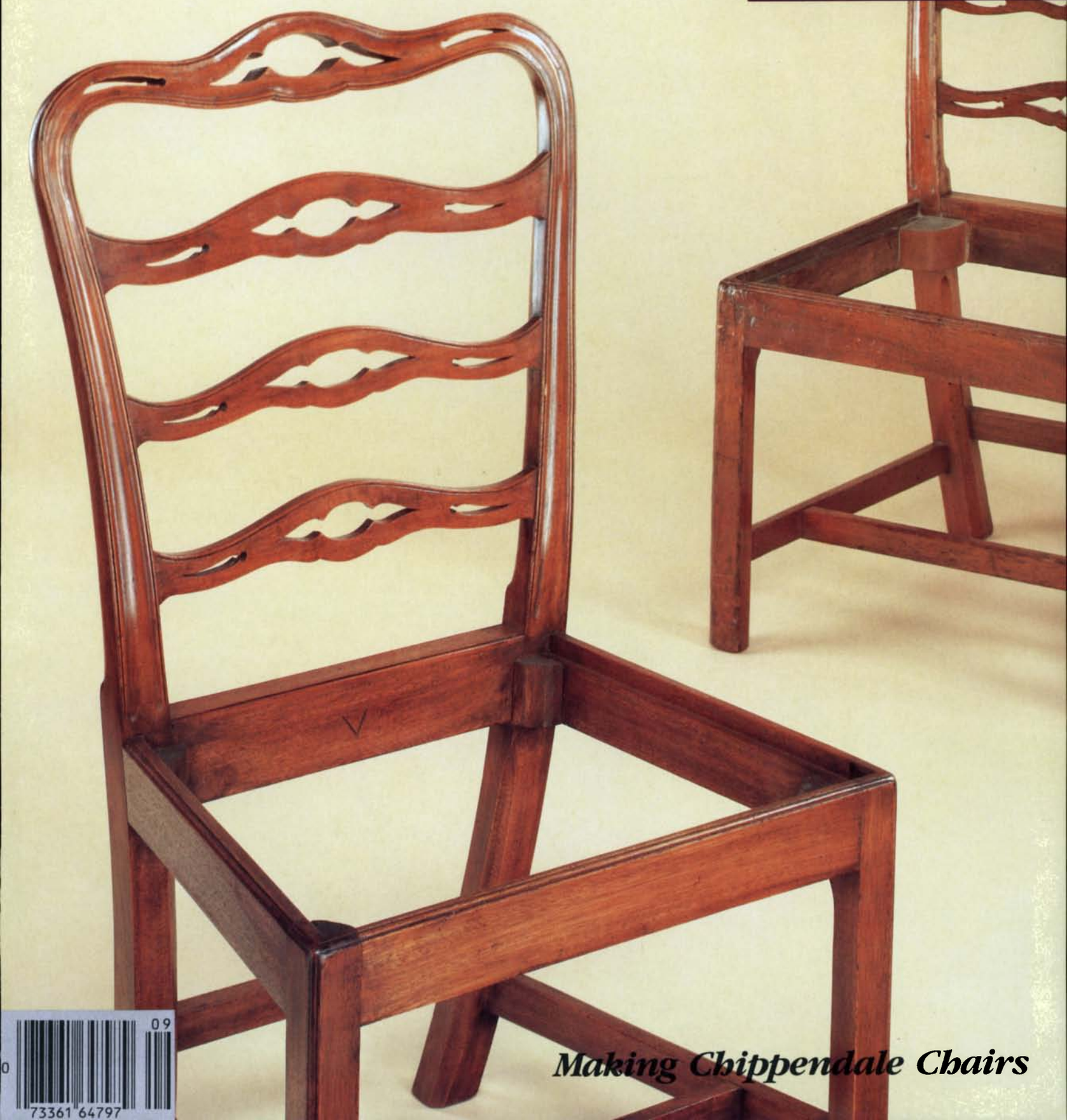

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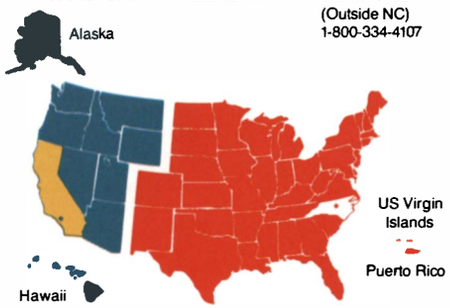

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Fine WoodWorking

September/October 1986

You could think of a bewildering variety of jigs and fixtures for the myriad off-angle cuts in a Chippendale chair, but according to Gene Landon, you're better off without them. He explains how to do the job in the article beginning on p. 38.

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Jay Fisher (*FWW* #58, Letters) does himself a disservice in believing himself a pretender. There are no pretenders, only woodworkers and non-woodworkers. If he works with wood frequently, then he's a woodworker. Everyone starts at the beginning and few become master craftsmen, so he shouldn't be intimidated by inexperience or unfamiliar terms. They come with time.

As for fear of butchering a hunk of expensive wood, he should practice techniques on pine and scrap wood, working with hardwoods when he becomes comfortable with the techniques. A well-fitted and finished piece is "fine woodworking," whether in pine or ebony, and mistakes are the birthplaces of wondrous details used to cover them up (and which the observer usually believes to be intended decoration.)

If Mr. Fisher takes the time to carefully fit and finish his wood, it *will* be a work of beauty, regardless of what he makes or the wood he works with. "Fine woodworking" is a state of mind—a quest for quality in what one does. Exotic tools and expensive woods are secondary. I sincerely hope that Mr. Fisher stops being self-conscious and starts happily (and carefully) chiseling away. —*Philip Wiener, El Toro, Calif.*

I was fascinated by the article in *FWW* #58, "Ripple Molding," by Carlyle Lynch. Some time ago I came into possession of an old spinet-type melodeon, cased in rosewood. Missing was about 18 in. of intricately cut molding. When I inquired of *FWW*, Jim Cummins referred to me Irv Rosen. In about a month I received an 18-in. exact duplicate in rosewood from Mr. Rosen, together with a modest bill for making the cutters and labor.

I was delighted, but how in the world did he make it? Now I know, almost. Thanks *FWW*, Carlyle Lynch and Irv Rosen.
—*Henry A. Latimer, Rockville, Md.*

Glen Gordon's fine meditation about Krenov in *FWW* #55 finally raises some of the big issues of furnituremaking in print. But Gordon is missing half the point about art furniture, mainly because he relies on the spurious distinction between art and craft. The notion that art is pure expression, removed from utility and as such is the highest calling for noble men, was originally a successful marketing ploy of Renaissance virtuoso painters. It finally came into its own as the cornerstone of the cult of the idle romantic individualist of the 18th and 19th centuries. It has more to do with surplus value than expression.

In fact, any furniture more adept than a plain pine box is an art object: its builder made aesthetic choices; it expresses a mind, a milieu. A Hamada pot, an Albers weaving, a cabriole leg are just as expressive as a de Kooning. But more than this, they serve the user through their utility. Granted, much current work is egotistical raving. This will be forgotten in ten years, but at the moment it provides a fermenting mash, so to speak, from which the excellent will emerge, much as a minor league nurtures two or three future big leaguers passing through. The traditions of the next centuries are developing today.

Gordon's adroit use of the Unknown Craftsman as an ideal type provides a good basis for comparison to reality. But did the Unknown Craftsman ever exist? Yanagi's enthusiasm is, partly at least, romanticization of the primitive, much like Rousseau's noble savage: civilized "fallen" people's nostalgia for an imagined prelapsarian innocence. More likely, woodwork has always been practiced by people worried about how to pay the bills, distracted enough to cut themselves, frustrated by edges getting dull and knots that chip out. The tools may be different, but the attitude is the same as it has always been. Moreover, the place of the artisan in society has not changed, contrary to Gordon's assertion. The need is still there for beautiful, expressive articles. . . handmade furniture is no more expensive now, compared to earnings, than it has ever been. It's the U.S. economy which is "unwoven from the warp and weft of. . . reality, . . . estranged from the energy which steams in everyday life;" likewise all those people who live in it. But this economy is a strange hiccup in the long history of humanity, a history in which the artisan has always had his or her rightful place. It's still there. The artisan's fine opportunity is to awake to it. —*Fletcher Cox, Tougaloo, Miss.*

The article "Getting Squared Away" was very interesting. As much as I enjoy the beauty of a try square with a brass-lined beam, I think the Stanley all-metal No. 12 square has much to offer. Definitely not as high in quality or price as a Starrett, it's still a very good tool. I have two such squares, a 6 in. and a 10 in. As I don't do any carpentry or any large work, I don't own a framing square.

When I wish to check my squares, I place the two squares back-to-back along my 12-in. Starrett steel rule. Then I repeat the operation with one of the squares and a third square. Checking each pair of squares this way ensures that the angle is 90°. Then, the inside of each square can be checked against any one of the other two squares.
—*Norman M. Wickstrand, Harwinton, Conn.*

I just finished reading your article on squares, which I enjoyed. That, in spite of the fact that I'm more interested in the history of tools than in tolerances in thousandths of inches.

Some points regarding the article: You say the distinction of having invented the steel square belongs to Stanley Tools. No way! Metal squares go back to the dynastic period in Egypt. In any event, whatever Silas Hawes invented, Stanley had nothing to do with it, or with Eagle Square, until the 20th century. The Silas Hawes carpenters' square patent was not granted in 1817, but in 1819. All this simply in the interest of accuracy. —*Paul B. Kebabian, South Burlington, Vt.*

After reading your article on surface planers in *FWW* #52, I went out and purchased a new Makita model 2030 with the jointer attached to the side. The thickness planer works great, but I noticed the jointer was cutting a taper on the workpiece. I laid a straightedge across the infeed and outfeed tables and discovered them to be 3/32 in. to 1/8 in. out of parallel.

I brought the machine to a service center, and they contacted a Makita distribution center. They were willing to send parts, but couldn't assure us that the parts they sent would be any better. According to the distributor, the tables are surface ground separately at the factory and trial-and-error is used to assemble the two, in hopes of getting an acceptable mate. We ended up bolting the infeed and outfeed tables together, and had them surface ground as a pair in order to true them up.

Since there's no means for adjusting the tables to match, my advice is to take a straightedge with you if you intend to purchase either the model 2030 or 2030N.
—*Jerry Espeseth, Omaha, Nebr.*

In *FWW* #57, two lathes built by Jerry Blanchard were described. Although fine machines, there are a couple of improvements he may like to incorporate in the future.

The red lathe would be more stable were the legs splayed and cross-braced like the letter A. A longitudinal diagonal strut would additionally prevent longitudinal swaying. Realistically, the red lathe isn't going to be used for work greater than 24 in. in diameter. If the bed had been taken through a foot past the left-hand end of the headstock, then this would have enabled outboard turning without a separate stand being required. Both lathes would benefit from the use of two A-section V-belts to

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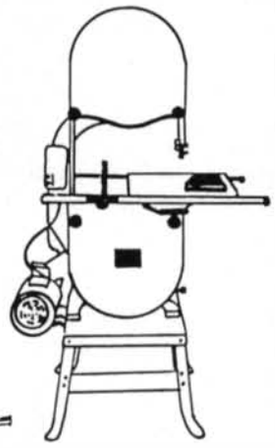

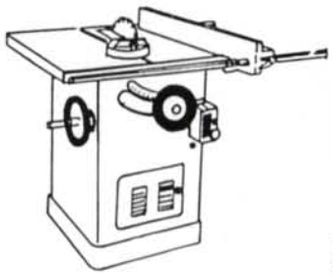

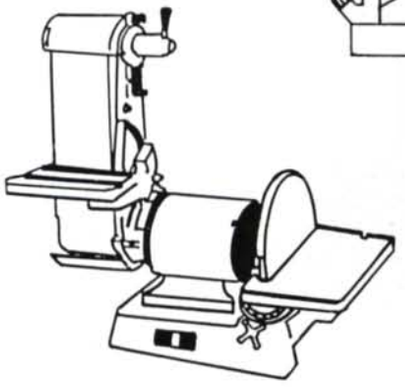

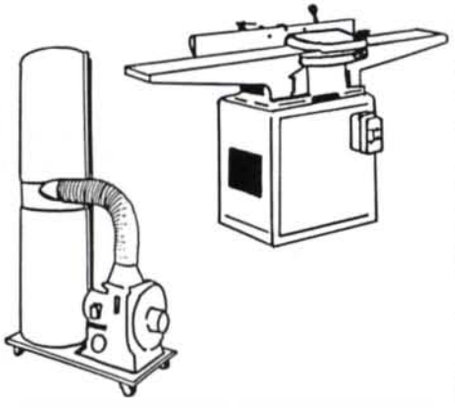

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drive the spindle. Needless to say, these should be properly guarded. —*Mike Darlow, Chippendale, N.S.W., Australia*

I'm building the woodturning lathe from your plans in the March-April issue. I sent the drawings to a machinist and he's also building the lathe. He made up extra sets of the steel parts. Readers who are interested can write to him: Bill Whalen, #1 Madalyn St., Verplank, N.Y. 10592.

—*Henry Gifford, Jamaica, N.Y.*

Regarding the question about paying for shrinkage in the kiln in *FWW* #58. I've been purchasing lumber from mid-Michigan sawmills for about 8 years and usually lumber is longer than the scalers estimate. For instance, an 8-ft. board is often 8 ft. 4 in. or 8 ft. 5 in. So, let's not forget that we gain on length many times, even though we lose on width. It's not the kiln operator's fault that wood shrinks; that's the nature of the material. Also, the energy invested to get that 8-ft. board from 30% moisture content down to 8.5% doesn't come cheap.

—*Tom Turnbull, Stanton, Mich.*

Being one of the low-budget builders that Roy Day lampooned in *FWW* #58 (Notes and Comment), I was irritated by his misunderstanding of low-budget projects. If the axiom, time is money, holds true, then home projects always cost as much, or more than a comparable new or used machine. The one thing that sets the homebuilder into action is that he has more time than ready finances. Another poor assumption by Day was that those parts "just laying around" got there without some effort at some point. He should spend an hour every week visiting his local scrap yard or junk dealer. America is truly a throw-away society and all of the components for homebuilt machinery are always available at one time or another at the scrap yard. When he buys his sheaves (off old motors), bushings, collars, and shafts for 22¢ a pound instead of $22 apiece, then he, too, can *build it cheaper and better himself.*

—*J. Mark Fineout, Terrell, Tex.*

Woodworkers and metalworkers alike are becoming increasingly aware of the health hazards of breathing wood dust, metallic and abrasive particles. There is no substitute for an adequate dust-collection system, but many craftspeople don't have the money to install a system, or feel that they don't spend enough time with their craft to justify the investment. I have a suggestion on how to reduce some of the health risks of breathing dust.

There's a simple and economical device, which many of us may already own, that can remove a substantial amount of dust from nasal passages. I'm referring to the spray-irrigation devices made by WaterPik, Sears, etc. To make use of either device to clear nasal passages, you need to purchase a nasal adaptor. (Do *not* try to use the jet-spray handpieces that come with the spray-irrigation device. The jet would be very uncomfortable, perhaps even injurious, to your nose.) Nasal adaptors are made by several companies. I purchased mine, a stainless steel handpiece, from Ethicare (P.O. Box 5027, Fort Lauderdale, FL 33310) for around $15. Many pharmacies stock these, or will order one for you—no prescription is required.

If you need to work in a dusty environment, you might consider this idea. It has, I might also mention, reduced my hay fever suffering during high pollen periods.

—*Steven J. Bartlett, Vista, Calif.*

In response to the question "Wood movement warps tabletop," in *FWW* #58, I have a simpler solution where the tabletop can be fixed without cutting it up and starting over. Take the top off the frame and lay it upside down on the floor on a blanket so it won't be scratched. With a circular saw, cut kerfs along the length of top's back about 4 in. apart. Stop the kerfs 4 in. to 6 in. from the edges (just where the apron stops underneath). These cuts should be two-thirds the way through, or ½ in. deep.

Whether you use a circular saw or a tablesaw, this method should be used on any large panel that's edge-glued together and has no frame to hold it from warping. It hasn't failed me yet, except that it's unattractive on the back of cupboard doors.

—*Ian Hackett, Lucknow, Ontario*

"Doomsday tool kit" in *FWW* #52 prompted these lines. Some of my friends tell me that I have the best job in the world. My hobby is woodworking, in particular woodturning. My present assignment is as project manager for the International Labour Office of the United Nations in Burma, the land of teak.

Working overseas, one has a limited baggage allowance. With destination Burma, I decided a lathe would be essential. In my shop, before leaving, I made the mandrel for a headstock, fitted it with a drive center and aluminum pulley, turned a 6-in.-long, ¾-in.-dia. bolt with a cup center on the end, fitted with two nuts. A simple tool rest was fabricated from a piece of angle iron and steel rod. With some ⅜-in. threaded rod, nuts and washers, all the essential parts for a lathe were packed. Assembled here in Burma, it is powered by a two-speed, ½-in. Hitachi electric drill. This drill is secured with large hose clamps to a base, which is screwed to a bench made locally. It takes about five minutes to set up.

In my spare time, turning bowls from the wide variety of exotic Burmese woods, making the odd chair or buffet for our living accommodation, gives me great pleasure. I rarely use teak, but mostly padauk, thinwin, thitsay and other hardwoods that one seldom sees outside of Burma.

But that is my hobby, what is my work? One aim of the project is to provide bulk storage capacity, using local materials, for grain, rice and oil seeds. For town and village water supply, we make teak tanks, similar to hot tubs, but these hold up to 6,000 gallons. Woodworking is an enjoyable hobby; as a profession, it can be helpful in developing countries. For almost 30 years I have been fortunate to be able to combine hobby and profession. —*D. Eadie, Rangoon, Burma*

The segment-turned bowls (*FWW* #54) so fascinated me I had no choice but to tackle one. Being a neophyte at this sort of thing, I picked the slant-line pattern, which appeared to be the simplest. I followed the instructions to "bandsaw the parallelograms square by eye," though I felt this left a great deal to be desired. Assembly of the finished pieces into the ring proved difficult in that I couldn't get perfect alignment of the pattern. (The authors had this problem, as seen on the right side in the cover photo.) Nonetheless, I was pleased with the finished product and it generated several ohs and ahs.

The second bowl required an 8-in. ring and I chose to make 20 segments, which would give me a finished size of 1¼ in. by 1½-in. high. I lined up all 20 parallelograms and juggled them around until I got good registry, as well as the most uniform exposure of light wood at the points (minor variations in the latter are less noticeable). After clamping with two bar clamps to control bowing, I marked the cutoff lines all at once. The resulting product was very satisfactory.

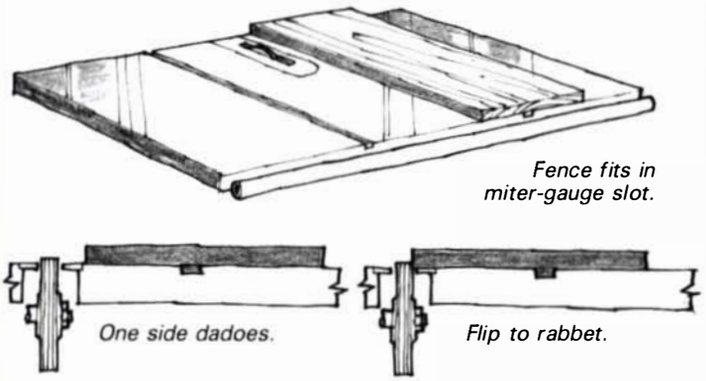
When I glued the segments together, I omitted glue on two opposing joints, then bandsawed an appropriate ring from each half and glued them together. Now I had material for a second, somewhat smaller ring.

—*Roger G. Huntress, Bayside, Calif.*

ERRATUM: In the drawing of T.H. Ralph's shop-made crosscut saw on p. 46 of *FWW* #59, the sliding table is incorrectly labeled as the fixed table and vice versa.

edited and drawn by Jim Richey

Tablesaw rabbet/dado jig

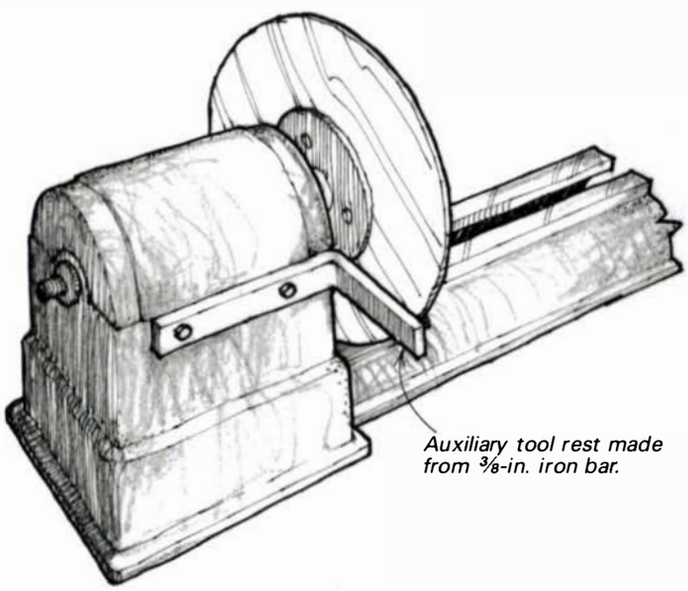


Because the plywood end panels I make for kitchen cabinet jobs are usually worked the same way each time, I found myself setting the rip fence to the same measurements for dadoes and rabbets time and time again. The simple fixture above solved this problem because it is essentially a pre-measured rip fence that I can use instantly by just popping it into the miter-gauge slot. It's a dual-purpose fixture—I just lift it out of the slot, turn it end-for-end and push it back down into the slot to use the other side. One side cuts dadoes 2 in. from the edge of the workpiece, the other side cuts ¾-in. rabbets.

The dado fixture worked so well that I made a second variation strictly for rabbeting. One edge is sized to cut ⅝-in. rabbets and the other to cut ¼-in. rabbets. I discovered on this second jig that it's best to make the fixture to mount in the right-hand miter-gauge slot if your sawblade slides on the arbor from the right (and vice versa if your blade slides on from the left). If made this way, the fixture can be used with virtually any width dado head in the saw—any excess width in the dado head is covered and doesn't affect the rabbet.

—Don Russell, Auburn, Calif.

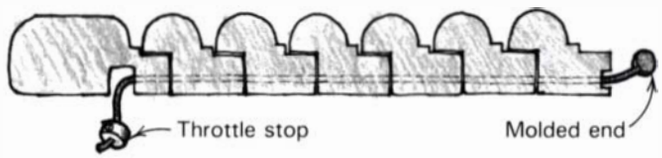
Auxiliary lathe tool rest



My lathe has a 15-in. capacity over the gap, but when I mount a large bowl or tray, it's impossible to get the tool rest behind the blank to turn the bottom. To provide a tool rest for working the back, I bent a strip of ⅜-in.-thick iron to a 90° angle and bolted it to my headstock casting, as shown in the sketch. The tool rest was so useful that I made a set of them bent to different angles to fit different shapes. For safety's sake, remove the tool rest before sanding so your fingers don't get pinched.

—Kevin G. Weir, Brantford, Ont.

Wired tambours

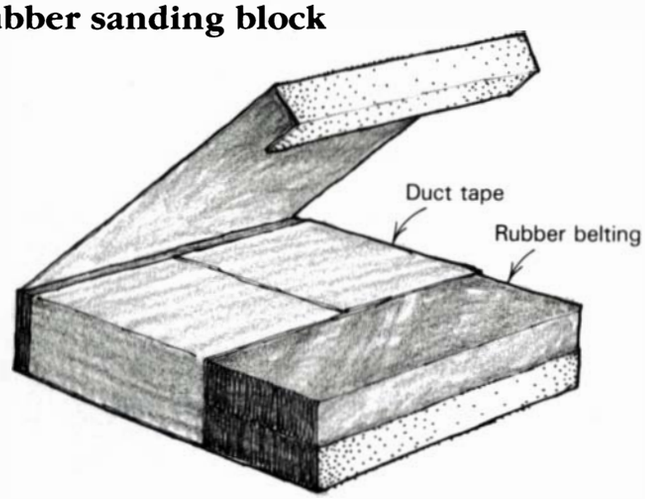


Last year one of the students in my high-school woodworking class made a roll-top desk based on Dale Tucker's wired tambours article (*FWW* #48). As a substitute for the vinyl-coated stainless steel cable Tucker recommended for stringing together the slats, we used ordinary bicycle brake cable, which is easy to find, strong, flexible and comes with a ready-made stop molded onto one end.

To make the tamboured desk top, we first shaped and cut slats with the profile shown. To align the wire holes in each slat we drilled holes in the first slat, clamped it to the benchtop and used it to guide the drill for the other slats. After all the holes were drilled, we threaded the bicycle cable through the slats, pulled it tight and locked it with a throttle stop from the local auto parts store. *—Sam Gardner, Duncan, Ariz.*

Quick tip: I live *and* work wood in a 28-ft. trailer, plus wife and cat, which makes space very precious. Instead of clamping edge-glued projects together with oversized pipe clamps, I've cut my pipes into 1-ft. sections, with both ends threaded. I use pipe couplers to assemble the clamps to whatever length I need for the job—that way I can stash projects along a wall or under a table without awkward lengths of pipe jutting out into my living space. *—Harry Kubeim, Friday Harbor, Wash.*

Rubber sanding block



The best solutions are always the simplest. When I needed a firm, yet pliant, sanding block for smoothing a long curve, I put together the block shown here, using two scraps of 5/16-in. rubber belting and duct tape. Size the block so that ⅓ of a standard sheet of sandpaper will wrap around with about ½ in. left over on each end to insert between the two pieces of belting. The block's advantages include two fresh surfaces per filling and less sandpaper waste than commercial rubber sanding blocks. It is cheap and easy to make, and a snap to load. For a good fit, fold the sandpaper around the block and crease the corners before inserting the ends.

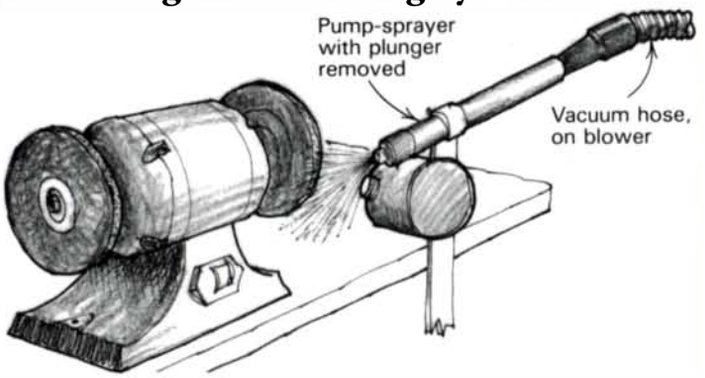
—R.G. Sapolich, Johnstown, Penn.

Two-faced sandpaper

Two-faced sandpaper, produced by sticking two pieces of sandpaper back-to-back with double-sided tape, is easier to work with because it doesn't slip under your fingers. The double-faced paper will also stick to a sanding block if the pad area is

covered with flannel cloth. The paper won't slip on the flannel but will pull off easily, so you can change grits almost instantly. —*Joel B. Johnson, Hendersonville, N.C.*

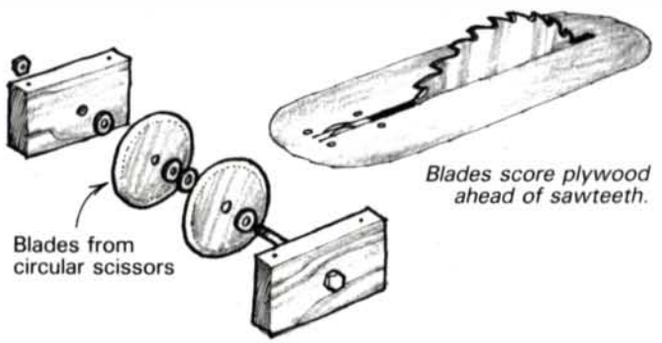
Low-cost grinder misting system



Charles Riordan describes a simple, effective sharpening system (*FWW* #39) that uses a compressed-air-powered misting device to cool the grind. Having neither the money nor the need for an air compressor in my shop, I improvised the misting system shown here. Start with a hand-powered sprayer, known in many locales as a "flit gun," and remove the plunger. Put your shop-vac's hose on the blower side and insert the hose's nozzle in the pump cylinder. Now simply fill the flit gun canister with water, mount the device on a stand near your grinder and turn on the vacuum. Voilà! Low-cost, low-tech misting. —*Peter S. Birnbaum, Sebastopol, Calif.*

Quick tip: When sharpening with waterstones, I avoid making a mess by unrolling an old plastic window shade over my benchtop. —*James J. Heusinger, Berea, Ohio*

Plywood-scoring tablesaw insert

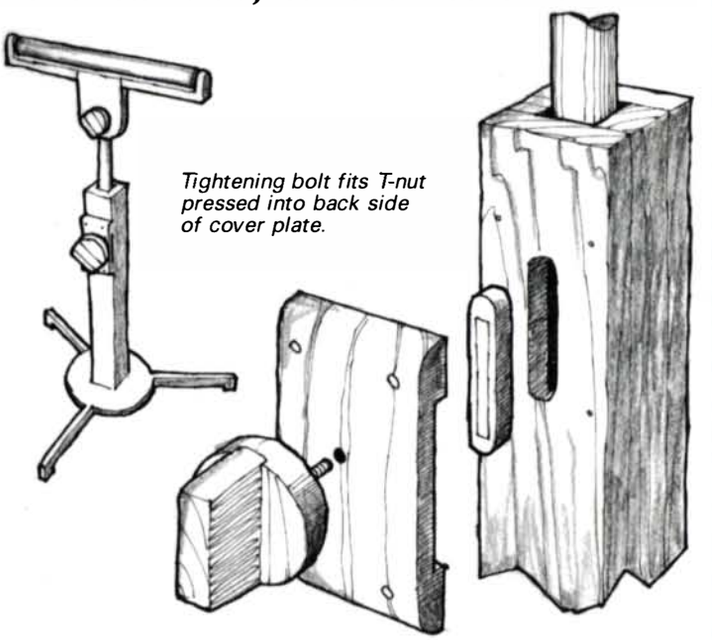


This device helps prevent the underside of veneered plywood from splintering by scoring the veneer just ahead of the blade. To make it, cut a snug-fitting insert blank from aluminum or plywood. Carefully raise the blade through it and enlarge the slot for clearance. With a straightedge against the teeth on each side of the blade, mark the outer edges of the blade's kerf on the front section of the insert. Cut along these lines with a thin saw to create two slots just ahead of the blade.

The scoring assembly uses two circular blades from the relatively new circular scissors made by Olfa. Spare blade packs for the scissors should be available at sewing and fabric stores. Make up a pillow-block assembly with a bolt axle to attach the scoring blades to the underside of the insert. Use regular washers, as well as shim washers punched from an aluminum can, to space the blades on the axle. Bolt the scoring assembly under the insert, making sure it will clear the sawblade and housing when in place. Ideally, the scorers should make a shallow cut (1/32 in. to 1/16 in.) in the plywood very slightly wider and in line with the kerf of the blade.

—*Sandor Nagyszalanczy, Santa Cruz, Calif.*

Roller-stand adjustment mechanism

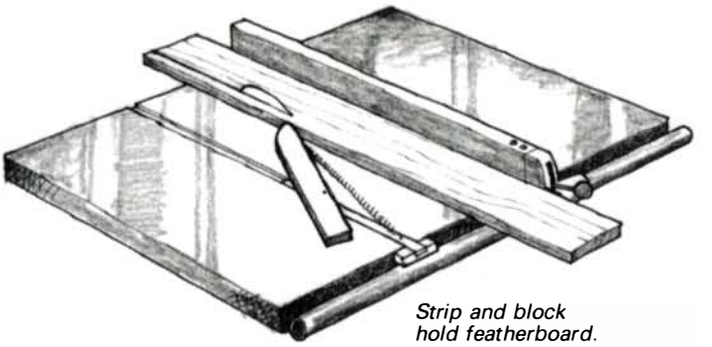


The main differences between this roller stand and other designs I've seen are the ease of adjustment and the tilting head. The tilting head, together with the three-legged base, makes it easy to cope with a shop floor which, like mine, isn't level.

The arrangement for adjusting the height consists of a bolt threaded through a T-nut pressed into the inside of a cover plate, as shown in the drawing. The head of the bolt is captured in an oak knob, which permits easy hand-tightening. The bolt does not bear directly on the sliding dowel, but on a loose wooden insert set in the post. This permits smoother adjustments and prevents the bolt from chewing up the dowel. The insert itself is protected by a brass wear strip.

—*Timothy D. Anderson, St. Paul, Minn.*

Featherboard variation



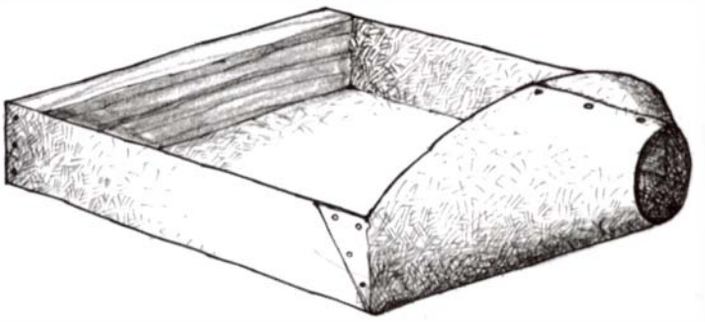
I use a variation of Arthur Kay's featherboard (*FWW* #55) that is very quick to install and remove. My featherboard is fastened to a strip of ½-in.-thick wood that's a snug fit in the miter-gauge slot. A small block on the end prevents the strip from sliding toward the back of the saw. The featherboard itself is fastened to this strip from below by a screw and is held in tension against the stock being ripped by a spring. I reversed the traditional shape of the end of the featherboard so that it would bear on the stock as closely as possible to the front of the blade, yet still clear the teeth when the stock being ripped passes through. —*Harold W. Books, North Platte, Nebr.*

Aligning pins with holes in table leaves

Here is a simple method for aligning the pins in table leaves with holes in the expanding table's top. Before gluing up the tabletop and leaves, take a piece of the tabletop stock and drill

the pin holes squarely through it using a drill press. Then rip this piece into several 1-in.-wide strips, enough to laminate a strip to all interior edges. All that remains is to carefully glue up the top and the leaves with a strip on each edge where pins and holes must mate. *—Kathleen Sillick, Gasport, N.Y.*

Sorting pan and funnel



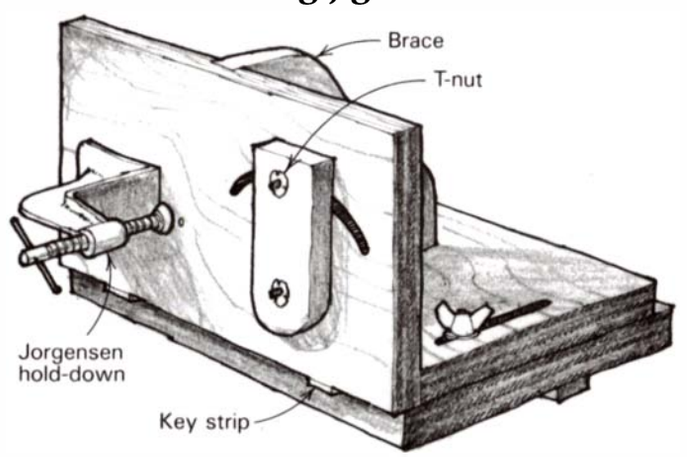
I keep a wide assortment of screws, nuts and bolts in cans with several sizes in each can. To find the item I want, I dump the can's contents into the sorting pan, where it is easy to find what I need, then I use the built-in funnel to pour the contents back into their container.

I used sheet aluminum to make the pan because it is more ductile than galvanized steel. The drawing gives the basic idea, but it has been simplified a little for clarity—a couple of refinements on my pan include cove molding glued around the bottom so things don't lodge in corners, and a stiffened top edge, made by rolling the aluminum around a length of wire.

—L. Byron Burney, Raleigh, N.C.

Quick tip: A handy trick for keeping furniture plans in good shape, instead of letting them kick around the shop, is to tape them to a roll-up window shade. They're available at the tug of a cord, and the light shining through them makes them very easy to read. *—Frederick J. Miller, Chatsworth, Ont.*

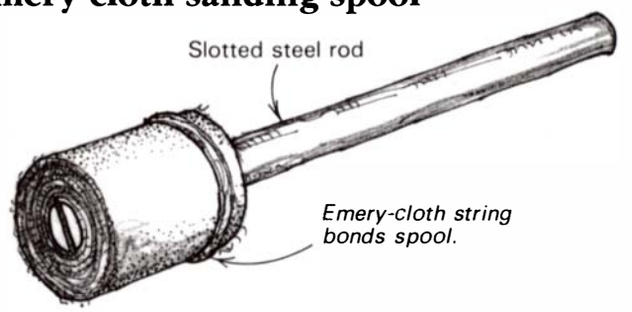
Tablesaw tenoning jig



Faced with cutting 32 tenons on a recent project, I priced a new Delta tenoning jig and found it beyond my budget. So I put myself to work and made the jig pictured here at the cost of a few ¾-in. plywood scraps and some hardware items already in my shop. It consists of a baseplate that rides along the miter-gauge slot, and a top table that adjusts closer to or farther from the sawblade. The work is clamped both against the jig's face and a vertical stop block, which can be pivoted to an angle if necessary.

To cut the tenons, I installed two identical 8-in. blades on my saw arbor with a ½-in. spacer between. I had the 32 tenons cut in no time. *—Harrie E. Burnell, Newburyport, Mass.*

Emery-cloth sanding spool



I first discovered how to make these emery-cloth sanding spools 35 years ago, when I used them to finish steel forging dies. Start by hacksawing a slot in a ⅜-in. steel shaft. From a sheet of emery cloth, rip a ribbon slightly wider than the slot. Insert the ribbon in the slot and wrap by turning the shaft in the direction it will rotate. So far, what you've made is a flap sander, but there's an improvement.

From the sheet, rip a second ribbon, keeping this one string-like, just about 6 or 8 threads wide. Wrap it around the lower part of the spool as shown in the sketch. Drop a little water on the string and, while holding a piece of scrap wood tight against the spool, turn on the drill to "burn in" the string. The glue in the threads of the string will bond tightly, banding the emery cloth into a firm spool that will last longer, sand smoother and won't flap all over your project.

—Larry Stedman, Flushing, Mich.

Quick tip: I keep my power-carving bits organized by drilling shank holes in old thread spools, and storing these in pill bottles from the drugstore. *—J.R. Karnes, Columbus, Ohio*

Making dowels the colonial way

In colonial times wooden pegs were often made by driving a square stick through a round hole in a steel plate. I haven't read much about the technique lately, but it still works. Drill a hole of the desired dowel diameter in a ⅛-in.-thick steel plate, then drill a series of two or three more holes of slightly larger diameters. Countersink the back of each hole, as shown in the sketch, then stone the front surface flat and smooth to provide a good cutting edge.

To use, cut a square stick slightly larger than the final dowel diameter, whittle a tapered point on one end and drive it (from the flat side) through successively smaller holes. In sizes smaller than ⅛ in., it's best to pull the dowel through.

Mild steel is quite satisfactory for this purpose—when the die becomes dull, just drill a new series of holes.

—H. Norman Capen, Granada Hills, Calif.

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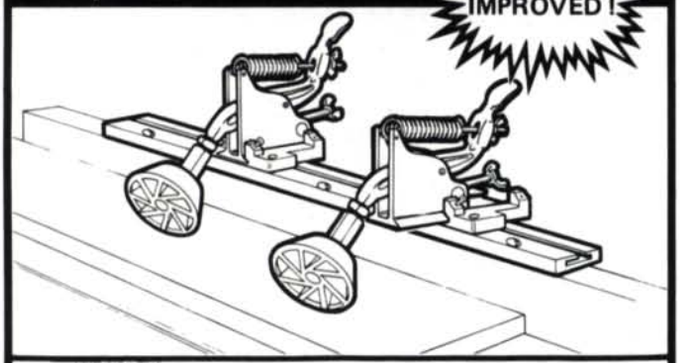

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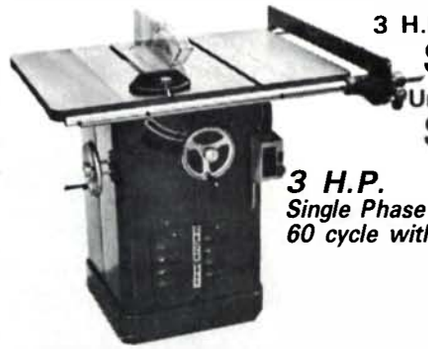

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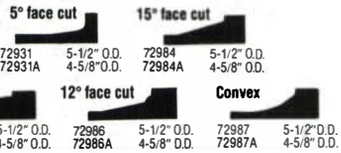

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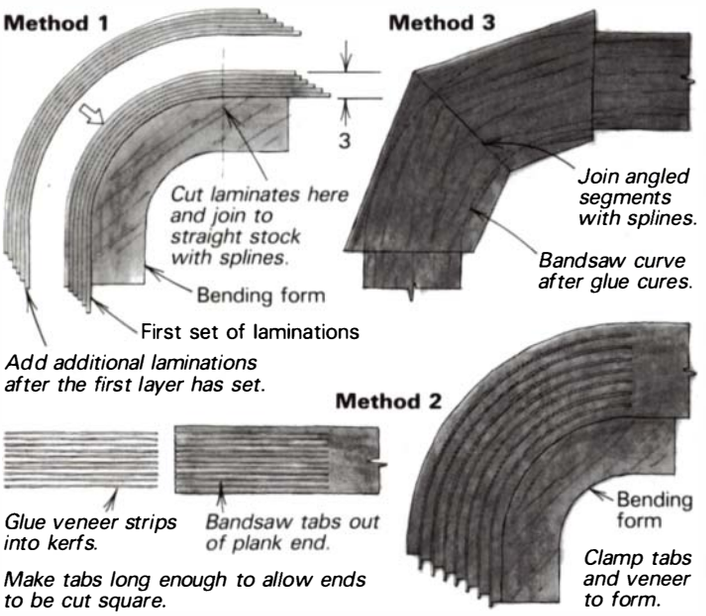
Laminating curved steps

I'm planning a set of stair treads with an abrupt bend on the flat end of each step. Could I make the treads by bandsawing oak planks into thin slices and laminating the slices around a form? *—David Shaw, Kelly Corners, N.Y.*

Seth Stem replies: The curved step you describe can be made in several ways. Although many types of wood can be bent, I'd suggest oak, ash or hickory for the tight radius shown. Because the step is 12 in. wide and 16 ft. long, it would be a waste to create both the curved and the straight areas by strip laminating the whole piece. The curved areas, however, could be laminated separately over a bending form and then joined to



the straight section with splines. Even with ⅛-in. strips, though, a 12-in.-wide lamination requires a tremendous amount of clamping pressure, so I would do the lamination in stages, about a 3-in.-wide section at a time, starting from the inner radius. Keep the outside edge of the lamination clean, so that it can be joined to the next section, by putting masking tape on it and using a wooden or metal backing strip between the wood and the clamps.

Method 2 involves bandsawing the end of a single 2x12 plank into thin slices about ⅛ in. thick. Fill the kerfs by gluing in veneer strips so the step width stays consistent, and clamp the slit end onto a bending form. The difficulties here are that it's hard to make that many multiple slices into a plank without making a mistake, and it's difficult to hold the veneer strips in place—especially butted against the end of a kerf cut—while bending the whole assemblage. As mentioned before, bending a 12-in.-wide section at one time will be difficult and will require lots of hefty clamps. I wouldn't use this method on anything except moderate curves.

Also, the curved section of the step, because it's supported by risers and perhaps other bracing underneath the tread, does not require bending for reasons of strength. If continuation of grain without joinery is not an issue, the bend could simply be made by mitering and splining several pieces of tread material together, as shown in method 3, preferably cutting the pieces from the same piece of stock to retain color and grain similarities.

[Seth Stem teaches furniture design and construction at the Rhode Island School of Design in Providence.]

Salvaging waterlogged walnut

I recently found a walnut log that apparently was left by loggers or washed up by a flood. The 14-ft. log is about 5 ft. in diameter, but the outer 12 in. of sapwood has rotted, although it's still attached to the heart. The heartwood appears sound except for some endchecks. Would the log float enough to be towed downstream for salvage? Would it be worth the trouble? *—Bill Yarbrough, Columbus, Miss.*

Bruce Hoadley replies: The heartwood of your log may still be sound and usable because walnut is a highly decay-resistant species. Before expending a lot of effort to move the log, hack through the sapwood in a couple of different places along the log, just to make sure the heartwood hasn't rotted.

It's hard to say whether the log will float. Black walnut weighs about 58 lb. per cu. ft. when green, and that's awfully close to the density of water (62.4 lb. per cu. ft.). If the log has absorbed a lot of water, it could sink. The best bet would be to cut a section off and see if it floats. If it doesn't, you could lash some lighter logs to it and raft it downstream, as is done to float heavy tropical species to the sawmills.

I also suspect the log would have been affected by some bacterial infection. I've found that long-standing walnut logs have a very foul smell when wet. The wood may also give off an odor when it's machined, but the final finished objects usually have no objectionable smell.

[Bruce Hoadley is professor of wood science at the University of Massachusetts at Amherst.]

Converting a router to a shaper

I'm considering modifying a large ½-in.-shank router to make a shaper, similar to the router table setup I now use with a ¼-in. router, so that I can use the ½-in.-shank panel cutters and other large router bits that are available now. Is it possible to do this? *—Ronald Frey, Clay, N.Y.*

Bernard Maas replies: Many woodworkers consider substituting a big router for a shaper. I don't believe that you can get the overall equivalent results from a 20-lb. router that you can from a 300-lb. to 400-lb. shaper. Even though the horsepower ratings may be the same, you can't equate the service of a 3-HP router motor with the 80-lb. behemoth that drives Delta's heavy-duty shaper. Also, technicians for several of the companies manufacturing the larger routers say they don't think the routers can take the stress of powering large shaper-type cutters. They fear this stress will destroy the bearings and the resultant heat buildup will cause motor components to fail.

There also are some very important safety considerations. Spindle speeds on a shaper run from 5,000 to 10,000 RPM. A router runs between 20,000 and 25,000 RPM. Centrifugal forces are squared by an increase of RPM. That is, if the RPM is increased from 5,000 to 20,000 (by a factor of four), the force is increased by a factor of 16. Make sure your bits can stand the strain. Also, the panel-raising bit you describe is 4 in. in diameter and weighs more than 6 oz. A standard ⅜-in. carbide roundover bit with a pilot bearing weighs less than 1½ oz. and is 1¼ in. in diameter. A large bit has a tendency to grab the stock, possibly dragging the operator's hands into the cutter.

I think you can get some shaper-like functions with a router, especially if you have specific and limited applications in mind. For example, I use a lock-miter bit in limited drawer production and classroom work. I use it in a handheld router with a special jig and the results are reasonably good and fairly predictable. You won't get true shaper performance and all its possibilities, unless you get a machine specifically designed for the purpose.

[Bernard Mass is associate professor of art and wood technology at Edinboro University of Pennsylvania.]

Dado splinters plywood

I recently purchased a 6-in. carbide-tipped dado set. When cutting dadoes across the grain in plywood, the plies splinter badly. My saw motor is rated at 3,500 RPM. Is the motor too slow, or is there some trick to prevent the wood from

splintering? Solid wood doesn't splinter across the grain, nor does plywood splinter when cut with the grain.

—Dan Graupensperger, Orange, Calif.

Rich Preiss replies: Tearout of surface veneer when dadoing plywood is not unusual, but it can be minimized by paying attention to a few details. Since dadoes aren't often cut very deeply, the power or speed of the cutter isn't usually a problem. I'd say your saw is appropriate for this work. The key to clean cutting is the parallel alignment of the cutter to the fence. Any variation from true parallel, either within the stack of dado cutters or to the rip fence, will cause one of the outside blades to catch and tear the thin surface veneer.

To eliminate the splintering, I'd recommend that you first go back to your standard 10-in. blade and align your rip fence according to your owner's manual. Make sure that the blade falls dead center in your kerf and test to see that there is no aftercut as you saw your material. Measure carefully to ensure continuous alignment along the full length of the fence. When stacking your blades and chippers, make sure that there is no foreign matter between the parts and that all surfaces pull up snugly when you tighten the nut. Try a crosscut now and compare the results. Feed slowly and evenly with good downward pressure on the plywood as it passes the cutter.

A couple of other tricks might also reduce splintering. First, make a wooden throat plate blank and raise the dado head through the insert to the desired height. A throat plate cut in this manner will support the delicate veneer fibers right up to the line of the cut. Second, and I do this especially on expensive, hardwood-veneered plywood, thoroughly burnish a piece of masking tape over the line where the shoulder of the cut will occur. The tape will hold the fibers together while you cut the groove. After the cut, peel the remaining tape away by pulling with the grain, then sand the surface smooth.

[Rich Preiss supervises the woodworking shop at the University of North Carolina at Charlotte.]

Imperfections of hand planing

I recently restored a Stanley No. 4 metal smooth plane. I'm impressed with the smooth cut, but troubled by the surface ridges created between adjacent passes of the plane. The ridges can be felt along the entire board, but are slightly greater at the ends. I've been able to remove the ridges with a couple of passes of a scraper. The cutter has no nicks and the corners are slightly rounded. Are these ridges common or am I doing something wrong? *— Mark Zeglen, Heath, Ohio*

Norm Vandal replies: A hand-planed surface is just that, and it includes slight ridges at the intersections of adjacent passes. These ridges should be tactile, felt rather than seen. Obviously, the finer the set, the amount the iron protrudes from the sole, the smaller these ridges will be. Rounding the corners of the iron, as you have done, makes the ridges less abrupt, but it is impossible to remove these ridges completely. The solution is to keep them as imperceptible as possible.

After you have surfaced the entire board, try going over it again with the plane iron set extremely fine, taking as light a shaving as possible. This setting is possible only with a well-tuned plane—the bottom must be flat, the iron honed and set correctly to the base. The fact that the ridges are more pronounced at the ends of the board is a factor of the length of the plane sole as compared with the length of the board, combined with how you're holding the plane. Try applying pressure on the toe of the plane as you begin the cut, and on the heel as you finish. Or, get yourself a longer No. 7 Stanley jointer, true it up and use it for surfacing long boards. You'll be surprised how well it will work.

Lastly, learn to rejoice in the subtle imperfections and sensual textures of the hand-planed surface. Think in terms of hand-woven vs. machine-loomed textiles, a beautiful tapestry as compared to double-knit polyester.

[Norm Vandal makes period furniture and architectural furnishings in Roxbury, Vt.]

Water-repellent exterior finish

We make old-fashioned maple folding lawn chairs, and need a finish that will withstand summer wear and resist humidity. Last year we tried varnish and tung oil, but the results were not too good. Any other recommendations for a water-repellent exterior finish? *—Berton LeBlanc, Moncton, N.B.*

Beau Belajonas replies: I've had excellent results with this simple formula for outdoor finishes. Start with a good indoor/outdoor phenolic resin-base spar varnish. Masury paint makes an excellent product called Cosmo Spar (available from local hardware and paint supply dealers) that dries in four hours. After sanding the chair to 220-grit paper and wiping off the dust with a tack cloth, thin the varnish 50/50 with mineral spirits and apply with a brush or cloth. Let it dry overnight. Sand smooth with 220-grit paper and wipe again with the tack cloth, then apply a second coat of the 50/50 solution. For the third coat, apply a mixture of three-parts varnish to one-part mineral spirits. Let the third coat dry overnight, then sand with 320-grit paper. The fourth and final coat is full-strength varnish. When the last coat has dried, you may want to dull the gloss with 000 steel wool and polish the surface with a good grade of wax. This finish is very durable and resistant to summer humidity.

[Beau Belajonas is a professional woodfinisher in Camden, Me.]

Taming Osage-orange

How do you cure, dry and stabilize a piece of Osage-orange? I need a 1¼-in. by 6-in. block of Osage-orange for turning the barrel of a duck call. So far, the Osage-orange I've cut has checked so badly, no matter how I try to dry it, that I haven't been able to salvage a piece large enough for a duck call. What can I do? *—R.T. Sniegocki, Little Rock, Ark.*

Jim Cummins replies: Try working with green wood. Take a piece of Osage-orange, drill the center hole for the duck call and turn the outside to shape. The purpose is to get the barrel to near the right size, thereby removing the excess wood that causes the checking through differential shrinking. As soon as the outside is turned, wax the piece and put it into a large shopping bag full of the wood's own fresh shavings. Roll the top of the paper bag shut and set it aside for a month or more. The wet shavings maintain a constant moisture level around the work, and the paper bag gradually allows this moisture to dissipate. I've used this trick many times to dry lathe turnings and have never had a crack. Osage-orange is especially tricky to dry, as you know. It wouldn't hurt to dry a half-dozen blanks this way, each in its own bag, in case some do crack.

Don't forget that the turned cylinder won't stay round as it dries, but will become oval. Drill the center hole a little undersize to allow for redrilling after the work is dry, and cut the outside a little full for the same reason.

If you feel high-tech, you could try drying the drilled and turned cylinder in a microwave oven, at the defrost setting. This will require a little experimentation, but you won't have to sit around a month or so to know if the wood will check or not.

[Jim Cummins is an associate editor of *Fine Woodworking*.]

Reader exchange

The rose metal mentioned in books and articles by Tage Frid as an inlay in wood is available from Belmont Metal, 330 Belmont Ave., Brooklyn, N.Y. 11207. It's sold as bismuth alloy.

Send queries, comments and sources of supply to Q&A, Fine Woodworking, *Box 355, Newtown, Conn. 06470.*

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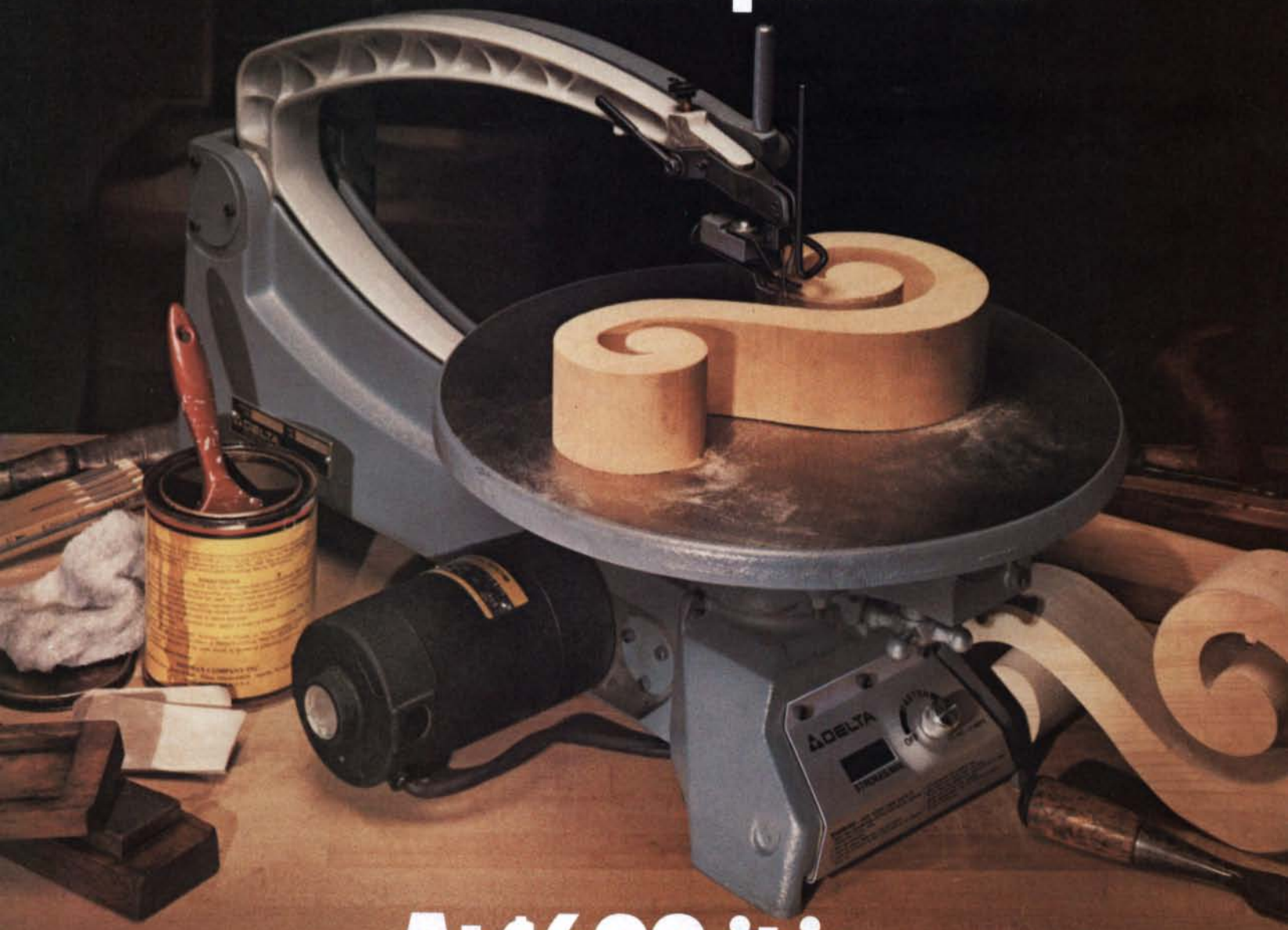

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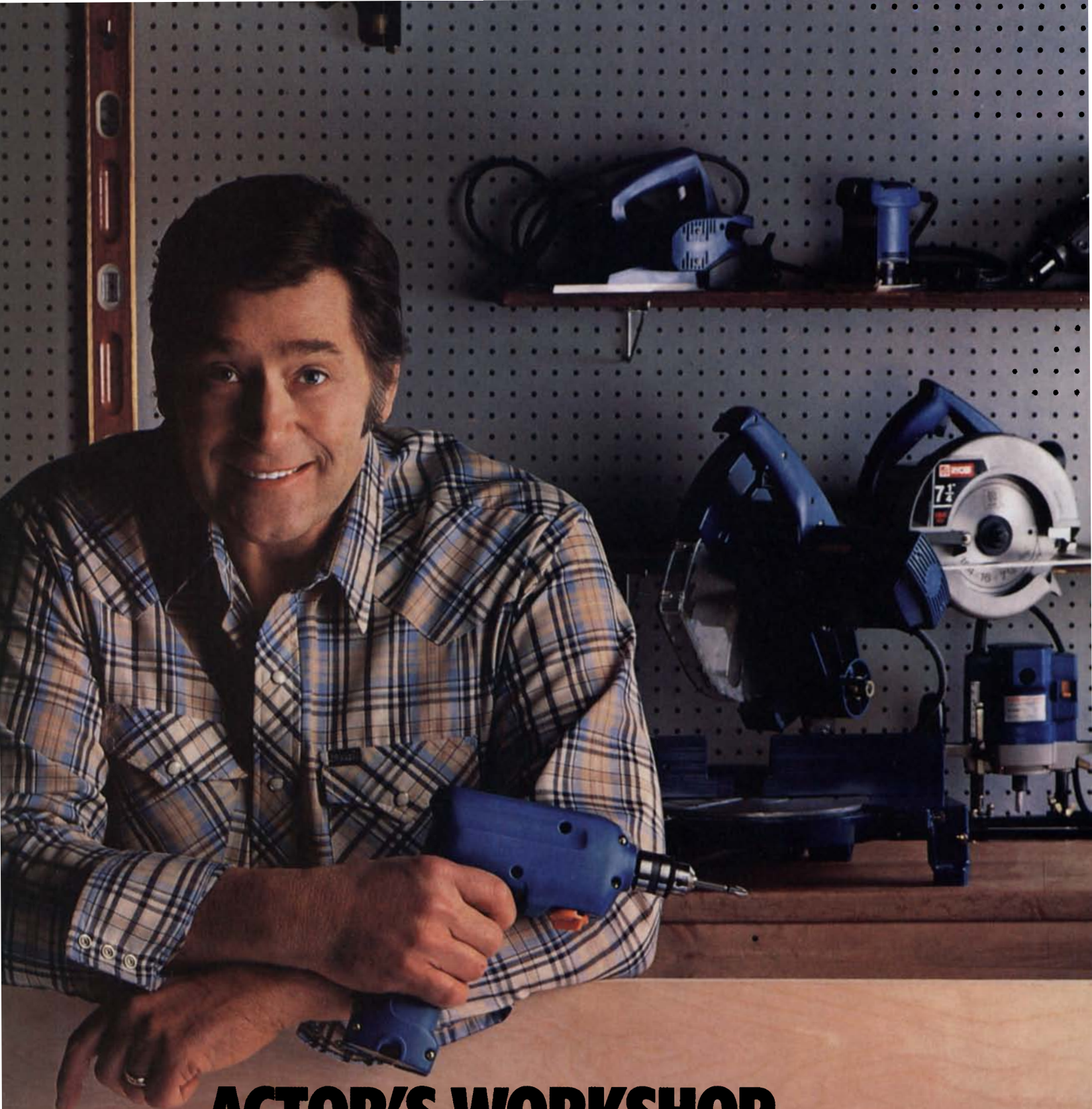

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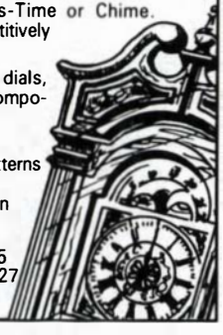

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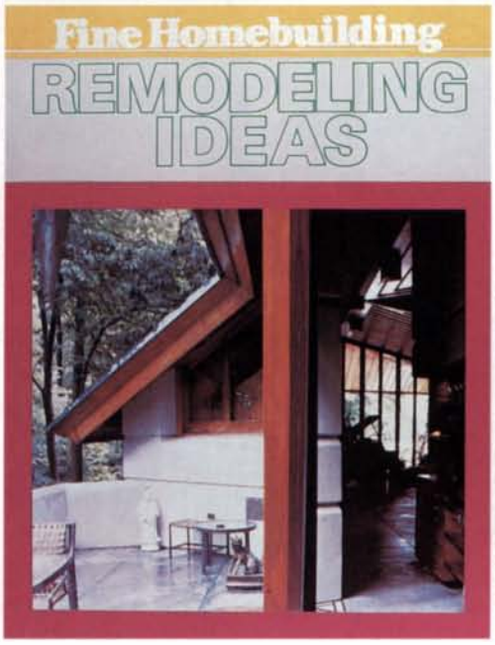

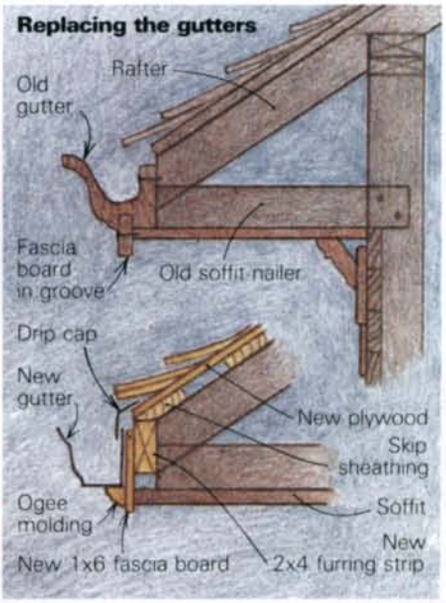

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Terry Wild Studio

Chairs of this Philadelphia-Chippendale pattern were produced by the thousands between 1770 and 1800. This utilitarian framework accepts all the fancier variations as well—pierced ladders, open splats, curved front rails, even ball-and-claw feet—without much change in angles or joinery. Landon's reproduction, finish hardly dry, is the one at left.

Making the Chippendale Chair

The way to a chair is to mind your flats and squares

by Eugene E. Landon

Chippendale chairs come in a profusion of designs: ladder-backs, Gothic backs, pretzel backs, some with ball-and-claw feet, some with intricate carving and detailing. The list could go on and on. Yet there's really only one Chippendale chair, because all the variations hang on a common framework. If you can master the chair in this article—it's not really difficult—you should be able to see your way clear to building any of the others. This particular design can be found in *The Philadelphia and Chair-Maker's Book of Prices*, second edition, 1795 (no copy of the first edition has yet been found).

The apparent problem in building a chair is that the seat is trapezoidal and the back posts not only curve, they splay out from the floor upward. This means that most of the chair's mortise-and-tenon joints are not at 90°. To compound the situation, it would seem that all those curves must make it very difficult to cut and fit shoulder joints. Well, the problems look a lot worse than they are. In making this chair we will start with the back posts, then cut each subsequent part to fit in a logical order.

I should say at the outset that you will need some common handtools to build this chair. If you are mostly a machine woodworker, you may never have been taught the virtues of handtools. I remember visiting a woodworking shop at a nearby school. I could hardly believe it, but there wasn't a marking gauge in sight, let alone a mortising gauge. I wouldn't know how to work without gauges, yet they are forgotten tools. You see them for sale in junk shops, garage sales, anywhere there's useless clutter. If you think about it for a moment, there must be *millions* of them out there. It makes you suspect that they might have been used for something, doesn't it?

I could make this chair very easily without electricity, but I could not make it at all without a bevel gauge, my marking gauges, a few sharp chisels, a plane or two, some scrapers, and some rasps and files. If you shy away from such tools, you are not alone, yet trying to duplicate their functions with a machine can be frustrating. For this project at least, I think I can show you that handtools are the right way to go.

The key angle—In building this chair, you would start by scaling up the templates shown on the next page. But if you were reproducing an existing chair in your own shop, you'd begin by determining what I call the chair's key angle—the angle at which the back seat rail meets the back posts, as shown in the photo below. This angle is the same as that at which the chair's back posts meet the crest rail. If you get this angle wrong, the posts will be out of line and no amount of measuring and gauging from the original will make the chair right—you may still end up with a chair, but you will be playing catch-up all the way.

As long as you have this key angle in your mind's eye, let's examine the main misconception most people have about a Chippendale chair, namely that it is composed of a series of continuous curves. It is not. At every place where a mortise-and-tenon joint comes together there is a planed flat, so that the tenon shoulder lines can be straight. There are short flats where each ladder joins the balloon-shape of the back, and longer flats for the side seat rails. There is even a flat low on the back leg for the side stretcher. The secret to making a chair is to be conscious of these flats, to shape them square to the members, then to fair the adjoining curves to meet them.

Begin with the back posts—The templates in figure 2 were scribed directly off the old chair in the photographs. The side-view template should be laid on the stock, traced, then bandsawn. Two back posts can be bandsawn from a piece of wood 37 in. long, 6 in. wide and 1¾ in. thick. Rough out the side view of the top tenon at this time, but don't saw too tightly to the lines—we'll saw and chisel this tenon to final size later.

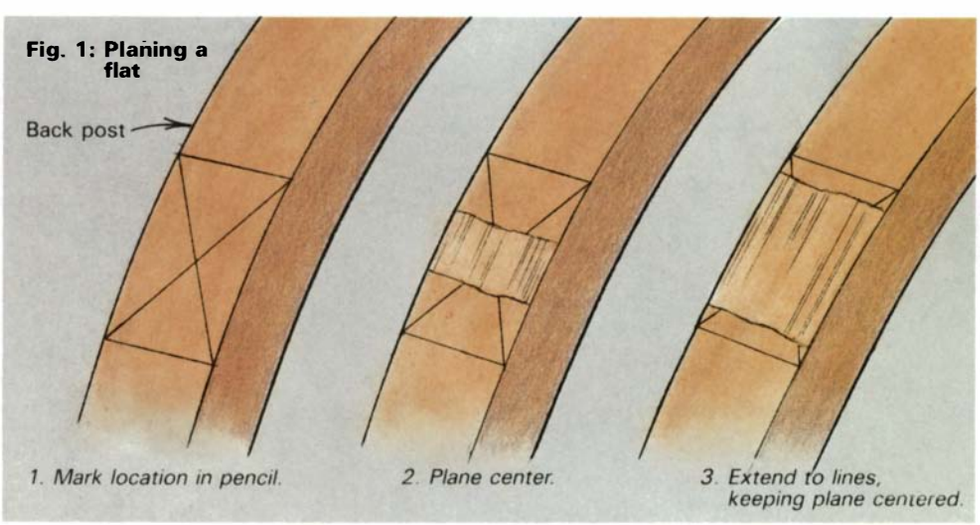
Mark the location of the flats for the side seat rails and stretchers, then plane them square. The trick for planing a true flat is shown in the sketch below. Next, use a series of three or four files, from a rough half-round rasp to about an 8-in. smooth file, to remove the remaining bandsaw marks, both front and back. Drawfiling gives the most precision—with the handle of the file in your right hand and the toe of the file in your left, push the file away from you along the work as if you were holding a rolling pin. If your strokes are long, the scratch pattern will give a clear indication of where the high spots are. Chamfers can be stopped using a ½-in.-dia. rat-tail file to achieve the curve.

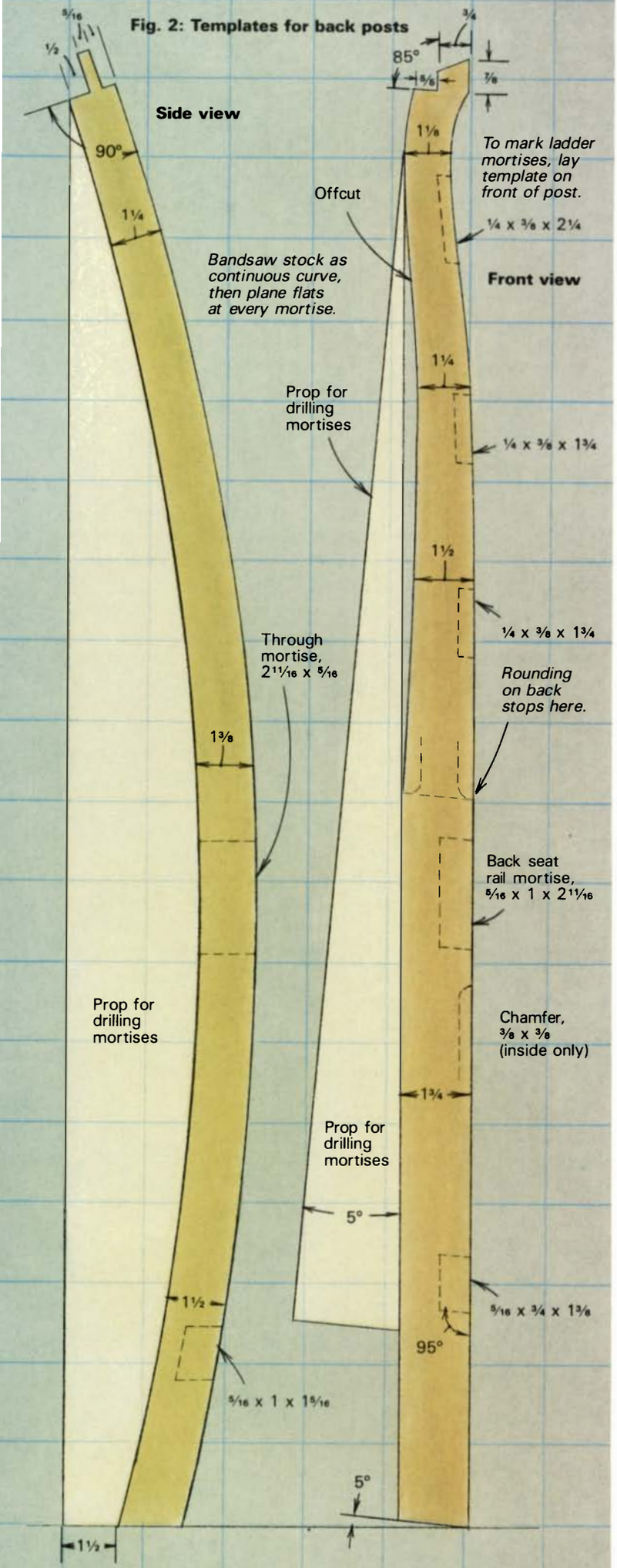
Files and rasps are precision tools. A coarse rasp may look as if it is butchering the wood, but it is safe to use to remove wood quickly because the scratches are all of uniform depth. The next file in the series replaces the coarse scratch with finer ones, and so on, until the surface is smooth. The whole job should take but a couple of minutes, just remember not to file into the flat spots. At this point, the curve should look continuous; it will look even more so when the chair is together.

The file marks are best removed with a scraper (*FWW* #58). It

The slope of the shoulders on the back seat rail is a key angle—it determines the splay of the back posts, and thus affects the sizes of all the other parts in the back.

Fig. 1: Planing a flat





is not necessary to scrape the upper parts of the post at this time—the front surface will be molded with a scratch stock, and the rear surface will be rasped round after the front-view curves have been bandsawn. The main reason for filing the curves on the upper posts is to be sure they are continuous and even down their centerlines. The lower parts of the posts will remain square from now on; therefore, scrape the front and back faces, then plane the lower legs inside and out. Take care here—these will be the final surfaces on the finished chair.

Chisel tips—Now is a good time to shape the top tenon, taking the sizes from figure 2. Saw, then pare the tenon shoulders to the correct angle (set with a bevel gauge), and adjust its thickness to 5/16 in., a step easily done with calipers as a gauge and the proverbial "sharp chisel," a term that can use some explanation.

There is really only one trick to using a chisel—its back must be absolutely flat, and polished as smooth as the bevel. When this is the case, you can lay a chisel down flat on the work, bevel up, and pare high spots away without risk of digging in. If you find the wood tearing because of contrary grain, simply pare in from the side of the tenon, cross-grain, instead of from the end. When cutting shoulders, press the chisel into the knife line, overlapping the cuts along the full length of the joint, then pare off the chips to establish a slight ledge. With the ledge as a backup behind the chisel, heavier cuts can be taken without danger of the chisel "backing up" and damaging the shoulder line. You can form a perfect square shoulder this way, but in fact, all the joints in this chair are undercut, as shown in figure 4.

If your chisels seem sharp but won't pare flat, it is because the back is rounded. The rounding may be so slight that you can barely see it, but such a tool rides up over the fibers you want to cut, just as the raised tip on a ski rides up over snow.

When the post tenon is sized, clamp the front-view template to the front of the leg and pencil the curves. You can bandsaw the front profile by supporting the post on the offcut from the stock, just as you would to bandsaw any three-dimensional object.

With this done, mark and shape the flats for the ladders. The best approach is to clamp the two legs side-by-side in the vise for marking, to ensure that the flats will align.

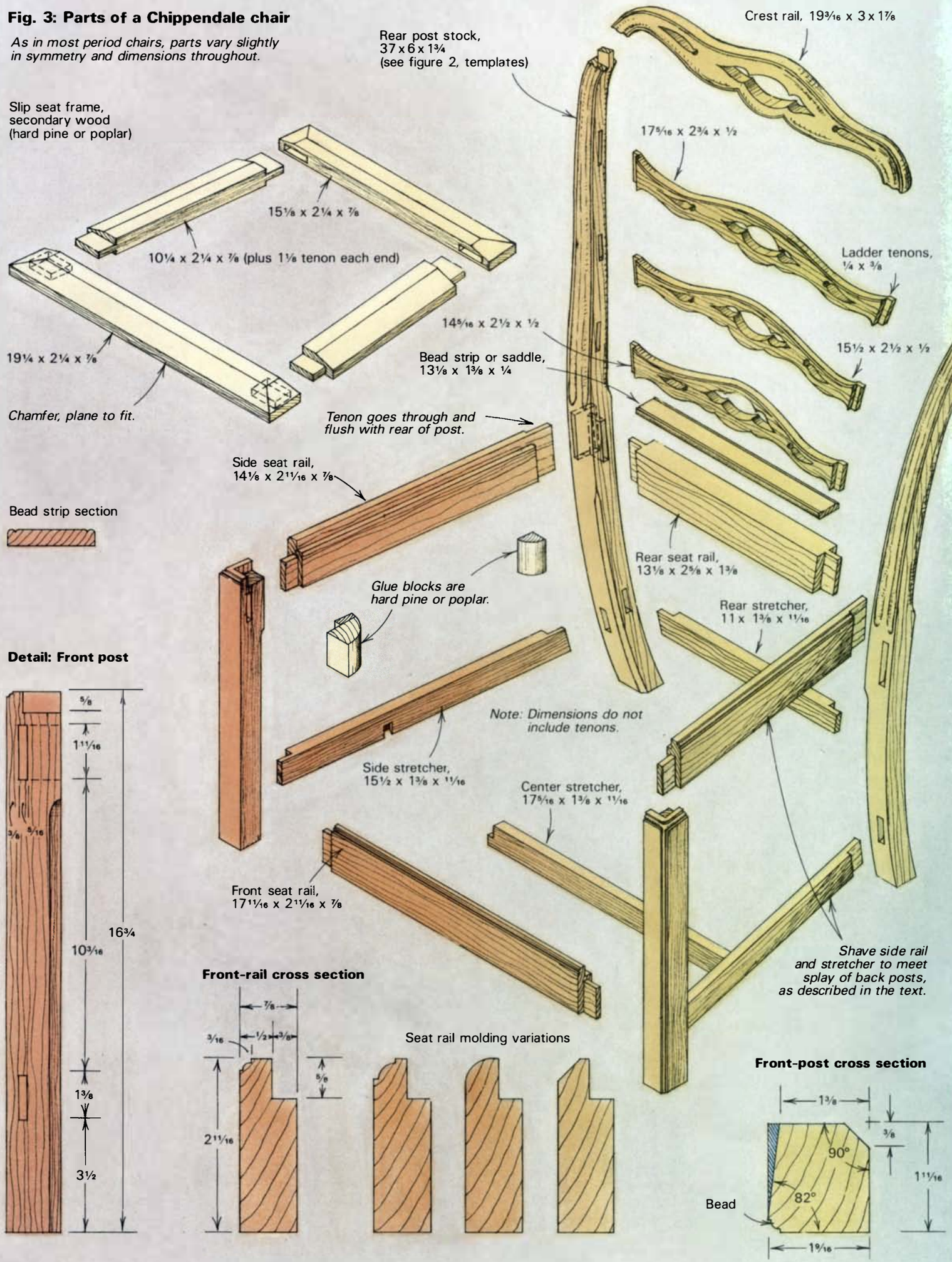
Laying out mortises—Scribe mortises with a mortise-marking gauge and/or knife, then use the drill press with a slightly undersized bit to remove most of the waste. Relieving the wood this way reduces the chance of splitting. Finally, pare to the knife lines with a chisel.

Gauges and chisels are extremely precise "partners" in handtool woodworking. To explain, let me begin with a couple of definitions: The familiar marking gauge has a sharp pin that scratches a single line—the pin can be set and locked a certain distance from the fence. A mortising gauge is similar to a marking gauge, but it has two pins that can be locked various distances apart to scribe parallel lines. The distance the pins are set apart represents the width of not only the mortise, but also the width of the tenon that will fit it. The distance the pins are set from the fence represents the distance the joint is from the face of the work. If you always run the fence along the outside faces when scribing, the two pieces will align perfectly when the joint comes together. Why? Because the final cuts are made to the line by starting the edge of a chisel directly in the scribe mark. This halves each scribe line down the middle, with a built-in precision that would require painstaking setup time on a machine.

The man who made this chair some 200 years ago set his mor-

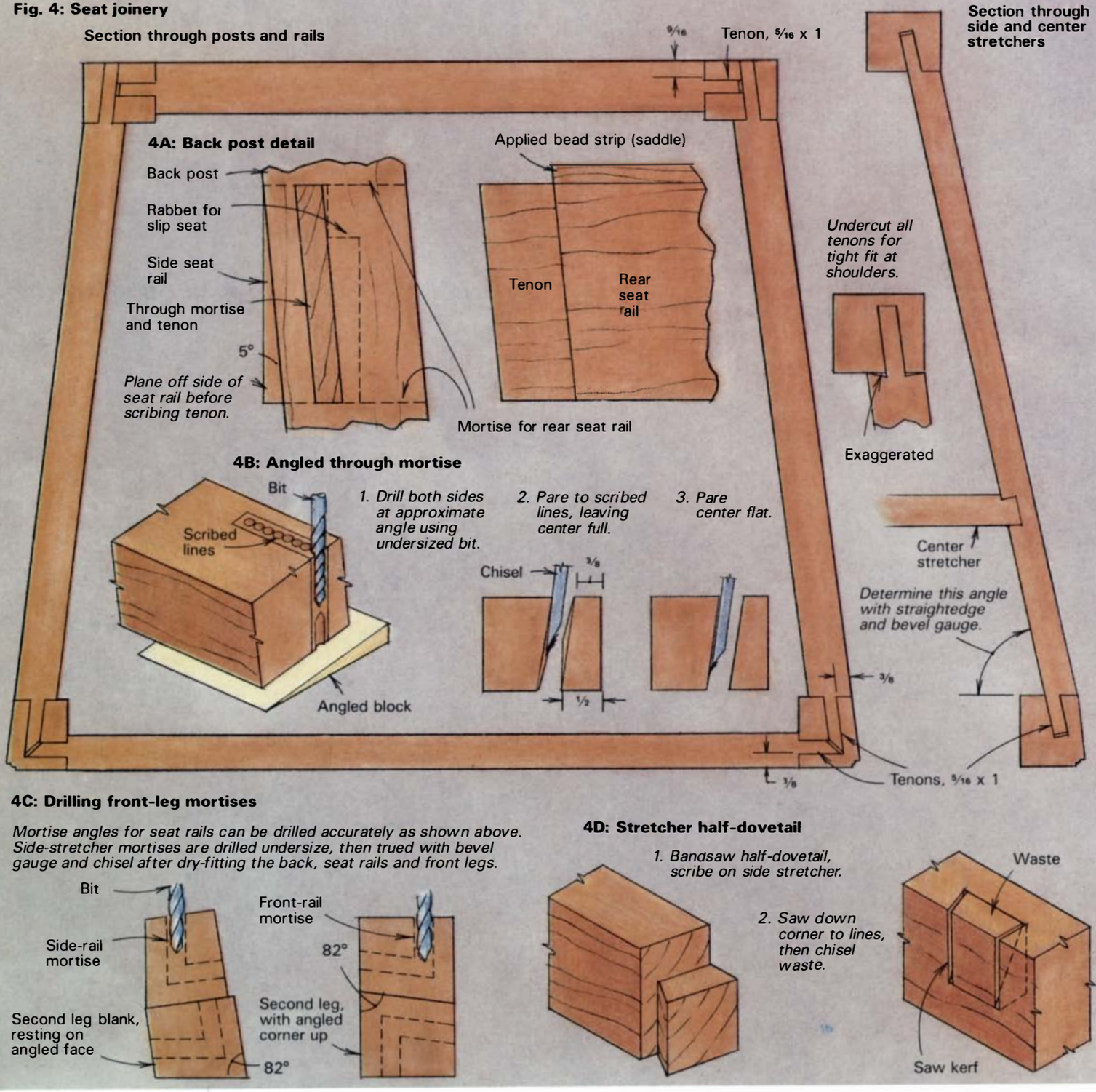
Fig. 3: Parts of a Chippendale chair

As in most period chairs, parts vary slightly in symmetry and dimensions throughout.



Drawing: Lou Bassler

Fig. 4: Seat joinery



tising gauge to scribe two lines 5/16 in. apart, then he left it there. Every mortise in the chair is 5/16 in. wide, except those for the ladders. He probably had another gauge, set at 1/4 in., for them. On complex jobs, I've had as many as six or seven gauges working, each pre-set to a specific critical dimension.

Sizes and locations of the required mortises are shown on the templates, with details of their angles in figure 4. The one that looks trickiest is the through mortise for the side seat rail. This through mortise is a Philadelphia hallmark, and I expect that it caught on for two reasons: First, to the chair buyer, it looks strong. Second, chairmakers like it because it is actually easier to cut than a blind mortise—figure 4B shows the strategy: Drill in from both sides with the work supported on angled blocks, using a drill considerably undersized. Then chisel to the lines on both sides, leaving the center of the joint to be pared out as the last step. With this method, an 18th-century cabinetmaker could simply eyeball the approximate drilling angle, as it was the final chisel cuts that would true it up. My drill press, therefore, is the equivalent of a brace-and-bit, not of a modern machine tool, which would call for elaborate angle jigs to cut directly to the line. It would be absurd to claim that a drill press is a handtool, but that's the spirit in which I use it.

Making an angled blind mortise is more difficult, but in this chair the drill press begins the correct angles and they can be pared remarkably true by simply angling the workpiece in the vise, as shown in figure 6, so that you are chopping perpendicu-

lar—any last adjustments can be made when the pieces are dry-fit together. As an aid for drilling and paring, the splay angle of the legs can be scribed on the front surface of the leg with a bevel gauge. Don't scribe the rear of the leg, or the marks will show in the finished chair.

Figure 4C shows strategies for ensuring the correct angles in the front-leg mortises. If you choose to, you can devise similar fail-safe tricks for the bottom mortise in the rear posts—which turns out to be the only mortise in the chair that's difficult to line up. I generally eyeball it using a bevel gauge to indicate the angle in top view, and positioning the post in the vise so that the side-view angle can be chopped perpendicular.

One piece at a time—The rear seat rail, as mentioned earlier, is the keystone that establishes the critical angles in the chair. Consider this lowly piece of wood for a moment. It is merely a length of mahogany with a tenon on each end. The shoulder lines are scribed with an X-Acto knife and a bevel gauge, roughed out with the bandsaw (by tilting the workpiece), then pared to the scribed lines with a chisel. This is *not* a difficult piece to make, nor, considered one at a time, are any of the rest of the pieces of the chair. Each may have its minor peculiarities, but I'll show you how to deal with them as we proceed.

The front rail is vertical and the rear leg splays. Because of this, the outer face of the side rail must be "twisted" to conform to the splay of the leg. The reflection in the photo, top right, shows that the rail is simply tapered on the diagonal to the necessary angle at the rear. Here's how to twist the rail:

According to the dimensions in figure 4, measure and scribe the twist angle on the endgrain at the back end of the rail blank. It wouldn't hurt to scribe the taper line along the bottom of the rail as well. A plane can then remove the wood down to the lines. Here is an example of another woodworking "partnership," that of a plane and a scribed line: As soon as the plane iron has cut down as far as the scribed line, the indented line appears as a feathery shimmer at the edges of the work, warning you that you have gone almost as far as you must—you don't have to keep looking at the edges of the work to see where you are.

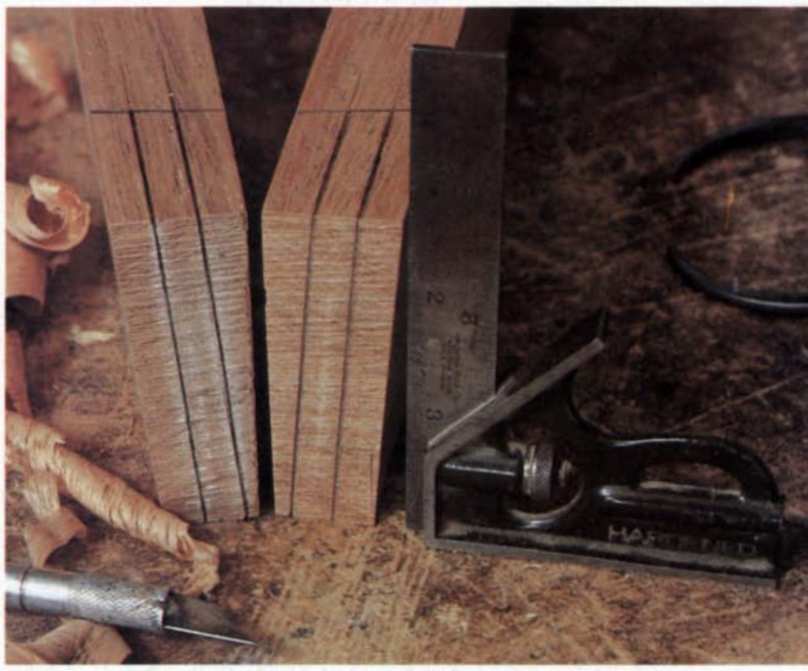
Once the faces of the side rails have been planed to shape, laying out the tenons is straightforward. The rear tenon is angled, as shown in the photo at right, but because it is scribed with the mortising gauge against the tapered outside face, it is scribed, in effect, just like any other tenon—square. I simply tilt the piece to bandsaw near the lines. The chisel does the rest.

The side rails (and the front rail) will be rabbeted on their inner edges to contain the slip seat. You could do this now. I usually use an old wooden rabbet plane for the job, but on this chair I used my Stanley 45, for the sole reason that a lot of you guys out there might want to show this paragraph to your wives and say: "See, honey, I really *did* need to buy that tool!" Of course, this cut is a perfect excuse to use a tablesaw.

The seat rail edges and front leg, in this chair, were beaded with a molding plane. This beading is optional, because in similar period chairs it might have been a chamfer or a plain round. I'd rather see these alternatives on a reproduction than see a molding generated by a stock router bit.

The top of the front leg posts must also be rabbeted so the seat will fit, but this step is done with mallet and chisel after the chair is assembled. Notice that the glue blocks are large enough to support the corners of the seat, doing double-duty, as it were.

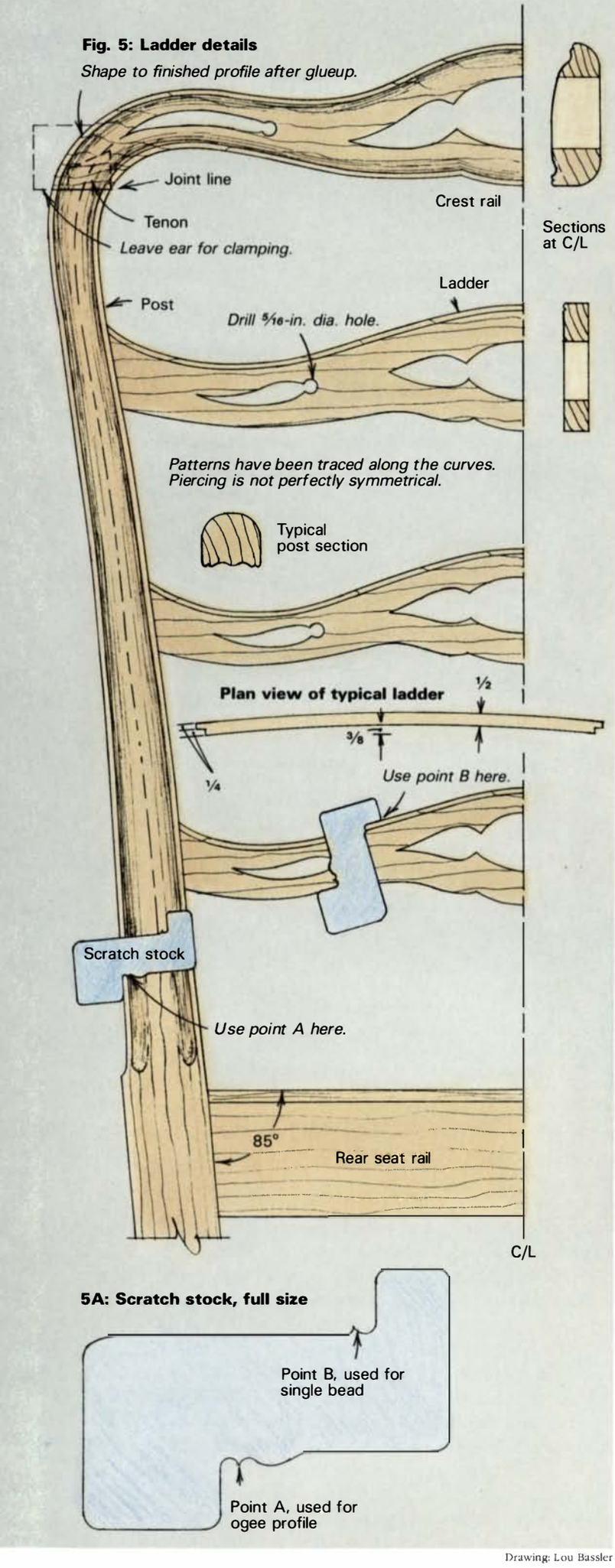
The stretchers are miniature versions of the seat rails and should prove no problem, but note that the side stretcher's angle



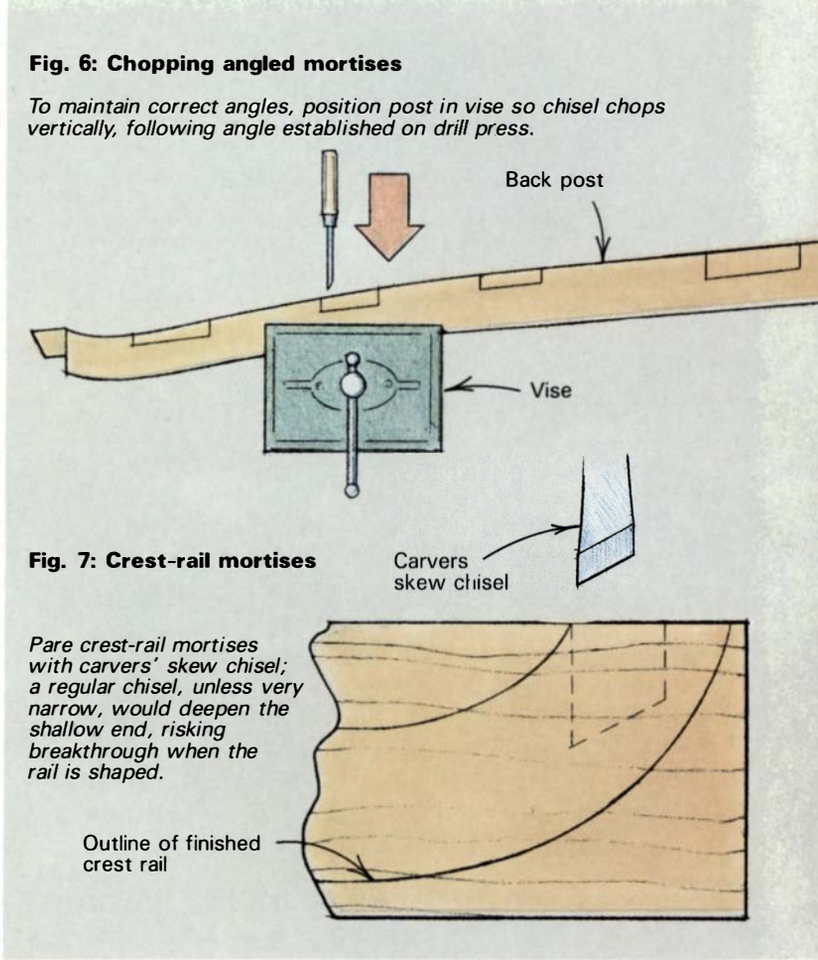
Top, the reflection on the side seat rail highlights the strategy for 'twisting' it to meet the splayed rear post—the surface is planed down along the diagonal. In normal lighting, the rail looks flat, with the twist more easily felt than seen. Lower photo shows the rear tenons on the rails (scribed marks darkened for clarity).

is more acute than the seat rail's. Notice, also, that they have only one shoulder on the tenons, so that the mortises can be wide, yet remain away from the face of the legs. This is typical chairmakers' strategy, keeping things strong. The single-shouldered tenon also shows up in chairs with a vertical splat, in case you would like one instead of the ladders, but the single tenon at the bottom of the splat must have its shoulder at the rear, while the tenon at the top has its shoulder at the front—otherwise there's no place to cut the mortises. Vertical splats are slipped into place after the rest of the back has been glued up. The saddle, which holds the splat at the bottom, is an applied piece, just as is the decorative bead in our chair. The saddle is glued atop the rear seat rail to secure the splat, which floats freely in its mortises both top and bottom—if you glue a splat it may split.

The center stretcher is fitted after the chair has been glued up—bandsaw the half-dovetail as shown in figure 4D, removing the saw marks with a chisel. Scribe the shape onto the bottom of the stretchers, then begin the sockets by handsawing down the



Drawing: Lou Bassler



lines as far as you can go. Next, chisel out the waste. If you have never made a half-blind dovetail this way, you may be surprised at how easy it is.

The crest rail—The mortises in this rail are as large as they can be without breaking through the top. Lay out the mortises and the profile of the rail on a piece of squared stock, then relieve the mortises on the drill press, being very careful not to drill too deep at the shallow end. Pare them as shown in figure 7.

Cut the front and the top profile of the crest rail on the bandsaw, but leave a couple of "ears" at the ends for clamping, as shown in figure 5. I make the pierced decoration on the crest rail by drilling 5/16-in.-dia. holes straight through, then using a power scroll saw to cut the rest of the curves (you could use a saber saw or a hand fretsaw). The back of the crest rail is rounded with rasps, files and scrapers to the approximate cross section shown. It is not possible to show drawings and photos of all these compound curves, but as a guide I might say that the back of the crest rail looks as if it were blown up with a bicycle pump, with hardly a flat spot anywhere. The backs of the ladders are eased somewhat, but are basically flat.

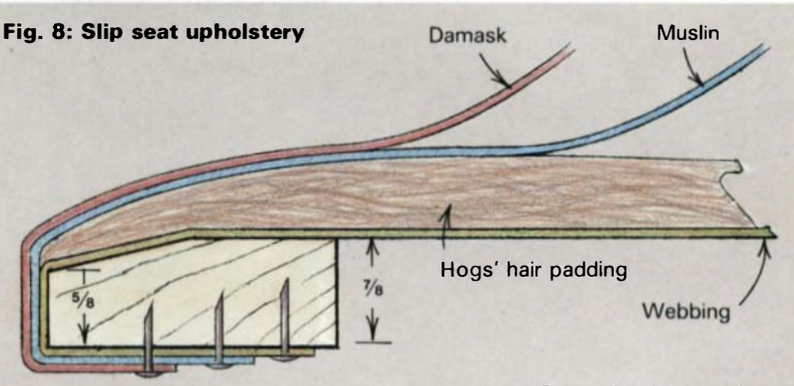
The fronts are beaded with a scratch stock. The one I used was made by a local machine shop from steel about 3/32 in. thick, then tempered to 50Rc—about the same hardness as a planer blade. It is ground square, and can work in either direction without needing a burr (if you encounter contrary grain, just go the other way). One edge has the profile for the back-post molding, the other for the single bead around the edges of the ladders. A more elaborate version of the tool was shown in *FWW* #54, p. 73.

Sizes for the ladders, and their precise shoulder angles, can be taken off the back when it is dry-assembled, as I am shown doing in the top photo on the next page. The ladders are made in the

When sizing the ladders, above, a pair of clamps stabilizes the back posts. To pierce the back, left, first drill entrance holes for the scroll saw blade. The size of the drill bit used, in this case 5/16 in., conforms to the design.

Terry Wild Studio

Fig. 8: Slip seat upholstery



Cotton batting may be used instead of hair.

same way as the crest rail, that is, they are marked out in the square, then shaped, pierced and beaded. Notice in figure 3 that the tenons have only one shoulder, located at the front.

Assembly—The back is glued up first and allowed to dry. The ladders, incidentally, are merely press-fit into place without glue. Then the rails, stretchers and front legs are glued and clamped to the back assembly. When this is dry, add the center stretcher, and fit the saddle (which is first beaded with the same scratch stock used on the ladders). Then cut the glue blocks to fit.

Make the slip seat as shown in the drawing, allowing a little room for the fabric—at least ⅛ in. on all sides. I prefer not to get involved with upholstery myself, as it would cut too much into my woodworking time, but there is nothing difficult about this seat. A cross section of the upholstery is shown in figure 8.

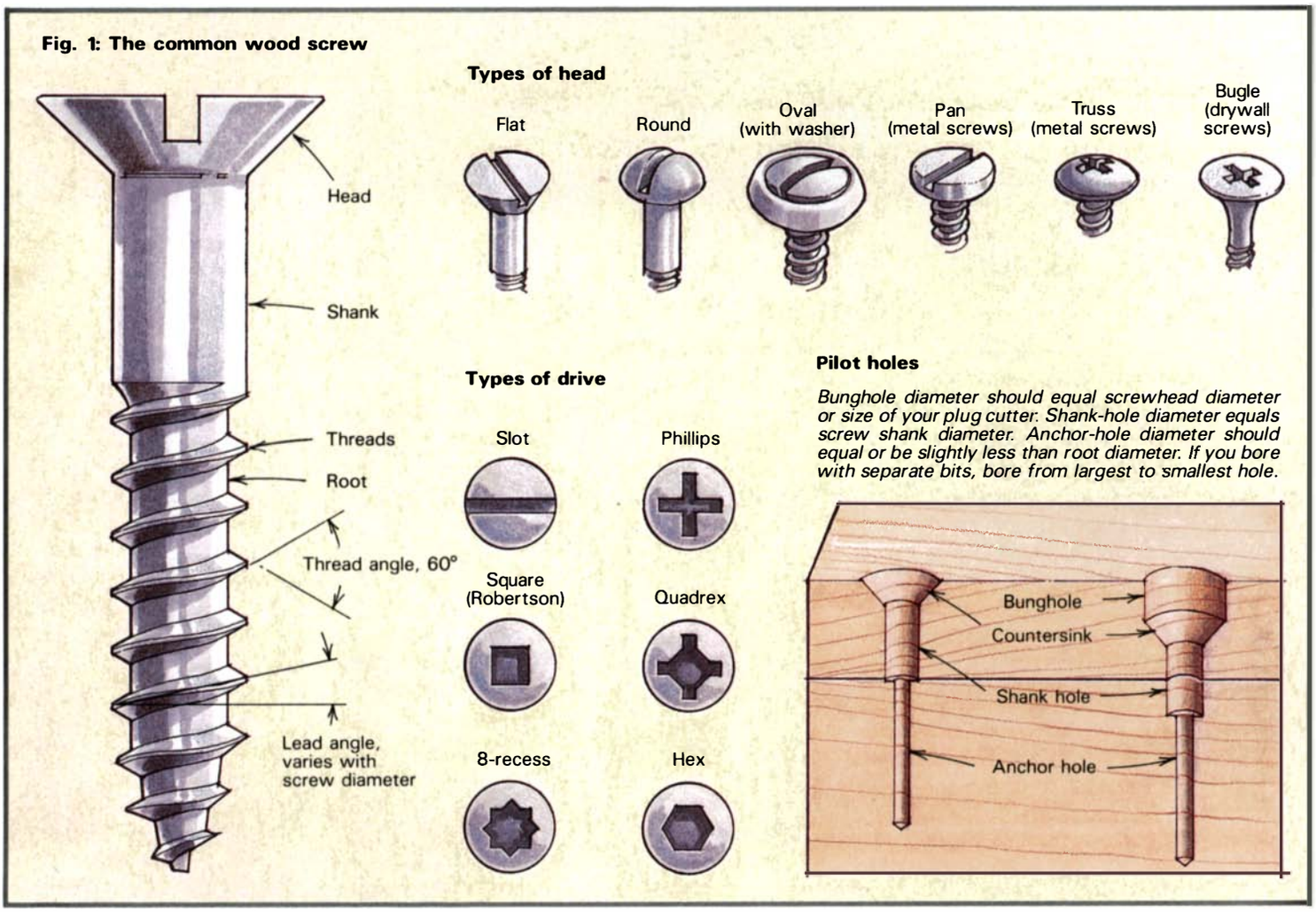
So, there's your chair, the first one, anyway. Now that you've got your confidence, my last piece of advice is to make them in batches from now on, the way they would have done it in the 18th century. You'll find that things go much faster. I'm not about to tell you how quickly I can make a set of six ladderback chairs—word might get out to my clients—so you'll have to find out for yourself. But I will tell you that 18th-century chair shops made a pretty good living, and there was a lot more competition then than there is now, that is, if you are talking about the real thing. It's a lot of trouble for a machine to duplicate the Chippendale look, so most factories don't really try—most of what you see as Chippendale these days is just mush. With handtools, though, the style is a piece of cake. □

Gene Landon makes furniture in Montoursville, Pa.

Wood Screws

The basics of the basic fastener

by George Mustoe



One day during my late teens I was struck by the desire to build a small sailboat. The fact that I knew nothing about sailing seemed irrelevant, as did my lack of woodworking expertise. After all, I'd built some barn-lumber shelves for my rock collection just the summer before and, as a foolish adolescent, building a boat didn't sound much more difficult. Within a year my 12-foot craft was sunk in a spring storm and I have few memories of sailing it, but, fifteen years later, I still remember the blisters I got driving hundreds of screws to fasten the plywood hull. Since then I've never had a great fondness for wood screws, but I don't share the disdain of purists who believe that metal fasteners are the devil's tool for capturing the souls of cabinetmakers.

Craftsmen who rely on well-cut joints for their finer projects still find screws handy for reinforcing these joints, as well as for attaching hardware, assembling jigs and bending forms, and making the usual run of utility furniture for home and shop (see figure 2, p. 50). Wood screws have gained even greater importance in recent years because of the increased use of particleboard and plywood, materials that are not suited for traditional joinery.

The basic wood screw consists of a head and a shank, roughly two-thirds of which is threaded. Standard wood screws come in lengths from about ¼ in. to 6 in., and a variety of head configurations, as shown in the drawing. In general, flat-head screws are used flush with the surface or hidden beneath a plug.

Round-head screws can be left visible, and, for a fancier touch, you can use oval-head screws seated in nickel-plated finishing washers. Sheet metal and drywall screws are increasingly used in wood (see box, p. 51). Sheet metal screws have flat or pan heads and drywall screws employ bugle heads, which are self-countersinking in sheetrock, most plywood, and softer woods. The drawing also shows some of the variety of drive configurations available. Square-drive screws are common in Canada, where they're called Robertson screws, after their inventor. A square-drive variant, the Quadrex screw, can be driven with either square or Phillips drivers.

Shank diameters are measured in gauge sizes from 0 to 24 (a range from 0.060 in. to about 0.372 in.), the difference between successive gauges being 0.013 in. The solid core of the threaded portion is called the root; its diameter is measured from valley to valley of opposing threads. All screws of the same gauge have the same head, shank and root diameters, regardless of their length. Two angles describe the threads. Single threads viewed in cross section have an included angle of 60°, called the "thread angle." Most wood screws, regardless of other differences, have thread angles of 60°. The "lead angle" is the pitch at which the thread winds around the shank. It varies according to the shank diameter, but is much the same on many common screws—the difference between the lead angle of a #2 screw, with 26 threads per inch (tpi) and a #24 screw, with 7 tpi, is a matter of only a few degrees.

Threads are either cut or rolled on the screw blank. In the first process, metal is cut away on a form of metal lathe. In the second, the blank is squashed between two dies to form the threads. A rolling machine can spit out between 200 and 300 screws per minute, while a thread cutter, which must make half a dozen passes by each blank, can produce only a tenth as many. Chances are, however, that the screws you're using (hardened drywall screws excepted) are cut, not rolled. It seems that third-world countries can produce cut-thread screws cheaper than first-worlders can produce rolled screws. If the outside thread diameter equals the shank diameter, it's probably cut; if the shank diameter is smaller, it's probably rolled. There's no difference in performance, though rolled threads are said to be marginally stronger.

For ordinary wood screws the choice of metal is usually determined by the amount of corrosion resistance that's required, or for appearance. Plain steel screws are not seen much anymore, and most steel screws have a thin plating of nickel, cadmium, or zinc chromate. (Unplated steel screws may stain woods containing tanin, such as oak.) Galvanized screws are better for outdoor uses, but the rough zinc coating makes them hard to drive. Brass and bronze screws are weather resistant and their golden color makes them popular whenever screwheads are visible. Aluminum screws are handy for attaching metal molding and where light weight is important. (Don't use aluminum screws in steel, or vice-versa, as any moisture will cause a galvanic reaction that will rot the hole.) Stainless steel screws offer the ultimate protection against corrosion, but they are relatively expensive.

The mechanical properties of the various types of screws are similar enough and screws appear to be so deceptively simple that workers often give little thought to the engineering considerations that go into a well-planned, screwed joint.

Screwed joints must withstand lateral shearing forces as well as the direct pull of tensile loads. Tensile loads are resisted by the force of the screw threads acting against the head. Lateral loads involve a different type of holding power, namely the friction of the wood surfaces that are being pressed together by the clamping action of the screw. When the surfaces are also glued, the joint's holding power is greatly increased.

The most serious mechanical limitation of wood screws is that they focus stress on a very small area of the joint. This effect is minimized by making sure screws penetrate far enough and are spaced closely enough to distribute their holding power. Several medium-size screws, say #8 or #10, spaced 4 in. to 6 in. apart will be stronger than huge screws placed at 1 ft. intervals. More penetration means more strength. A handy rule of thumb for screw length is that, where possible, the entire threaded portion of the screw should penetrate the piece.

The strength of screwed joints is highly variable according to the size and spacing of the screws, the type of wood, and the grain direction. Withdrawal strength (tensile load), for example, varies according to how deep the screw is inserted and the shear strength of the wood. A #10 wood screw inserted ½ in. into face grain will resist withdrawal up to 678 lb. in maple, but only 346 lb. in yellow poplar. Inserted 1 in., the values rise to 1,400 lb. and 711 lb., respectively. The holding power in any species is about 50% less for endgrain, so screw length should be increased about one and a half times to compensate.

Screws must be kept snug if they are to perform properly. This is a problem particularly with chairs and other solid wood furniture where wood shrinkage, severe overloading or merely the rigors of daily use can cause joints to open up so that the screws are no longer able to maintain pressure between the adjacent wood surfaces. Instead of being distributed evenly over the joint, the loading falls on the shank of the screw. If the screw loosens, it may pull out. More likely, the joint will fail when the wood around the screw tears out or splits.

The strength of the screw metal is not very important in determining the final strength of the joint, for even the softest metals are much stronger than the wood they penetrate. When screws do break during driving, it's almost always because the pilot hole is too small. In effect, you shear off the screw—proof that the lateral strength of a screw is much less than its tensile strength.

Screwed joints don't allow wood movement to take place, so screws cause problems when used to attach solid wood panels to cabinet carcases, or in other situations where humidity changes would cause expansion or contraction along the joint. Several methods of allowing for movement when attaching tabletops or panels with screws are shown in figure 2.

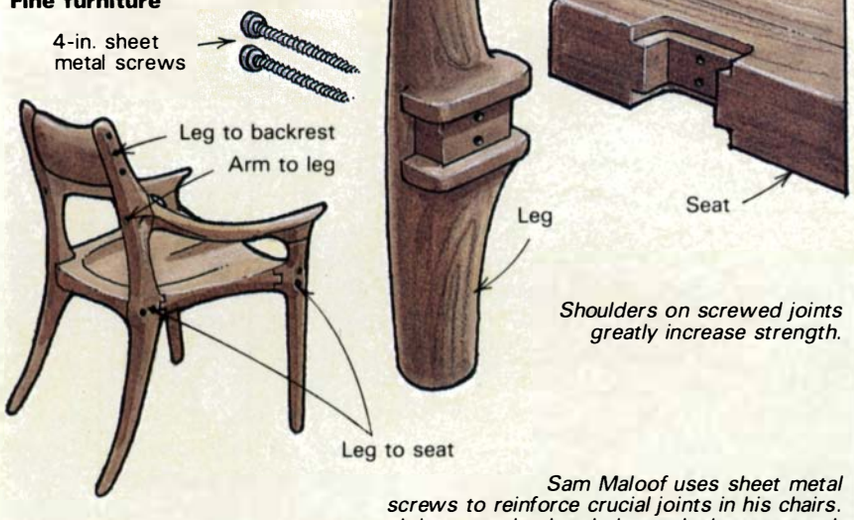
Most screwdriving problems are related to the pilot hole. In fact, the pilot hole consists of several concentric holes, as shown in the drawing on the facing page. The plug or bunghole (or countersink, if a flat-head screw isn't to be hidden) should be at least the diameter of the screwhead or of your plug cutter. The shank clearance hole should be the same diameter as the unthreaded portion of the screw's shank. This allows the shank to slide through the wood without binding so the two pieces are drawn together as the screw is tightened.

The anchor hole is drilled the same diameter or slightly smaller than the screw's root diameter. If the anchor hole is too large in diameter, the holding power is reduced and the screw is likely to strip out of the hole. Too narrow and you're in for some hard driving and the possibility of a broken screw or split lumber. Some wood technologists recommend that anchor holes be 70% of root diameter, larger for denser woods, and

Drawings: Joel Katzowitz

Fig. 2: Screw joints for furniture

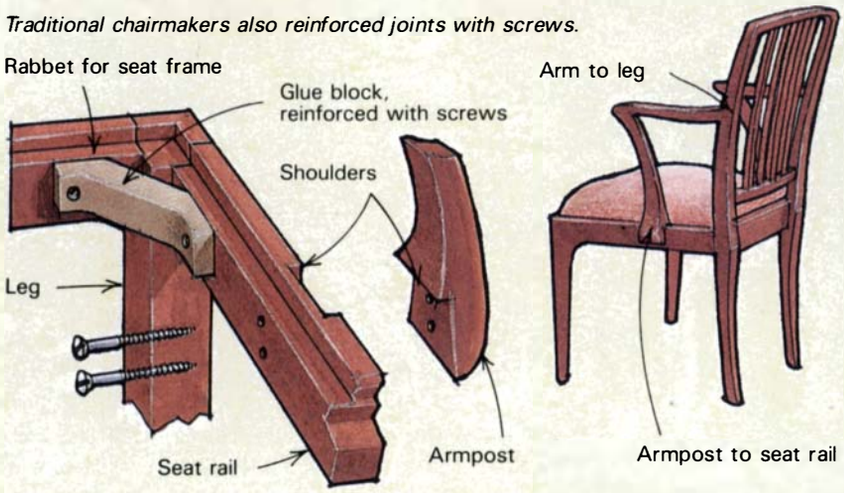
Fine furniture



Shoulders on screwed joints greatly increase strength.

Sam Maloof uses sheet metal screws to reinforce crucial joints in his chairs. Joints are glued and clamped, then screwed.

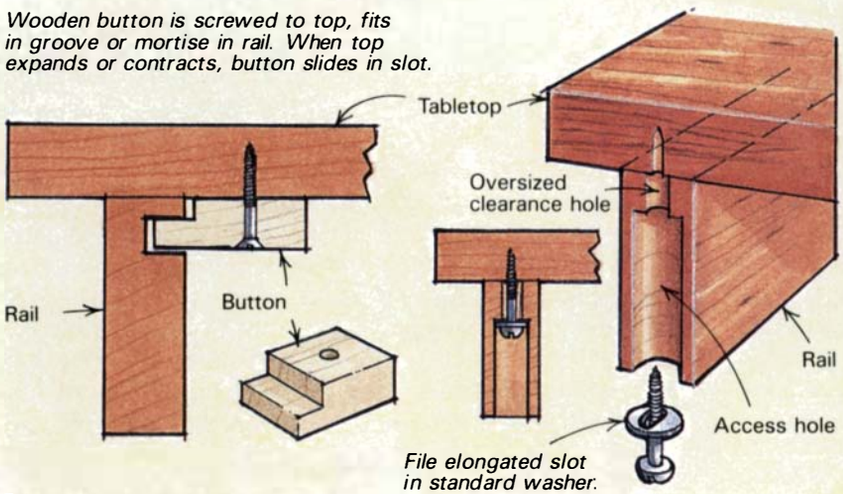
Traditional chairmakers also reinforced joints with screws.



To fix a tabletop to its base and allow for wood movement, you can use buttons (below left) or slot screw (below right).

Top is screwed to rails through a slotted washer in which screw can slide as top expands and contracts.

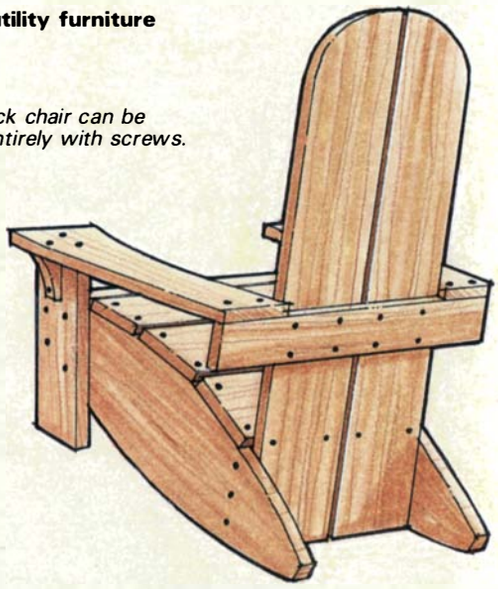
Wooden button is screwed to top, fits in groove or mortise in rail. When top expands or contracts, button slides in slot.



File elongated slot in standard washer.

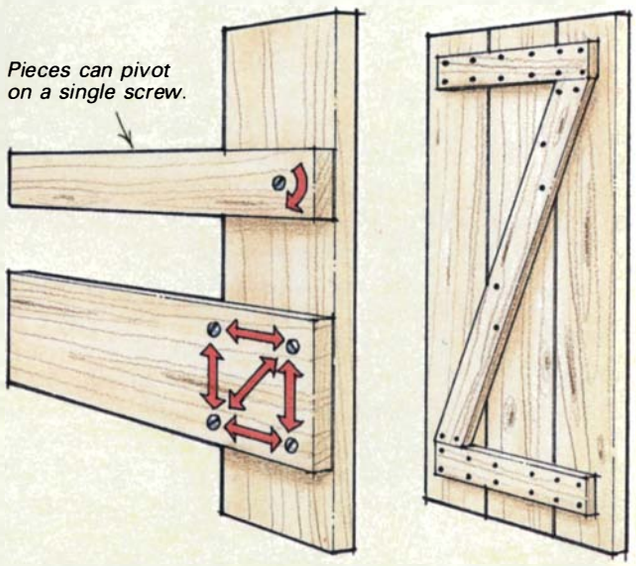
Screws in utility furniture

An Adirondack chair can be assembled entirely with screws.



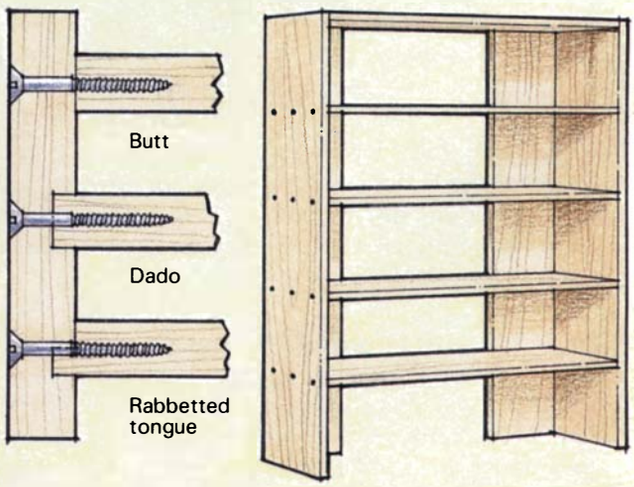
Flat panels for doors, tabletops and carcase sides can be quickly made with screwed battens. Screwing pattern shown here makes no allowance for wood movement, but provides for maximum strength through triangulation.

Pieces can pivot on a single screw.



Screws in rectangular pattern resist racking through triangulation of forces between any combination of three screws.

For simple carcases, like this bookcase, screws can provide the primary joint (butt joint), or can reinforce stronger, shouldered joints (dado and tongue).



Wide back battens screwed to carcase top, sides and shelves triangulates the structure and makes it rigid. A full back of thin plywood or Masonite will do the same.

Drywall screws: who needs pilot holes?

by Paul Bertorelli

My hatred of the common wood screw has nothing to do with the purist's view that wood ought not be defiled by metal. Except for dowels, I'll stoop to any method of fastening wood, so long as it gets the job done in a hurry. What I can't stand is rummaging around my drill box for the right pilot bits (usually burned and dull) and my drill's extension cord (upstairs running the fan), only to discover that I've lost the chuck key again.

I had just about resigned myself to common wood screws and their attendant paraphernalia when a friend introduced me to drywall screws six years ago. These case-hardened screws are engineered to penetrate drywall, wood and thin metal without a pilot hole. They were developed during the 1960s when metal framing began displacing wooden studs in commercial buildings. Before long, cabinet and furniture shops discovered how effective they are for woodworking. These days, they are often available in the local hardware store along with low-cost power driving attachments for electric drills.

Drywall screws more closely resemble self-tapping sheet metal screws than regular wood screws. They have a straight shank that terminates in a needle-sharp gimlet point capable of penetrating light metal and wood under power driving. Usually, the shank is threaded right up to the base of the head, but some drywall-type screws have partially unthreaded shanks. Most drywall screws have double lead, which means that two threads wrap their way around the shank rather than just one. The angle at which each of these threads climbs the shank is double that of an equivalent conventional wood screw, so double-lead screws drive faster. Some manufacturers say they have marginally greater withdrawal strength than single

For speed and holding power, drywall screws are hard to beat. Top screw has a double-lead, fully-threaded shank. Bottom screw has single-lead threads.

leads, but the difference rarely matters in woodworking applications.

The threads themselves are deeper than those of a conventional wood screw, that is, their height represents a greater proportion of the root diameter. Deep threads are why drywall screws work so well without a pilot hole. They bite hard and forcefully pull the screw into the wood, displacing the wood and compressing it rather than actually boring a hole as a pilot bit does. With all that compressed wood crammed into the threads, drywall screws are supposed to be very resistant to stripping, especially in plywood and particleboard where conventional screws don't hold nearly as well. Despite this forceful entry, these screws don't seem to cause much splitting when driven in hardwood, at least in my experience.

Drywall screws aren't available in as many varieties as are conventional screws. The most common sizes are #6 and #8 in lengths from ¾ in. up to 3 in. Some suppliers sell larger and smaller sizes, but I've found that a box each of #8 Phillips head in 1¼-in. and 2-in. lengths covers virtually all of my needs.

Drywall screws have bugle heads, their undersides gently radiused rather than sharply angled like a regular flat head. In softwood, some hardwoods and plywood, a bugle head will neatly countersink itself. In meaner woods, you may have to help the screw along with a countersink before driving, and a single-diameter pilot hole makes driving easier. But in most applications, you don't need a pilot hole at all.

My weapon of choice for driving drywall screws in wood is a Makita electric screwdriver fitted with a Phillips bit in a magnetic holder. Simply snap on a screw, jab the point into the wood and pull the trigger. You can drive these screws by hand but frankly, I don't see the point of it. One of the reasons they are case-hardened is to stand up to punishing torque of power driving. In six years, I can only remember snapping one.

I pop in a drywall screw anywhere a regular screw might go. For utility shelving out of plywood, for example, I just butt join the parts with four or five screws across a shelf 10 in. wide. Glued carcase joints can be pulled home with a few drywall screws and the screws left in for additional strength. Conventional screws are too wimpy for that kind of barbarism. If I want a neater job I either do a quick countersink or use a brad-point drill fitted with a depth stop to bore a bunghole.

The only thing I don't really understand about drywall screws is why they haven't driven conventional wood screws into complete oblivion. Perhaps it's nostalgia. I've got a couple of dozen boxes of old-style wood screws gathering dust in my shop. I guess I'm saving them for something, but I can't imagine what it might be. □

Paul Bertorelli is editor of Fine Woodworking *magazine.*

most screw manufacturers give away charts listing optimum drill sizes. But it's easy to select the proper drill bits just by holding them up against the screw to compare diameters. It's a wise idea to drill a pilot hole in a piece of scrap lumber to test the anchor hole fit, though. Leave the anchor hole shallow so that the leading two or three threads penetrate solid wood.

A small dab of tallow, soap, beeswax or paraffin makes insertion easier, but lubrication won't be necessary if the proper size pilot hole is used. Try to resist the urge to give that final jerk, which can twist off the screw. If a reluctant screw won't turn quite as far as you'd like, try striking the screwdriver one sharp, downward blow with a mallet. The compression will usually create just enough slack so that the screw can be rotated another one-half turn. You'll also avoid marred screwheads and gouged work by using a driver that fits the screwhead snugly.

To make pilot holes for bunged screws, three different bits are needed: one for the anchor hole, one for the clearance hole and one for the bunghole. This explains why so many impatient workers end up trying to use brute force to make a screw fit into a single hole. If you use more than an occasional screw, it's worth the expense to buy a set of pilot-hole bits, which drill stair-stepped or tapered holes in a single operation, including the countersink or plug hole.

Three styles of pilot-hole bits are commonly available, either

Pilot bits, another view

by Michael Podmaniczky

As George Mustoe has pointed out, the job of properly boring pilot holes for a screw requires three different-size drill bits, one each for anchor, clearance and recess (the bunghole, to a boatbuilder). Boring three separate holes takes time, an important factor to the professional, so various "step" bits were developed. They are indeed faster, but have serious drawbacks. Adjustment is minimal or absent, and waste clearance is ineffective. Tapered bits, for example, cut along their full length, making them prone to overheating, and they are difficult and expensive to sharpen. More often than not, step bits produce burned wood, dull bits and oversized bungholes from the repeated plunging necessary to clear the waste. If time isn't your main concern, there's a better way to do the job.

Decide on the screw sizes you most commonly use: probably #6, #8, #10 and maybe #12. Trot down to the hardware store and buy four *good* twist bits to match each screw size: two anchors (one each for hard and soft wood), one for shank clearance and one for countersinking and bungholes. This last bit should allow for the smallest-size bung possible, and should be ground to match the shape of the underside of the screw head. To ensure a very tight bung fit, I've also had the diameters of the bung bits professionally ground a few thousandths undersize. If you're feeling flush, buy brad-point bits as well for countersinking round-head screws—they produce a flat bedding surface for the screw head.

Mount all of these bits in a nicely finished block of wood, stand it on the shelf over your workbench and you are ready for anything. □

Michael Podmaniczky of Williamstown, Mass., is a contributing editor to Fine Woodworking.

Pilot bits range in sophistication from the one-piece, non-adjustable bit at bottom right to the three-piece tapered twist drill with countersink/bunghole and depth collar at top right. Between is a two-piece rig consisting of a common twist bit and a countersink/bunghole cutter. From left are a brad point twist bit, two plug cutters and a Vix pilot bit, which centers a twist bit in hardware holes—hinges, locks, strike plates and so on.

as individual bits or in sets that cover the most common screw sizes (examples are shown in the photo at left). The least expensive kinds are single-piece flat or half-round steel bits. Their limitation is complete lack of adjustability—a #12 bit, for example, might work great for a 2-in.-long screw, but poorly for longer or shorter sizes. For only a little more money, you can buy pilot bits having an adjustable cutting sleeve. With these, the shank hole depth remains constant, but you can vary the depth of the anchor hole. Some of these adjustable bits have flat cutters, but the best ones use a twist drill for the anchor hole. A set of four costs about $7. Tapered twist bits cut both anchor and shank holes at the same time with exceptional accuracy, and they stay sharp longer than the other two types. Each screw size requires a bit, a matching countersink/bung borer, and a collar depth stop. A set of seven can cost from $50 to $70. They're worth the cost if you use a lot of screws, especially when working with very hard wood. □

George Mustoe, a geologist and woodworker, lives in Bellingham, Wash.

Sources of supply

A wide variety of screws, pilot bits and screwdrivers are generally available at hardware stores. Here are some other sources:

Screws—Reed and Prince, one of the largest screw manufacturers in the country, doesn't sell small quantities direct; to find the distributor nearest you, write to Judy Hogan, Reed and Prince, 1 Duncan Avenue, Worcester, MA 01603, or phone (800) 225-7260. Trend-Lines (375 Beacham St., Chelsea, MA 02150) carries a good selection of wood and drywall screws. Parker-Kalon (395 Roberts Road, Campbellsville, KY 42718) makes a drill-point drywall screw for use in heavier metals, and Woodshop Machines (70 Regional Drive, Concord, NH 03301) sells Quadrex screws. Write for information.

Tools—Pilot bits, brad-point bits, power-drive bits, plug cutters, and a variety of hand and power drivers are carried by Garrett Wade Co. (161 Avenue of the Americas, New York, NY 10013), Woodcraft (41 Atlantic Ave., P.O. Box 4000, Woburn, MA 01888), and Trend-Lines (see above).

Chasing is an old technique for cutting any size wooden thread by hand on the lathe using simple shop-made tools.

Chasing Large Wooden Threads

An alternative to tap and die

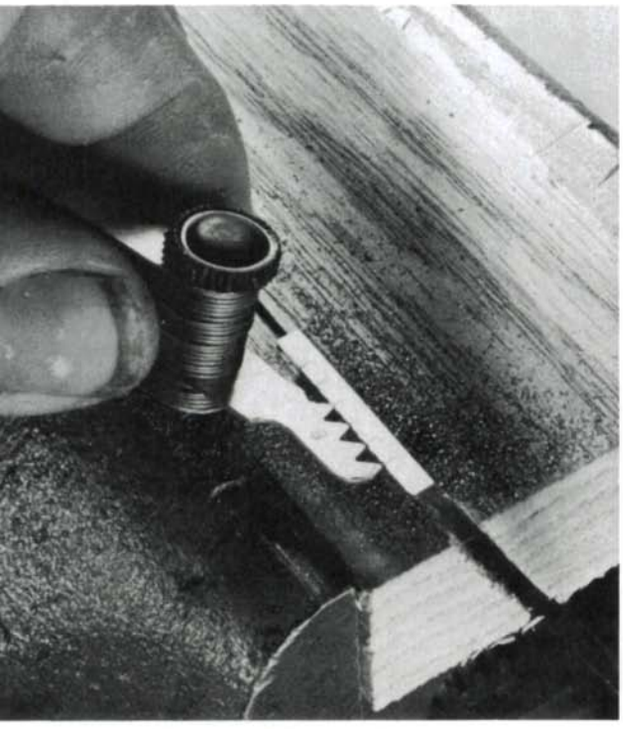
by Richard Starr

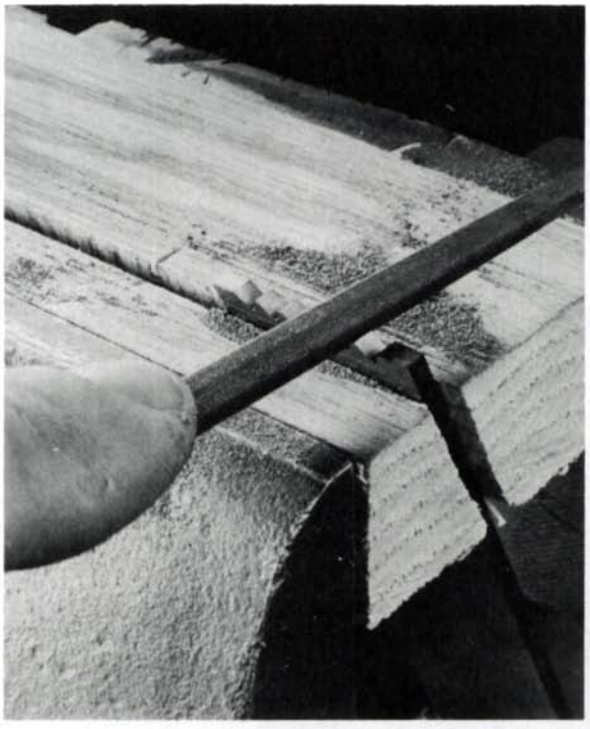
When I first read about chasing, an old technique for cutting wooden threads by hand on the lathe, I couldn't believe such a simple method could work. How could anyone move a multi-toothed cutting tool across the spinning wood at just the right speed to cut an accurate thread? Yet, all the old books said it was easy so I tried it. Sure enough, after a few tries I was able to scratch out a recognizable thread. Since then, I've used chasing to make screw-top jars and to fit wooden handles to threaded sockets in pottery. Old-time turners used it to thread together sections of long turnings like canes and ivory candlesticks. You may find other applications.

Chasing tools are not available commercially, but they're easy enough to make yourself. Because the tools cut by scraping, they don't work on soft or crumbly woods. Hard maple is about the softest wood that works well. On the other hand, some hard woods are too brittle and the threads break off. I've had good results with Osage-orange, ebony, lignum vitae and, especially, boxwood. Once, I even chased a thread in soapstone. Old turners chased threads in ivory and brass and probably would have appreciated some of the modern day plastics.

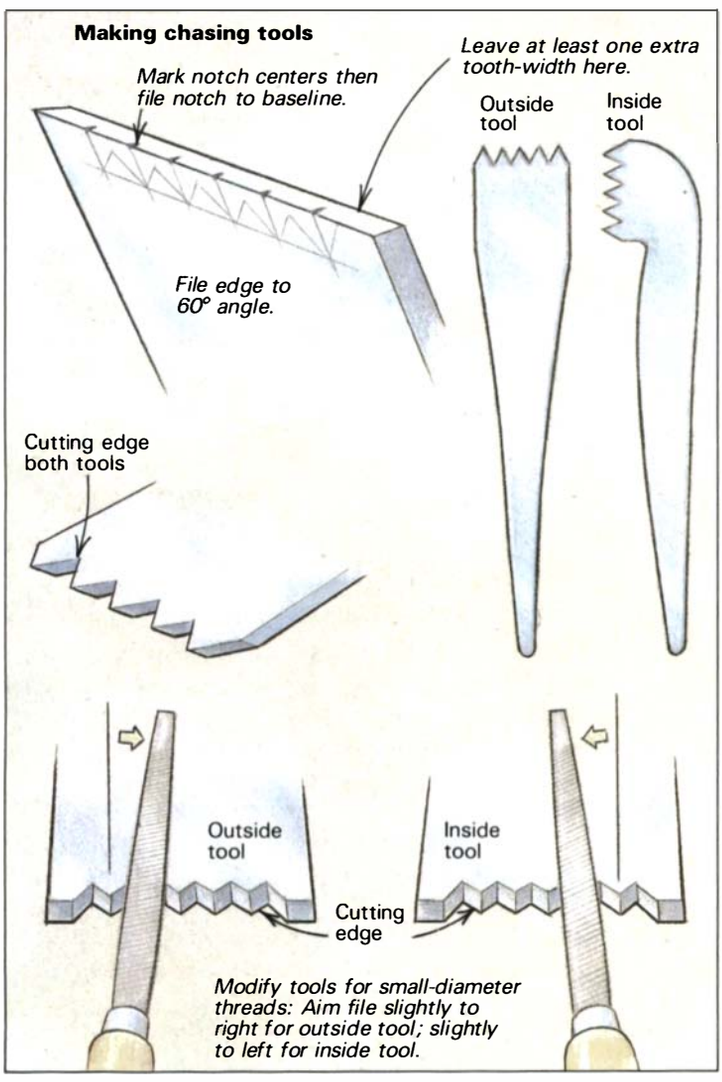
Making the tools—You'll need to make two chasers—an outside tool and an inside tool—to cut matching male and female threads. You can file the tools to cut any pitch, which is the distance between the crests of a thread expressed in threads per inch (tpi). One set can cut a screw of any diameter, though there is a lower limit that can be overcome by slightly modifying the tools—more on that later.

I make my chasers from ⅛-in. or 3/16-in.-thick oil-hardening tool-steel flat stock (available from Manhattan Supply Co., 151 Sunny-





After filing the end to a 60° bevel, lay out the chaser teeth with a screw pitch gauge (photo left and drawing below), then file the notches until the points touch the baseline (above). After striking a clean thread with the outside tool, the thread is deepened, or chased to depth, at a slower speed (right). The right hand pushes the tool from right to left.



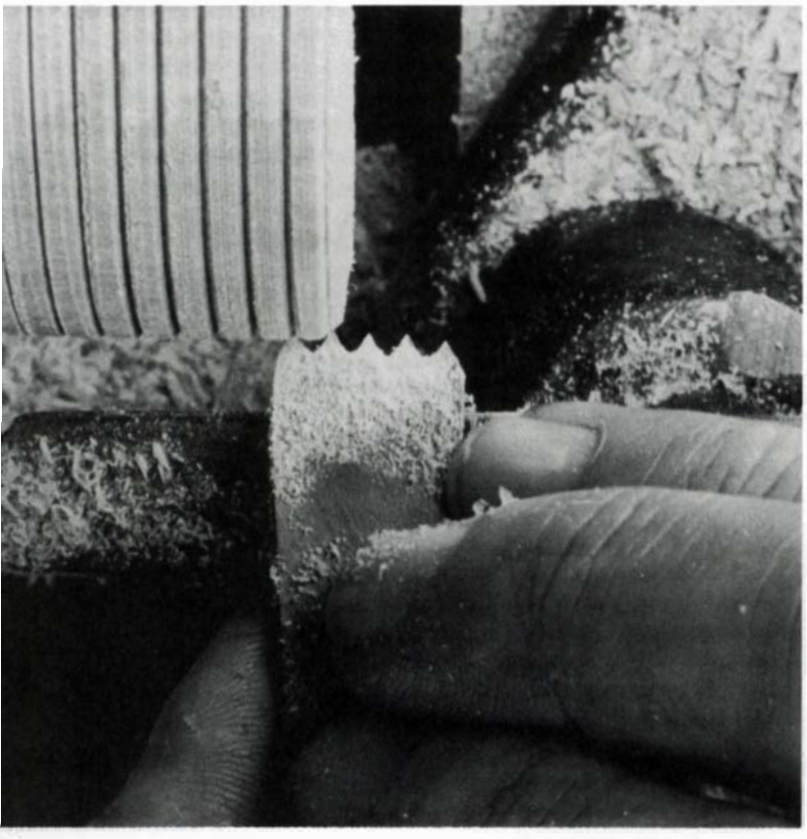
side Blvd., Plainview, N.Y. 11803). You can also make chasers from an old plane iron or a file, but you'll have to soften the metal first so it can be filed. This process, called annealing, is accomplished by heating the metal red hot, then letting it cool very slowly. I just drop the piece in the hot coals of my wood stove and leave it overnight with the cooling cinders.

Paint the steel with machinists' layout fluid or a magic marker and scribe the outline of the tool as shown in the drawing at left. Chasers should have four or five teeth, so the width of the tool will depend on the pitch you choose. Leave enough metal for at least an extra half-tooth on either side of the chasing tool.

Because all the filing is done at a 60° angle to the face of the metal, I made the jig shown in the photo (above, center). Hold the file level to the floor and you're at the correct angle. First, file a bevel on the end of the stock to establish the rake (undercut) of the tool. Now scribe the positions of each groove on the beveled end of the tool. These mark the gullets of the teeth, not the points, so the first and last marks should be located at the outer ends of the tool, as shown in the drawing. A five-pointed tool requires six marks. I use a thread gauge to help lay out the teeth since inch-rules aren't calibrated for odd fractions. Scribe a baseline that is slightly farther from the edge than the threads are deep. This ensures that when you file the notches they'll intersect to create sharp points at the cutting edge. For 60° threads the thread depth is about ⅞ of the distance between points.

Use a small triangular file to cut the grooves. First make a shallow notch at each scribe mark to locate the cut. File all the notches simultaneously, a few strokes in each one, rather than cutting one at a time to full depth. Be sure to hold the file level and at right angles to the jaws of the vise (unless you are filing a chaser for small-diameter screws, as explained below). Stop filing when the notch just touches the baseline. If one notch goes too deep, establish a new baseline and deepen all the notches.

Once the teeth are finished, rough out the shape of the tool



with a hacksaw, then file it to final shape. File right to the bottom of the outer notches to leave a complete tooth on either side of the tool. Ease all the edges so the tool will feel comfortable in your hand and slide easily on the tool rest.

Next, harden the teeth. Use a propane torch to heat the top surface of the teeth red hot. Quench the tool immediately in a can of motor oil and stir it around so it cools quickly. In most toolmaking the next step would be tempering, to reduce the brittleness of the steel. With chasers I've found, however, that the teeth are so short that there's no danger of breakage, so the extra hardness is a bonus. But be sure only the teeth get red hot or the tool will be too brittle and may break.

Turn a comfortable handle and make a ferrule from a piece of copper pipe. Drill a pilot hole for the tang of the tool. Heat the tang red hot and force the handle down on the tang, which will burn into the handle amid billows of smoke.

Sharpen the tool by rubbing its top face flat on a fine oilstone until you have a bright and polished surface. A brief touch on the stone during a job can result in a surprising improvement in the tool's cut.

Small-diameter threads—Large-diameter threads look like rings when viewed from the side, but small-diameter threads of the same pitch will look much more like a spiral—you can actually see the threads lean over. This lean is called the helix angle. The smaller the diameter, the more the threads lean. If chasing tools were thin enough, they would be able to cut threads on any size cylinder but, because of their thickness, the underside of the tool may interfere with the leaning threads on small-diameter screws. This results in rough cuts and breakouts. You can avoid this by filing a special set of tools with the grooves slightly skewed to accommodate the helix angle. When filing the outside tool, point the file slightly to the right; point the file slightly to the left on the inside tool. You'll have to experiment to determine at what diameter this becomes necessary. You can extend the use of square-filed tools to somewhat smaller diameters by slightly lifting the right edge of the outside tool or the end of the handle of the inside tool as you cut the threads.

Most lathes were foot powered when thread chasing was in its heyday, but most of today's lathes run too fast to use these tools comfortably. I prefer to make the first cuts (called striking the thread) at about 400 RPM and subsequent cuts at much slower speeds. Try out the technique on your lathe as it is, but for frequent work you will want to modify it for lower RPMs. One way is to replace the belt pulleys with a larger one on the spindle shaft or a smaller one on the motor, or both. A better way is to add a jackshaft between the motor and the lathe. For my lathe, I bought a DC motor and an electronic control set originally made for a potters' wheel. The pedal control gives me a broad range of speeds.

Striking a thread—I've developed a style of using these tools that works well for me, but you'll want to find your own way. Turning is an individual's art.

For practice cutting outside threads, chuck a piece of maple or harder wood between centers and round off a cylinder. At the right end, turn a surface a bit smaller in diameter than the main cylinder. Chamfer the right edge to allow the chasing tool to enter easily, as shown in the photo on p. 56. Set the tool rest close to the wood at, or slightly above, the centerline. It helps to file the edge of your tool rest smooth so the chasing tools can slide without catching.

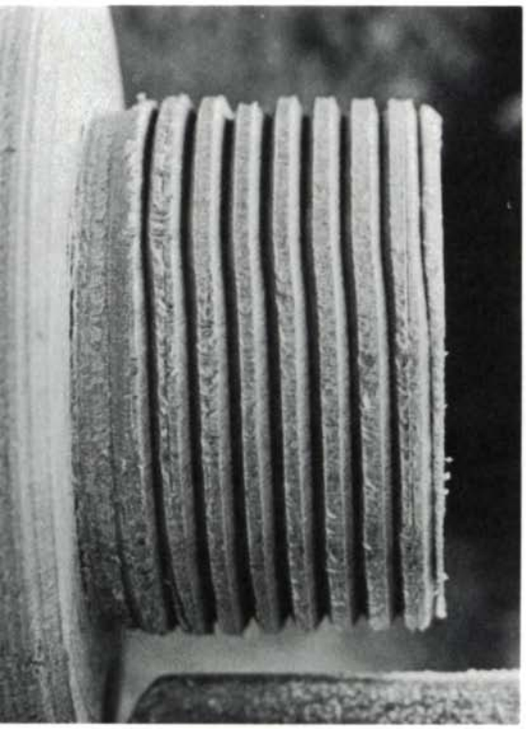
Hold the outside tool in your left hand, palm up, with your forefinger bearing against the tool rest to control depth of cut. Hold the tool level, or with the point slightly downward. The first two fingers of your right hand are used to push the tool to the left, supported by anchoring the other two fingers on the tool rest.

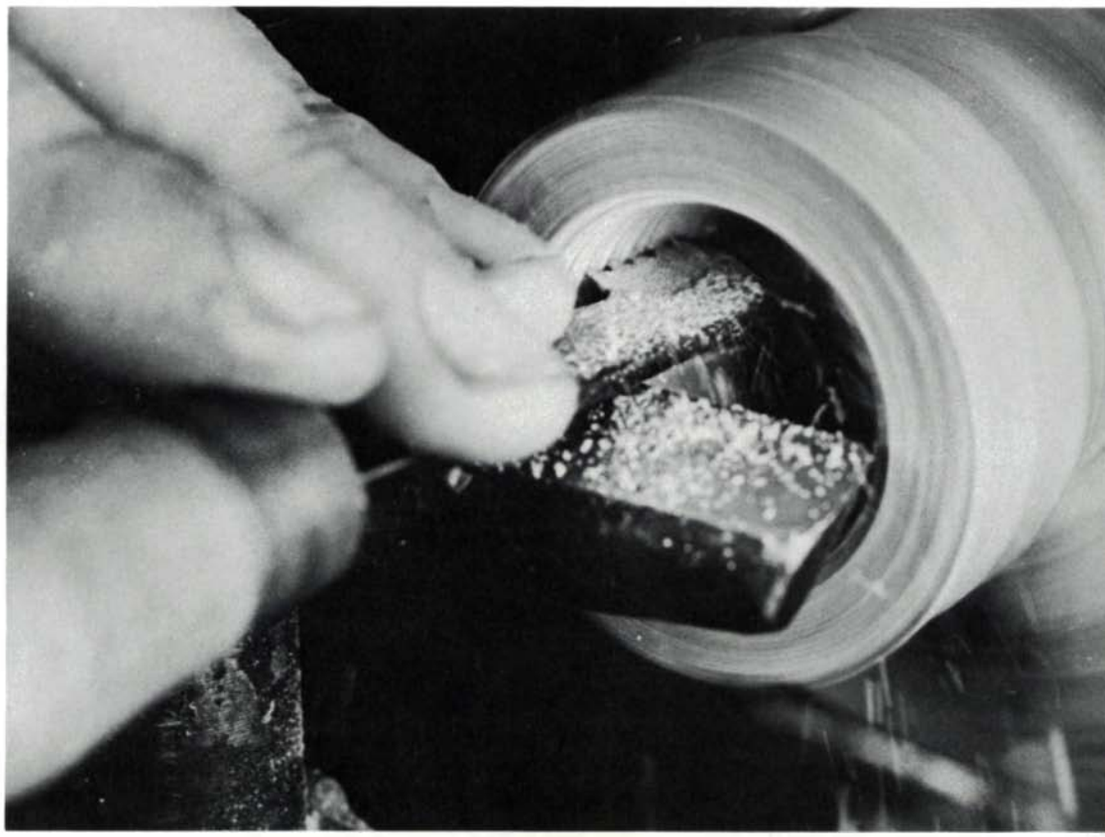
The teeth of the tool should enter the wood in an arc so that the first tooth touches first, then the others descend to the surface. To do this, your left hand pulls the handle slightly to the left, swinging it perpendicular to the lathe as your right fingers push the tool toward the left. Run the lathe at about 400 RPM while you practice this motion without actually touching the wood. Even experienced turners take a few swipes in the air to get the rhythm smooth and even. Feel ready? OK, go ahead and try gently striking your first thread.

Consider this: as the multi-toothed tool moves across the wood, each point is cutting its own groove. But when the tool is moving at just the right rate, the second tooth falls into the furrow plowed by the first, as do all the following points in their turn. When this is happening, the tool is removing much less wood and it moves more easily. This is a tactile cue that tells you you've hit it right. The correct cut tends to be deeper and, therefore, a bit more visible than wrong cuts. I find that if I unfocus my eyes and let them drift over the wood I get a strong visual cue. You'll be surprised how easy all this is, almost magical.

Of course, striking a thread is trial-and-error work and if you've left a rough surface of bad cuts, turn the surface clean for a fresh start. There are two problems that can occur even if you have managed to strike a clear thread. One is "drunkeness," where the thread appears to wiggle as it rotates. This is visible in the top left photo on the next page. You get a drunk thread when you push the tool with an uneven motion or just slightly too fast or slow. You can't correct this problem, so turn it clean and try striking again with a smoother motion and, perhaps, at a higher RPM.

The other error is striking a double thread, wherein the third





Chasing the inside thread on a screw-top jar lid (right). 'Drunken' threads (above) are an error caused by moving the tool unevenly.

tooth of the tool falls into the groove cut by the first tooth and the second and fourth teeth are cutting their own separate groove. You have pushed the tool exactly twice too fast. You can recognize multiple threads by the large helix angle—they seem to lean over more than they should. You can also check for them by counting the thread starts at the edge of the screw. Triple and quadruple threads are also possible. Turn it clean and try again.

Once you've struck a decent thread, you'll want to chase it to depth. I like to do this at a very low lathe speed, about 200 RPM, sometimes slower. Use the same motion as when striking to introduce the tool, but this time, take care to catch the first tooth of the tool in the original cut. This becomes easier as the cut gets deeper. When chasing, I usually lower the handle slightly, pointing the cutting edge upward. On very hard woods, I get the best cut with the bevel rubbing on the wood as though I was cutting with a gouge.

Never try to cut the threads so deeply that they have sharp crests. The chasing tool will cause breakouts before you get there and besides, sharp threads in wood are fragile.

Inside threads are much less prone to breaking out and are, therefore, easier to chase. Turn a cylinder of scrap between centers, then chuck it in a 3-jaw or screw chuck. Bore or turn a cylindrical opening in the end somewhat smaller in diameter than the outside thread you intend to fit it to. Chamfer the edge of the opening to ease entry of the tool. Set the tool rest near the wood and slightly above center.

The inside chasing tool must slide on its back edge along the tool rest to keep the teeth from snagging on the rest. Hold the tool in your right hand and pivot the tool slightly on its back edge to lift the teeth slightly off the rest. The cutting action will try to pull the tool down flat again, and you must resist this with your right wrist. Your left hand presses the back edge downward on the rest to keep it from chattering.

The inside tool is introduced to the wood in an arc, just like the outside tool. Push the end of the handle away from your body just a bit, and bring it toward you as you push the tool in. Toward the end of the cut, just before the tool hits bottom, twist the handle away from you, raising the teeth out of the cut. So, the motion of your right hand is a combination of pushing toward the headstock while twisting your wrist away from you. It's a smooth, swooping motion and easier than it sounds. Practice the motion a few times with the lathe running, then boldly, but gently, strike the thread. The inside tool practically strikes by itself, but it's easy to start multiple threads.

When chasing the thread to depth, try to disengage the tool before hitting the bottom of the hole. Actually though, the inside threads are so sturdy that they practically eject the tool if it bottoms out.

When fitting outside and inside threads, you trim one or the other, or both, whichever is appropriate for your project. Inside threads can be increased in diameter by trimming the crests with a scraping tool. Outside threads are easily reduced using a skew chisel or a square-end scraper. Then chase the threads to full depth again and try the fit.

Wooden threads should fit quite loosely to accommodate seasonal changes in dimension. I listen for a pleasant click as I wiggle the mating pairs axially. The firmness of the joint comes from the tension between the snugged-up shoulders, not from tight-fitting threads. While fitting, you may have trouble unscrewing a very tight thread. A little candle wax on the threads before testing will prevent this. I keep a monkey wrench nearby just in case. Once you have a good fit, sand the crests of the threads lightly with 220-grit paper. □

Richard Starr teaches woodworking at Richmond Middle School in Hanover, N.H., and is the author of the book, Woodworking with Kids *(The Taunton Press, 1982). Photos by author.*

Turning a screwtop jar

Chasing threads takes practice, but once you feel confident, try making a screwtop jar. I messed up my first four or five, but the rest were easy. The jar shown here is about 1¾ in. in diameter and made of Osage-orange, which is very hard. Like all of my jars, it has an 8-tpi thread.

Turn a cylinder between centers, face off the right end with a skew or small gouge and chuck that end in a 3-jaw or a screw chuck. Part off the stock as shown in photo 1, leaving enough in the chuck for the lid. Hollow the lid with a ¼-in. gouge and finish with a scraper. I use a ½-in. roundnose scraper sharpened to cut on both the end and the left side. The inside flange of the lid should be a straight-sided cylinder for about ½ in., and be roughly ¼ in. thick.

Now strike and chase threads on the inside of the lid (2) as explained on p. 55. You can sand and finish the inside now to avoid having to rechuck it later.

Chuck up the bottom of the jar with the end from which you cut the lid facing inboard and, with a ½-in. skew (or a square-end scraper), turn down the flange that fits inside the lid. Turn the flange about ⅛ in. larger in diameter than the opening in the top. If you're just learning how to chase threads, turn it a lot larger so you can clean up bad threads several times before the diameter gets too small. Square off the shoulder and cut a groove at the shoulder about the width and depth of a thread, to allow the top to screw all the way to the shoulder. With a skew, chamfer both ends of the flange (3).

Strike and chase the threads (photo p. 53) and test the fit of the top. You'll probably need to trim the threads on the jar with the skew or scraper to get the lid to fit. After trimming, chase the threads to depth again and re-test the fit. Repeat the trimming, chasing and testing until you get a good fit.

When the lid fits, hollow the jar. I chuck a Forstner or multispur bit in a tailstock chuck, bore out the inside and finish with a scraper. You could also hollow the inside with a small gouge and finish up with a scraper. After hollowing, trim the rim of the flange with a scraper and sandpaper. If you can reverse your lathe, work on the far edge of the rim to avoid chipping the entrance of the thread.

Measure the depth of the jar and mark the bottom on the outside. Now screw on the lid and turn the jar to shape. Remove the lid frequently, to check the wall thickness. Sand and finish the jar on the lathe, then part it off.

In the waste piece left in the chuck, bore and thread a socket to fit the threads on the jar. Now you can turn and finish the bottom of the jar. Save the threaded socket for future jars. —*R.S.*

The threads on the screwtop jar (top) were cut on the lathe with 8-tpi chasing tools. The jar body is parted off (center) leaving the lid in the chuck. A ½-in. skew (above) turns the flange ⅛ in. larger than the opening in the top.

To emphasize the grain of this oak tabletop, Shaw works a mixture of plaster of paris, purple Japan color and water into the wood pores. After sanding off the excess, he finishes the wood with white shellac to seal in the color highlights.

Filling the Grain

Making wood as smooth as glass

by David E. Shaw

Filling the grain is one aspect of wood finishing that should be in the repertoire of every finisher and cabinetmaker. Even when contemporary styles lean more toward the natural look, a highly polished, smooth-as-glass finish, like the walnut shown in the photo at right, is frequently considered proof of elegance, especially with pianos, dining-room tables and other more formal furniture. But you can't simply sand and buff this glow onto the wood as you can on brass or silver. Compared to these fine-textured metals, wood is a pock-marked, torn-up country road, and all its grain irregularities and pores must be filled before you can get a breathtakingly flat, glowing finish.

Applying fillers can be tricky. If you're not careful you can ruin a few day's work and then have to strip the piece and start all over. A properly filled and finished surface, however, will look as if you could dive into it. You can run your fingernail

Filled and polished walnut is as smooth as glass.

across the wood and never feel the grain telegraphing through, even with oak or walnut. Visually, the filler will be unobtrusive and subtle, and not affect the clarity or color of the finish.

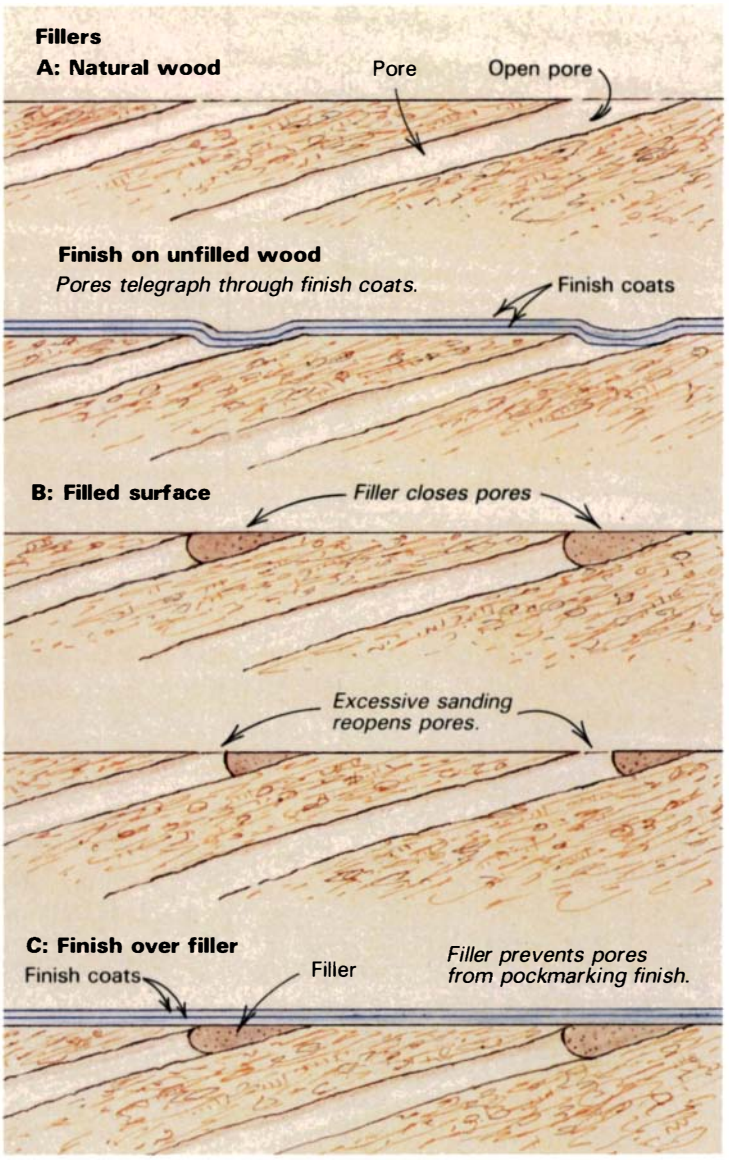
The two most popular filling methods involve applying numerous thinned coats of the finishing material itself or rubbing in commercial paste fillers made from ground quartz. For special effects, the filler can also be colored to highlight the wood grain and create a decorative look, as shown in the photo on the facing page. As a professional finisher, clarity is one of the qualities I admire most in a finish, so I prefer using the finish itself as a filler. I dislike any finish that obscures the natural beauty of the wood, so I avoid paste fillers and other heavy, opaque fillers as much as possible. With tight, close-grained woods like cherry or maple, white shellac and high-solids-content, water-white lacquer sealer or lacquer work best for me. White shellac is sometimes hard to find, so you might be tempted to substitute orange shellac. That's fine, as long as you don't mind the way the finishing material will change the color of the wood. Experiment on scrap first. On oak, ash, walnut and other open-pored woods where heavier fillers are needed, I tint paste fillers to match the wood, vigorously work the material deep into the pores, then rub and sand off any excess before applying a final finish.

In contrast, when you use a finish for a filler, you apply a coat of finish and sand it down, then repeat the process until the surface is smooth. Both lacquer and shellac dry so quickly that you can apply several filler coats, as well as the top coats, in one day. Shellac can be a filler under almost any finish, except pure tung oil and penetrating oils such as Watco. It's okay under oil-based varnishes, but will make them less resistant to extreme heat, such as a hot pan being dropped on a table. Lacquer works well under lacquer, but not under much else. If you're building a pure polyurethane or varnish finish, use thinned coats of the finish itself as a filler. You still must sand with 400-grit paper between coats, and, since varnish and polyurethane dry so slowly, you can only sand down one coat per day. Any oil finish can be its own filler, but it's a time-consuming process because the oils dry so slowly.

When using a shellac sealer, it's best to mix your own solution with denatured alcohol and shellac flakes or buttons (available from the better finishing supply houses). This guarantees a fresh mixture, essential if the finish is to dry properly, and you can make a thicker "cut" than what's usually available at the hardware store. The "cut" of shellac describes the amount of raw shellac that's dissolved in a gallon of alcohol. A 6-lb.-cut—6 lb. of shellac in one gallon of alcohol—is best as a filler.

Sanding sealer is a good filler under lacquer, but you can use any heavy-bodied lacquer. Sanding sealer is just a type of heavy-bodied lacquer that has a higher percentage of solids and, therefore, fills the pores more rapidly than thinner lacquers. Make sure the lacquer or sealer is water-white clear; the natural amber tone of regular lacquers affects the color of the finish.

When using finish as a filler, remember that you want to level the thin coats of finish you have applied, but you don't want to sand into the wood itself. If you sand into the wood, you will remove some of its color and only the finest touch-up work will blend that spot in with the surrounding surface. This is a problem even when you haven't applied a stain or a dye to the wood. If you've left the wood its natural color, this heavy-handed sanding and filling eventually will lead to a finish that looks blotchy and uneven. If you've applied a stain or dye and sand into the wood, you can usually feather the colors well enough that few



customers would notice it, but the odds are that you will always notice the repair. If you're aiming for perfection, however, you will have to strip off all the filler and color coats and start over. To minimize the risk of damaging the color coats, I rely on water-based aniline dyes when I want to change wood colors. These dyes penetrate more deeply than pigment stains and are available in a vast array of colors. But, even with aniline dyes, you'll get a color change if you sand through the surface of the wood. Don't make the mistake of assuming you can avoid the problem by staining after filling. Grain sealed with filler doesn't absorb stain well, so the finish will appear blotchy.

While great care is essential when sanding, you shouldn't be so timid about sanding through the finish that you end up laying five or six coats of material before you actually begin to level out the filler. This leads to a heavy look. If you want an unobtrusive filler, you should learn to fill grain with only a few coats. The key is to stay on top of the work at all times, checking your progress at least every minute or so. After a while you will get the feel of when the grain is full and the surface is ready for a coat of finish.

When your wood is sanded to at least 220 grit and ready for finish, brush or spray on a coat of shellac or sanding sealer. When this coat is dry, dry sand the surface carefully with 220-grit wet/dry sandpaper on a felt or rubber sanding block. The goal

is to sand the material remaining on the surface of the wood while leaving the material that has settled into the pores and grain. Sand the entire surface evenly in the direction of the grain, being careful not to sand through the filler on the edges. Change the paper when it's clogged, and sand until you have smoothed out all the raised grain, dust and other impurities. Remove these impurities with a blast of compressed air or with a tack rag—excess dust on the surface will work into the pores, blocking the shellac and detracting from the clarity of finish. (I generally buy tack rags from the local paint store, but you can make them with rosin or colophony. Dissolve a teaspoon of the rosin powder in a pint of mineral spirits, add a few drops of linseed oil and soak clean rags in the mixture, then squeeze out as much liquid as possible.) After applying another filler coat and letting it dry, wet sand with water and 220-grit paper. Wipe the surface periodically to check your work (you can't accurately judge a wet surface).

Wet sanding is somewhat faster than dry sanding and the paper doesn't clog as fast. You don't have to wet sand with the grain as long as the paper is clean. I generally find it easier to wet sand with a circular or figure-eight motion. The important thing is to sand evenly. This sanding step will remove a large amount of material (more than the first step) and, with a close-grained wood like cherry, pine or birch, may be almost enough to fill the grain. If you're working with an open-grained species like walnut, oak, elm or mahogany, you probably have a way to go. To check if the grain is full, put a light directly over the furniture and look at the surface from about 2½ ft. in front of the piece and slightly above the level of the top. You shouldn't be able to see any shadows from the grain.

If you don't see any shadows, you can double check your work by looking for highlights in the material. If the surface isn't completely filled, you'll be sanding only the material on the surface, and the sandpaper won't touch the finish that has settled into the pores. These finish-filled pores will appear like shiny little dots. If the grain is full, the sandpaper will reach both the surface and the material in the pores and you won't see any shiny highlights. The entire surface will appear uniformly dull. If you run your fingertips over the surface, you won't feel any surface irregularities. When you think the grain is nearly filled, dry the surface, recoat and wet sand with 320- or 400-grit sandpaper.

With oak and other open-grained woods, it's faster to use a commercial paste filler. These fillers are mixtures of ground quartz (called silex), oil, thinners and other materials, and let you stain the wood at the same time you fill the grain. Check the label before you buy any filler. High-quality fillers are almost pure silex, but numerous low-cost brands are mainly starch or flour. These cheaper fillers are easy to work, but they're worthless because they shrink so much when they dry.

Have the paint store agitate the filler on a mixing machine to lift all the silex that will have settled to the bottom of the can, otherwise you'll spend an hour or so cursing and straining to mix the stuff by hand. You will also need a stiff, wide brush and some paint thinner (unless your brand calls for a specific thinning agent). If you can't buy the color you want, tint the natural filler with any oil-based stain, universal color or Japan color until it's just slightly darker than the desired color. It will lighten as it dries. Don't use any filler labeled "natural" without adding some color. I've always found "natural" fillers to be a bland tan, quite unlike any natural wood shade I've ever encountered. From the start, you should realize that some touchy finishes, such as catalyzed lacquers (*FWW* #54) may not adhere to paste fillers. Most finishes will adhere, but some may not be as strong as you expected. For example, polyurethane is very heat resistant, but, if applied over paste filler, will turn white or burn when exposed to extreme heat, just as lacquer or plain varnish would.

Thin the paste filler according to the type of wood being treated. Large, open pores, like oak and walnut, can absorb a lot of silex, so thin the filler just enough to make it brushable. Woods with small, tight pores, like cherry, maple and some exotic hardwoods, need a thinner filler about the consistency of a milk shake. After thinning and coloring the filler, brush it on heavily with a 3-in.-wide brush, as shown in the photo below. Brush against the grain, using the bristles to work the filler into the grain. Do small sections at a time, feathering each section into the next. The filler will have a slightly oily sheen at first

Brush thinned filler on heavily with a 3-in. wide brush.

and look terrible. As soon as the filler dries to a dull shine, rub off the excess with burlap or horsehair, as shown in the photo below. Don't let the filler dry so long that you can't rub it off. If you do, brace yourself for a miserable sanding job. Horsehair is the stuff found in the guts of many old, upholstered chairs, and the best material for rubbing off filler. If you use horsehair, roll it into a ball, dip the ball in some shellac and let it dry before

Vigorously rub off excess filler with a wad of burlap or horsehair.

using. The dried shellac will bind the horsehair together and keep tiny pieces from breaking off.

To remove the filler, grip your ball of burlap or horsehair tightly and firmly rub across the grain. As you're removing the excess filler, you'll be working more of the filler deep into the wood grain. As you remove the excess, gradually lighten your pressure and turn the direction of your rubbing until you are going very lightly with the grain. Next take a clean, soft rag and gently wipe the piece off, photo below, again starting across the direction of the grain and gradually falling into line with it. You should be able to rub the surface perfectly smooth just with the cloth and not have to sand the filler at all. Again, when the pores

Gently wipe with clean, soft rag until surface is smooth.

are full, you won't see any shadows from the overhead light and the colored filler will be highlighting only the pores. Now leave it alone for a full 24 hours. The slightest handling can mess up the works. After the filler dries, I generally apply a coat of sanding sealer to lock it in, then sand the surface with 400-grit or 600-grit paper, as shown in the photo below, before applying the finish.

You can create some interesting effects by adding aniline

After filler dries, apply sanding sealer to lock it in, then sand.

dyes or other colors to plaster of paris for a filler that will accent the grain of the wood. It's a simple process, but the labor involved is endless. I generally do it only when it's necessary to accent wood grains with different colors. You can begin with a stained or natural board, depending on the effect you're after. Take a little bit of plaster of paris (available from most hardware stores) and mix it with water and a little lime powder to inhibit the drying. Work the plaster of paris quickly into the grain with your fingertips, cover the whole piece and let it dry. To speed up drying, I sometimes uses an electric heat gun, as shown in the photo below.

The only colors that I find rich enough to use with plaster are aniline dyes. I add the aniline to the plaster while mixing it with water, and then work the plaster in with my fingertips. If you are squeamish about coming into direct contact with aniline, you can use watercolors or other water-based coloring

An electric heat gun speeds drying of plaster filler.

agents. If you simply don't want to have colored fingertips, you can seal the wood before applying the uncolored plaster. After the plaster dries you can brush on the stain. The dried plaster will be able to absorb the water stain, but the sealed wood will not. When the plaster is dry, gently sand the surface with 360-grit or finer paper until the plaster is level with the surface of the wood. This is a slow process. A small serving table can take as long as five hours.

My favorite formal finish is lacquer sprayed over a lacquer filler. If I don't have spraying facilities, I favor a shellac filler, a couple of coats of shellac, then two coats of varnish. You can also get a formal look with just tung oil, but it takes time. You can increase the oil penetration and make it a better filler by heating the oil before you apply it. Boil a pan of water, remove the pan from the stove, then put a coffee can of oil into the water until the oil warms up. I use shellac and varnish over paste fillers, but these fillers are seldom my first choice. Putting colored solids into the wood pores detracts from the appearance and clarity of the finish, which I think is the hallmark of a really fine job. □

David Shaw is a writer and finisher in Kelly Corners, N.Y.

Sources of supply

Among the finishing products used by Shaw are:

Natural paste filler No. 101, colored fillers, Japan colors by Ronan and Universal colors, available from Industrial Finishing Products, 2624 Pitkin Ave., Brooklyn, NY 11208.

Behlens Pore-O-Pack paste filler, natural No. 99-P-03.01, colored fillers, shellac and aniline dyes, available from Mohawk Finishing Prod., Rt. 30 North, Amsterdam, NY 12010.

Behlens Pore-O-Pack paste wood filler, shellac and dyes, available from Garrett-Wade Co., 161 Ave. of the Americas, N.Y., NY 10013.

Dri semi-paste filler natural No. D70T1, available from Sherman Williams Co., 101 Prospect Ave., Cleveland, OH 44115.

Pad sanders are comfortable to use in one hand and their small size allows them to get into tight places that a bigger sander can't.

Testing Pad Sanders

You can't judge one by its cover

by Robert Vaughan

Not long ago, you had only one choice if you wanted a small orbital sander—Rockwell's Model 330 Speed-Bloc. This little workhorse, introduced back in 1965, was comfortable to hold in one hand, used only a quarter sheet of sandpaper and got into tight places easily. Cabinetmakers loved it, and the small, black sanders soon turned up in professional shops everywhere. Today, the Speed-Bloc (now made by Porter-Cable) is still going strong. But lately some imported pad sanders have appeared on the scene to challenge Porter-Cable's corner on the market.

To see how they compared, I rounded up all the electric sanders I could find that used a quarter sheet or less of sandpaper. Of the five I came up with, only the Porter-Cable is American-made. Three—the Ryobi, Hitachi and Makita—come from Japan and one, sold by Black & Decker, is made in France. (Skil's model 7565 pad sander was introduced a few months after the test.) I tried them all to see how they sanded. Then I took them apart (a warranty-voiding no-no) to see how well they were made.

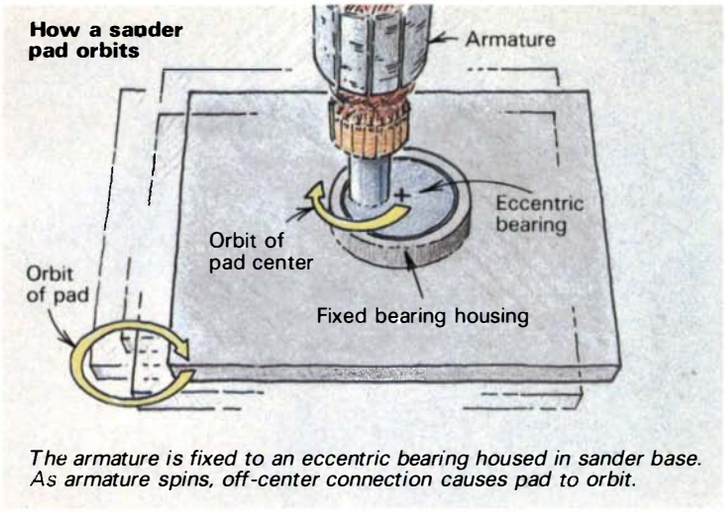
In an act of unparalleled self-denial, I opened the owners' manuals first. The Porter-Cable manual was the only one that suggested, and offered hints for, using their sander for drywall joints, sanding metal or plastic and rubbing out finishes, in addition to sanding wood. Not one of the manuals contained instructions for disassembly. Each recommended the sander be taken to a service center for repairs. (A tip of the hat to the Ryobi people for assuming that the owner is capable of changing the brushes and explaining how to do it in the manual.) In fact, except for the Ryobi, changing the brushes yourself voids the warranty.

As I examined the sanders, the most obvious difference (aside from the dust-collection bag on the Black & Decker, which I'll discuss later) was in the pads. The Makita and Porter-Cable had felt pads, the others had rubber pads of varying degrees of firmness. Porter-Cable sells an optional sponge pad for sanding contours and a felt finish-rubbing pad.

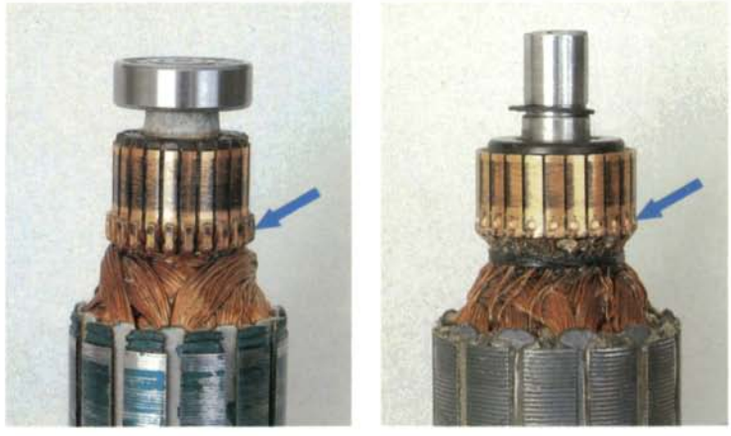
Performance testing the sanders didn't produce the radical difference in results that I expected, although slight differences were noticeable. To test the sanders, I drew a circle in pencil on a piece of birch plywood. The object was to see which sander erased the circle the fastest. The Ryobi and the Porter-Cable were the fastest sanders of the bunch, and about equal in sanding speed, wiping out the circle in 25 to 30 seconds. It seemed curious that the Porter-Cable sanded so well when, at 1.2 amps, it had one of the least powerful motors. The other three sanders performed pretty much the same.

To save time, I like to put several sheets of sandpaper on at

Ryobi S500 **Black & Decker 4010** **Porter-Cable Model 330**



The armature is fixed to an eccentric bearing housed in sander base. As armature spins, off-center connection causes pad to orbit.



Armature windings can be connected to the commutator by a tang folded over each wire, left. The more durable punch-crimp connection, right, has no vulnerable projections.

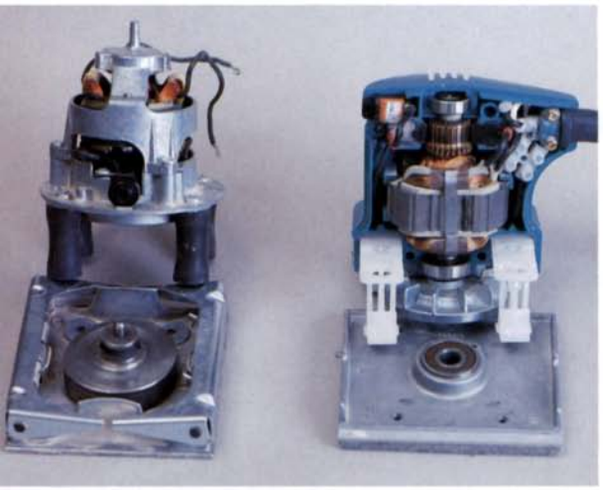
once. This allows me to tear off the worn sheet to expose a fresh one underneath without having to stop as often to change paper. All of the sanders can hold at least four sheets of 120-grit paper, but the Ryobi and Porter-Cable sanders have the strongest paper clamps.

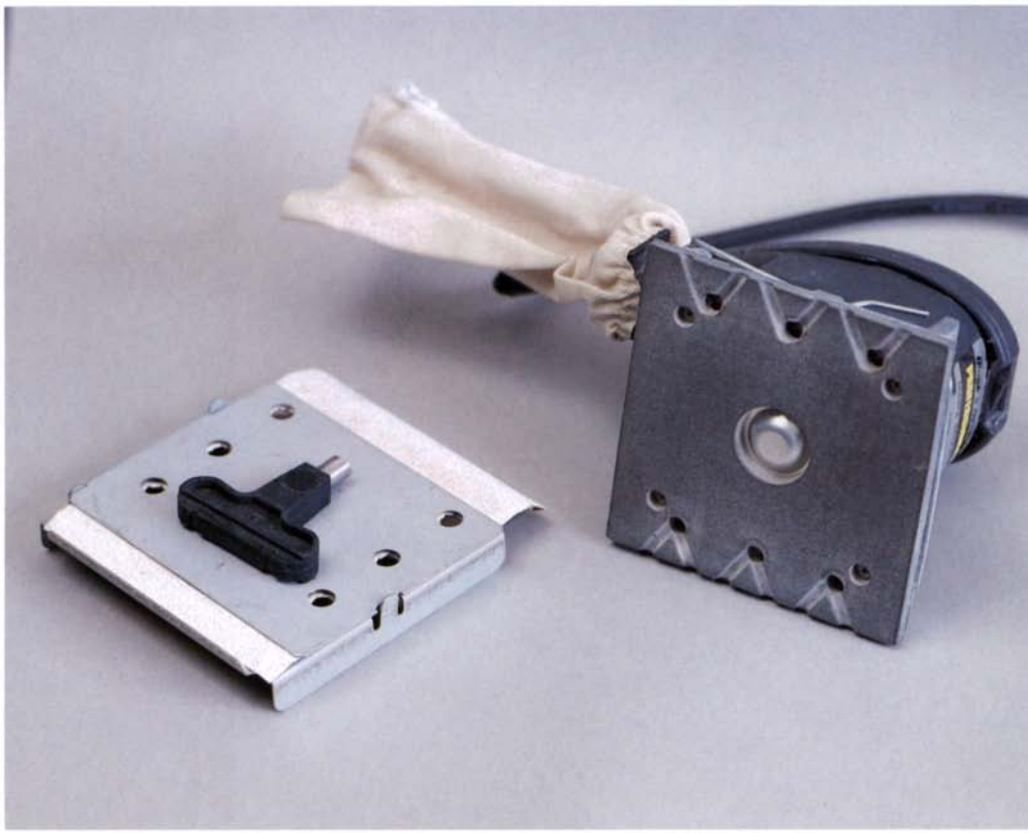
Since there wasn't that much difference in the way these sanders sanded, I looked deeper to find a difference, and a reason to choose one sander over another. As I disassembled them, I could see just why the manufacturers didn't want us to take their sanders apart, and I don't recommend that you do so. Some of the sanders were difficult to get back together again so they worked properly.

These pad sanders all work on the same principle. The armature is connected at the bottom, through a bearing, to an eccentric that drives the pad in a small orbit. A counterweight, called a balancer, counteracts the weight of the pad and keeps the sander from shaking itself to pieces.

The way a sander is constructed has a lot to do with its usable life. Power tools can be designed for the long haul, or they can be designed as throwaways. The difference is usually (but not always) reflected in the price. Manufacturers going for the long haul spare no expense to make components as carefully as possible and design their tools so that parts prone to wear are easy to replace. Consequently, their machines cost more. Manufacturers adhering to the throwaway philosophy figure that if they can keep the price low enough, the owner will choose to replace a worn-out tool rather than have it repaired. This approach dictates design and manufacturing shortcuts that make the rock-bottom selling price possible, but may mean a tool that won't run as many hours or won't be practical to repair.

The armature is the heart of any electric power tool. It's here that a manufacturer can either make or break a tool. The thing that usually makes an armature useless is that the clear epoxy-resin insulation on the winding wires wears off, causing them to short out. Sometimes the wires short out when the insulation is burned away by excess motor heat. Mechanical shorts can also occur when a foreign object shears a wire or knocks the insulation off and the wires touch. Some manufacturers take extra steps to protect these wires. Quality-conscious manufacturers flow an epoxy resin over the whole armature, fusing the wires into one solid mass. The Makita, Hitachi and Porter-Cable armatures have this secondary coating. Another detail of quality is banding, string tied around the wires just below the commutator bar connections. Banding holds the wires in place under centrifugal load and, when they are covered with the extra coat of epoxy, these wires won't budge.





Porter-Cable (above, left) has a metal housing under its plastic cover. Four rubber posts isolate the housing from the pad. A heavy steel balancer in the base counters the weight of the whirling, off-center pad. The Makita (above, right) has a plastic housing, and flexible plastic posts to isolate the pad. The balancer is cast into the underside of the fan. The Black & Decker dust collection system draws sanding dust through holes in the paper and sander base and around the edges of the pad. A hole-punching die and punch come with the sander.

Only the Hitachi and the Porter-Cable armatures have banding.

The armature's commutator is made up of copper bars. Each of these bars has a winding wire connected to it. The most durable way of making this connection is the punch-crimp method, where a wire is inserted into a slot cut in the bar and then the slot is crimped with a punch and sometimes welded. The folded-tang method is another way of making this connection. A tab on the end of the commutator bar is bent back over on top of the commutator bar, crimping the winding wire. These tabs protrude above the surface of the commutator and are more susceptible to damage from foreign objects than a punch-crimped connection. In folded-tang construction, the winding wires are looped about the commutator and, under centrifugal force, these looped wires can flex and distort, causing metal fatigue or abrasion of the wire insulation and, therefore, a higher risk of premature armature failure. The Porter-Cable and Hitachi armatures are made with the punch crimp method, and all the others use folded-tang construction.

The motor housing is another construction factor to consider. Metal is the most durable and repairable, but plastic motor housings are lighter and less expensive to make. Only the Porter-Cable sander has a metal housing.

Vibration does the work with these sanders and having these vibrations transferred to the hand is unavoidable. The construction of the sander, however, can lessen the degree. Because of the way it's constructed, with a separate aluminum motor housing, the Porter-Cable vibrated less in the hand than any of the other sanders. The Speed-Bloc has four large rubber posts connecting the motor housing to the pad, as shown at left in the photo above. It also has a rubber coupling separating the motor shaft from the base. The plastic cup housing that you grip with your hand is connected to the motor housing at the top only. It is this type of construction that makes the Porter-Cable such a smooth-feeling sander to use. The other sanders vibrate more because you grasp the plastic motor housing itself rather than a motor housing cover. Another reason for the increased vibration is that the hand is directly over the top bearing housing. Grasping the sander around the side will lessen the sensation. While the degree of vibration is not a real problem in the home shop, it may be a consideration in a professional shop where you may be sanding for hours at a time.

All of the sanders had ball bearings. Each sander has a one-year limited warranty that covers defects due to faulty material or workmanship. The Makita, Porter-Cable, and Hitachi warranties specifically exempt repairs required because of "normal wear and tear," so if you wear out your sander in less than a year, the repairs are on you.

Following are some specifics about the individual sanders. The prices listed are the manufacturer's suggested retail price, but mail-order tool companies often sell these sanders for much less than the suggested price.

Makita BO4510 ($82)—At 1.8 amps, the Makita has the most powerful motor of the bunch, yet it was not one of the more aggressive sanders. Vibrations weren't too bad and the indentations for the finger grips are comfortable. Because of the way you grip the sander, it's easy to control it, especially for rounding edges. Unfortunately, the ventilation slots are located in the grip area and the hand covers about 40% of them, reducing the flow of cooling air to the motor.

The clamps that hold the sandpaper are strong and grip well. Two levers on opposite sides of the base swing out to lift up the clamps. The pivot points are pretty stiff to prevent these levers from swinging out while you're sanding and, as dust and dirt build up over time, it's hard to budge those levers. An occasional drop of oil on the pivot point helps some.

The pad is isolated from the motor housing by four plastic skeleton posts, as shown on the right in the photo above left. Brushes are not easy to change. The Makita sander also comes in a round-

base model BO4530 ($86) for use with stick-on paper discs.

Hitachi SV 12SA ($79)—The Hitachi is similar in design to the Makita, with a 1.7-amp motor in a plastic housing. Upper and middle armature bearings ride in plastic housings while the bottom bearing is housed in the aluminum base.

The Hitachi armature was very well made. It was the only imported sander to have the winding wires punch-crimped and banded. It also had more wrappings where the winding wires connect with the commutator bars. I liked the Hitachi better than the other imported sanders. It gets up to speed quickly and feels comfortable, although the switch isn't quite as easy to reach as is the Makita's. For sanding on flat surfaces I preferred the Hitachi's firm foam-rubber pad to the Makita's soft felt pad.

As with the Makita, your hand covers many of the cooling vent slots on the top of the Hitachi. Another point I don't like much is the weak wire springs that clamp the sandpaper.

Ryobi S500 ($59)—At 1.5 amps, the Ryobi was the third most powerful of the sanders, yet tied with the Porter-Cable as the most aggressive. Although it's impossible to avoid covering some of the vent holes with your hand, the Ryobi also has vents on the underside of the grip area where fingers won't interfere.

I liked this sander. Its small 3-in. by 4⅛-in. pad (taking one-sixth of a sheet of sandpaper instead of one-quarter) is perfect for sanding cabinet face frames or door stiles and rails. Going the direction of the narrow pad width, narrow stock was easily sanded and moving the sander sideways sanded a swath as wide as any of the others. Because of the firm pad, the sandpaper didn't wear on the corners as it did on the other sanders. The pad is a 1/16-in. layer of hard rubber over a ⅛-in. layer of foam rubber and was the firmest pad of any of the sanders and great for sanding on flat surfaces. On the negative side, the Ryobi transferred more vibrations to the hand than any of the other sanders causing an unpleasant tingling sensation after only a few minutes of use. I suspect that the firm pad contributes to this.

The switch was the most peculiar switch I've ever seen on a machine. It's a rocker switch covered by a thick plastic dust cover, which results in a mushy and unpredictable switching action.

Changing paper is a breeze, the easiest of all the sanders. You can hold the sander in one hand and compress the clamp levers with your thumb and middle finger. The clamp mechanism seems durable and grips the paper firmly.

Instead of four outside posts, the Ryobi design features a short 2-in.-dia. rubber tube connecting the motor to the pad. This shields the balancer and the bearings from outside contaminants. The base and motor housing are clamped to this post with steel bands. The top armature bearing rides in a plastic housing while the middle and bottom bearings have metal housings. The brushes are a breeze to change.

Black & Decker 4010 ($88)—The French-made Black & Decker was the only pad sander with a dust-collection system—a great idea. It works reasonably well. The sawdust is drawn into the sander through holes in the pad (shown on the facing page) and up around the edges of the base through the impellor fan and into the dust bag. The owner's manual readily acknowledges that the dust bag is going to be inconvenient on certain operations, so it recommends simply removing the bag and installing the plug supplied with the sander.

You have to punch holes in the sandpaper for the dust to go through, and a hole-punching die and a punch come with each sander. The manual explains the hole-punching procedure well and it's easy to do, but you can also buy pre-punched paper from Black & Decker. Changing paper was fairly easy, but the wire paper-holding clamps are weak and spindly and seem likely to break.

Changing worn brushes is a simple matter of removing the top cap and there they are. One little nicety inside is the chrome-plated brush channels. This sander's light weight and 1.2-amp motor make it one of the best for sanding lacquer sealer, where you don't want a super-aggressive sander.

Porter-Cable Model 330 Speed-Bloc ($87.50)—Beneath the black plastic cover is a stout metal frame more befitting a small industrial router. The housings for all armature bearings are metal. At 3 lb. 14½ oz., this sander is the heaviest of the lot. All that metal makes the difference. The Speed-Bloc is designed and built for the long haul.

It has the best armature of the bunch. Not only is it made with the punch-crimp method, but the tip of that punch is also a welding tip that welds the wire solid to the commutator bar.

The Porter-Cable has the strongest sandpaper clamps but it's the only sander that requires a separate tool to lever up the clamps. This is a nuisance, and the only bad feature about this sander. A small lever comes with the sander but I've never seen a cabinet shop that didn't use a screwdriver instead.

It's not hard to guess that the Porter-Cable Speed-Bloc was my favorite sander. It's not that the others don't sand well; they do, and they're comfortable and convenient to use. It's just that the Speed Bloc is so well made, and has such a good track record for reliability that it's the one I'd buy, especially when you consider that the Porter-Cable is sometimes sold for only a few dollars more than the imported sanders. But I would also buy the Ryobi as a second sander. Its small, firm pad is really handy in places where the other sanders are too bulky. □

Robert Vaughan ran his own cabinet shop in Roanoke, Va., for two years. He is currently territory manager for a firm that supplies tools to schools.

Sanding without swirls

A common complaint about orbital sanders is that the circular action of the pad at 12,000 orbits per minute leaves swirl marks that telegraph through the finish. Quickly sand a piece of maple, hit it with a dark stain and a couple of coats of finish and see what a mess you get. This doesn't have to happen. For best results, move the sander along at the rate of about one inch per second. Go faster than this and the swirl marks don't have time to erase themselves. The faster you move across the stock, the stringier the swirl marks. Don't set the sander down hard on a surface and then start moving; instead, gently land it on the wood and then move it along. Abrupt landings and starts and stops while on the wood can leave clumps of swirls that appear as gouges and are difficult to erase. For work that will be observed under strong light or at distances closer than 18 in., it's always best to do the final sanding by hand. —*R.V.*

Jigsaw Puzzles

Brain twisters can be works of art

by Steve Malavolta

I first got involved in making puzzles when I needed a gift for my nephew eight years ago. A woodworker friend and I decided that it should be a stand-up dinosaur, in pieces. This led us to make some puzzles out of nicely grained wood cut into somewhat undefined pieces. They were a success on the arts and crafts circuit, so my friend and I formed a partnership and made puzzles full blast for a few years. When the partnership split up, I continued on my own.

A good puzzle should have at least two qualities. The design should be nice to look at and the puzzle should be challenging to put together. I live in the Southwest and derive many of my designs from landscapes. These are fun to make into puzzles, and my patrons seem to prefer them. I also do some abstract designs, and any custom designs a client might ask for.

Over the years, I have tried to expand my notions of what a puzzle can be. The standard jigsaw puzzle is flat. You can make a puzzle a lot more interesting by layering it, making one puzzle fit over another. I've worked up to 10 layers deep and cut up to 1,500 pieces in a single puzzle. I'm constantly working on new ideas, but cutting and finishing each puzzle takes time, and many designs never make it out of the sketchbook.

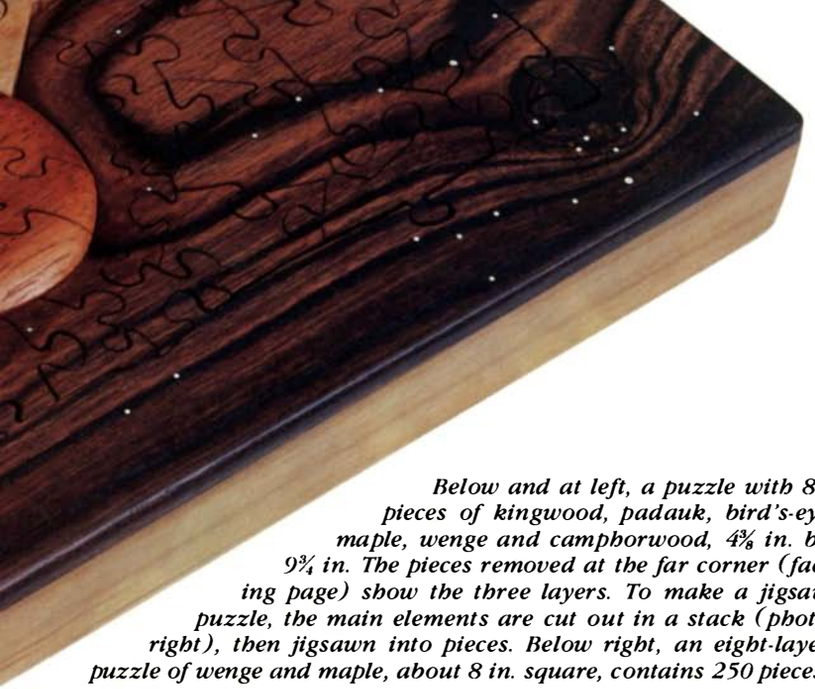
The jigsaw—Just a note or two about the jigsaw. Any reciprocating jigsaw will do the job, but I'm presently using Delta's new scroll saw and find its electronic speed control very helpful. I work anywhere from 800 to 1,400 strokes per minute, depending on the thickness I need to cut and the number of teeth per inch (tpi) on the blade. I mainly use two blades, both a #0 size, with the same thickness of about 0.011 in. and width of 0.023 in., but one has 22 tpi and the other 32 tpi (available from Woodworker's Supply, 5604 Alameda N.E., Albuquerque, N.M. 87113). I use slower speeds, along with the 32-tpi blade, on thinner or softer material for a slower cut and more control.

Tension is important. I tighten my blade so it vibrates at about a D# when plucked—you can check the note with a pitch pipe, a harmonica or a guitar tuner—but the best tension (and musical pitch) for you will vary according to your jigsaw and blade size. You should experiment. A blade that's too tight will break with slight stress and a blade too loose will bevel the cut, not allowing the pieces to slide in and out of each other smoothly.

Whatever your jigsaw, some fine tuning is needed if you want to work to close tolerances. Viewed from the front, the blade must stroke perpendicular to the table, with no movement from side to side. You can adjust this, on most of the older jigsaws, with a large bolt on the upper back portion of the frame—you simply loosen, adjust and retighten. If in doubt, consult your owners' manual. My new Delta required some shimming at the blade clamps to get the blade absolutely perpendicular.

I remove all guides and hold-down mechanisms from the machine. Guides cause friction on the blade, shortening its life. Hold-downs get in the way when I want to maneuver wood quickly and they block the line of sight.

Cutting without guides and hold-downs takes a bit of practice. The work must be held down firmly by hand or it will lift with each upstroke and slam back down with each cutting stroke. This is not only hard on the blade, it's hard on fragile puzzle pieces.



Below and at left, a puzzle with 88 pieces of kingwood, padauk, bird's-eye maple, wenge and camphorwood, 4⅜ in. by 9¾ in. The pieces removed at the far corner (facing page) show the three layers. To make a jigsaw puzzle, the main elements are cut out in a stack (photo right), then jigsawn into pieces. Below right, an eight-layer puzzle of wenge and maple, about 8 in. square, contains 250 pieces.

Photo: Pat Berret

Despite the firm holding pressure, you have to be sensitive enough to turn the work carefully when cutting curves—if the blade does not remain exactly tangent to the curve, it will stress sideways, either angling the cut or breaking.

Even with every precaution, a good new blade lasts only about ten minutes before it dulls and breaks, and some blades seem to have too little set and break even faster. With that in mind, a machine with quick-change blade holders is an asset. Older saws can be modified by removing the Allen holding screws and replacing them with thumbscrews.

Planning a puzzle—Choose nicely figured hardwoods, free of checks and with fine grain structure. For example, cutting oak is difficult because of its inconsistent and porous grain. In the thicknesses I work with, oak and similar woods are liable to break. Walnut and maple work well, as do tropical hardwoods such as bubinga, wenge, zebrawood, ebony and purpleheart.

I bandsaw the wood into slabs approximately 5/16 in. thick using a ¾-in., 3-tpi hook-tooth blade, then thickness sand them to approximately 5/32 in., with a 180-grit finish.

Figure 1, on the following page, is a simplified, overall view of the steps in cutting the wood into two different types of puzzles, flat and layered. Here are some of the fine points.

I select up to four different pieces of wood and stack them, tacking them together with quick-set epoxy at the corners. If the woods are very dense, I stack fewer layers. I always run the grain in the same direction throughout the stack and examine each piece so that I can orient it effectively. For example, in a landscape scene I will position each layer so that the wood that looks most like a sky will be in the sky part of the finished puzzle. Also, the bottom wood of the stack should be the most dense to minimize any chipping during the cut. And, the uppermost piece of the stack should be the lightest in color so the pencil lines of the drawn design stand out clearly.

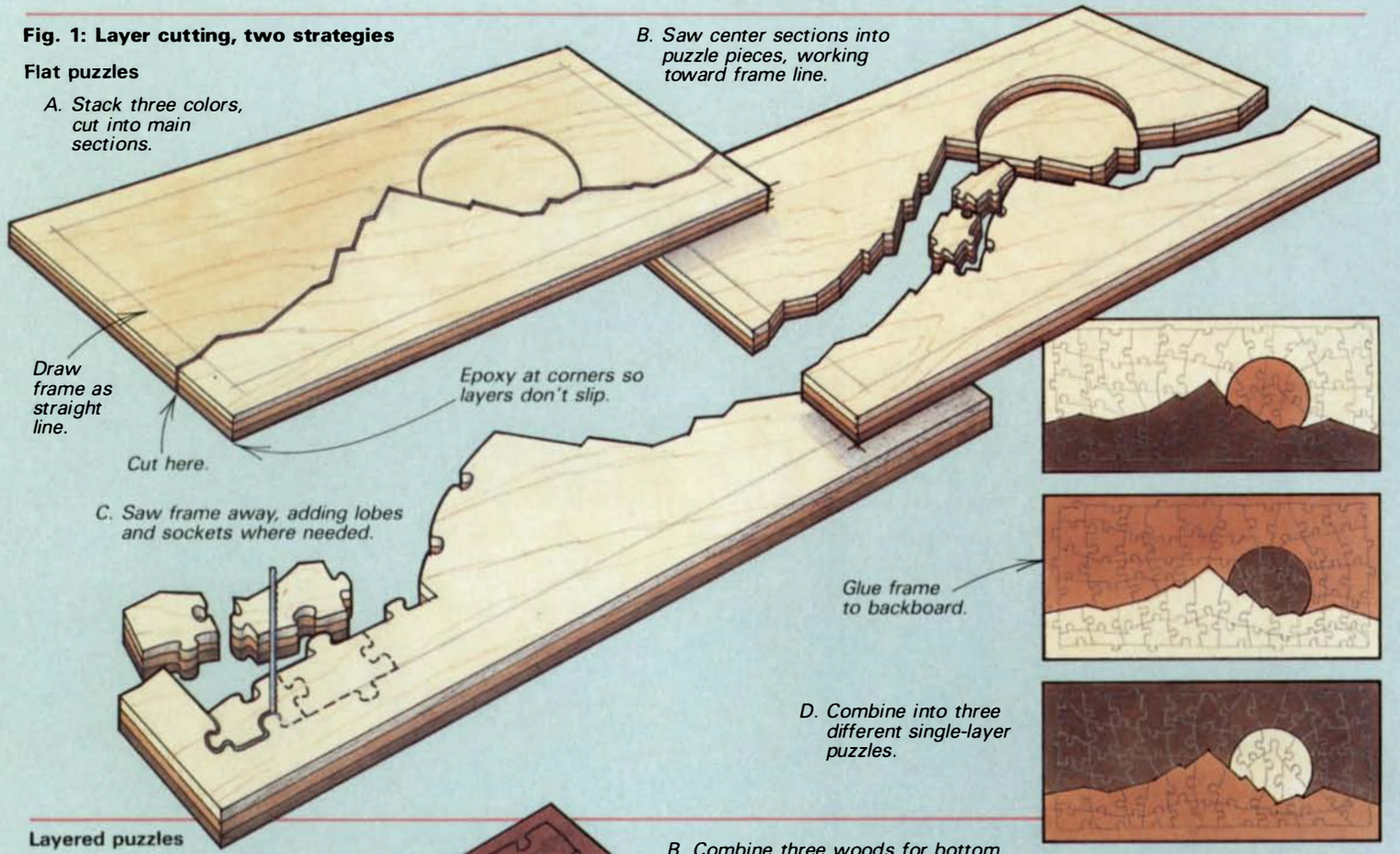
I now draw the main sections of my design—the areas such as mountains, moon, sky. These are the areas that will later be cut into puzzle pieces, and I take care not to draw any section too small or too fragile. I cut along the drawn lines, as shown in the top photo. In theory, the jigsaw would allow me to cut totally enclosed shapes—such as a full moon not touching the horizon line—by drilling a tiny starting hole through the work, threading the blade through it, then clamping the blade in the saw. But, in practice, the starting hole leaves a nasty little indent on the edge of the puzzle piece. So in all cases, I begin the cut at the edge of the puzzle, just as if using a bandsaw.

I draw my designs so that the puzzle pieces will be held in an outer frame that's glued to a backboard. In a puzzle such as the one in the large photo above, the outer frames are cut so that pieces of them can be used to build up depth in the foreground. Another approach is to glue the frame as a boxlike border, such as in the puzzle with circles, which is also shown.

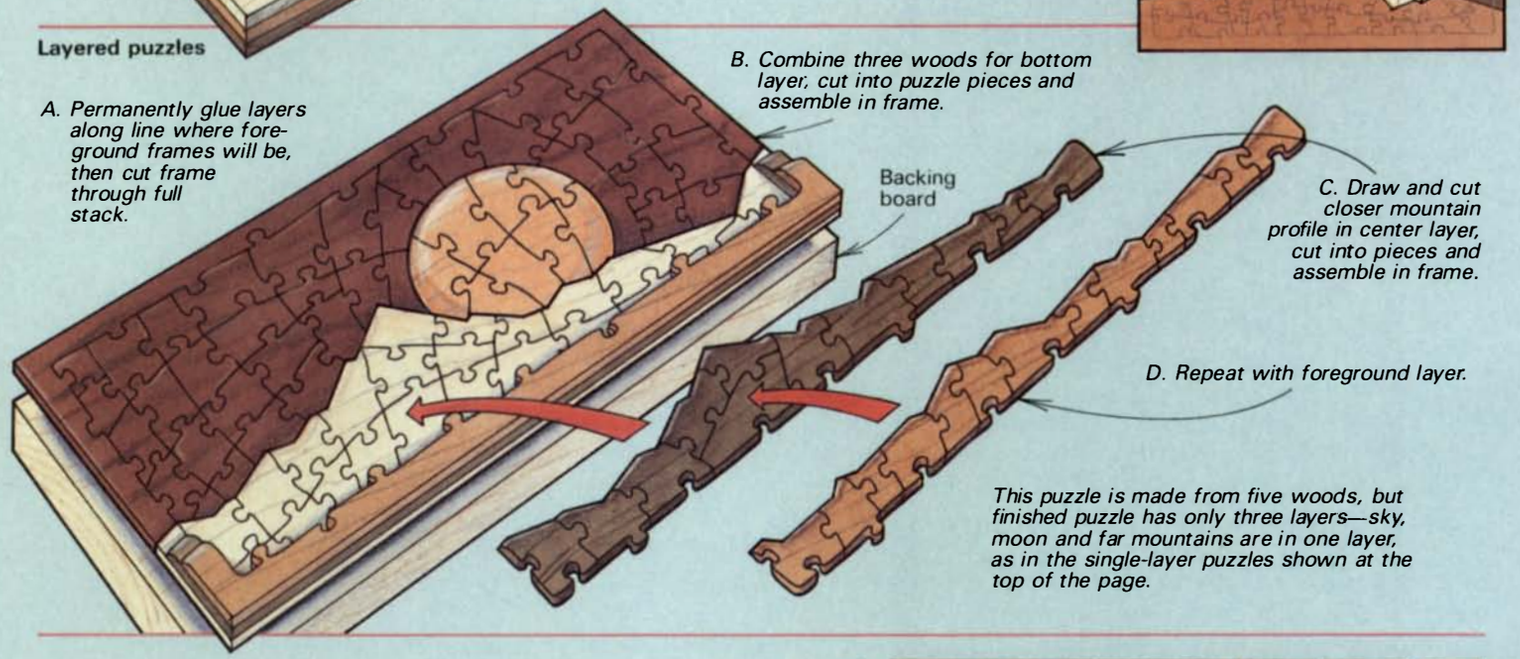
Regardless of which type of puzzle you are making, the inner border of the frame must be cut through the entire stack at once. How much of the outer frame should be cut into pieces at this time depends on the design. Sometimes, figuring out the cutting sequence for a complicated puzzle reminds me of what the

Fig. 1: Layer cutting, two strategies

Flat puzzles



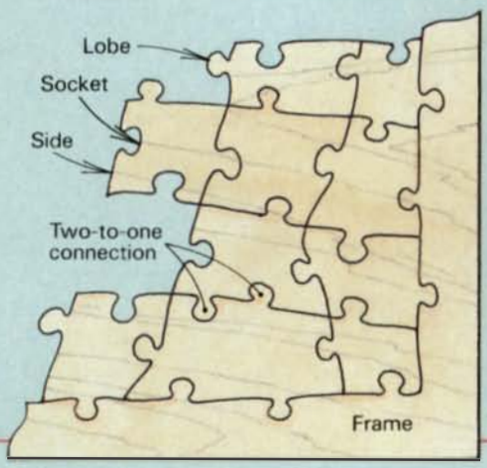
Layered puzzles



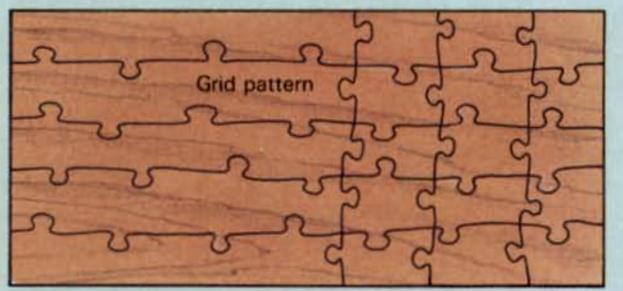
This puzzle is made from five woods, but finished puzzle has only three layers—sky, moon and far mountains are in one layer, as in the single-layer puzzles shown at the top of the page.

Fig. 2: Cutting patterns

Freehand pattern



The author, from long practice, cuts pieces without drawing guide lines, keeping the following rules in mind: He interlocks at least every other perimeter piece to the frame. Within the puzzle, he interlocks each side of a piece with the piece next to it. About every 5th to 10th piece, he makes two-to-one connections, as shown in the drawing, to help tighten the slack created by the sawkerfs.



The grid pattern is much simpler to plan and cut, but is less suited to puzzles of irregular shape. First draw a series of horizontal grid lines with lobes and sockets alternating along their length. Then cross the horizontal lines with vertical lines to produce an interlocking pattern containing a locking joint at each side of each piece.

Drawing: David Dann

puzzle's buyer will have to go through when putting it together.

If you're making flat puzzles, the sections can be sawn into puzzle pieces while they are still stacked. But layered puzzles are sawn into pieces with the sections split apart, so that you don't end up with one identical puzzle piece over another in the finished puzzle. I split the layers apart using a sturdy utility knife, working with the grain.

Beveling the edges of the sections gives the illusion of more depth than the puzzle actually has. For example, in the landscape puzzle shown in this article, the sky, moon and far mountains are all on the puzzle's bottom layer. I usually bevel pieces on a 60-grit, 6-in. by 48-in. belt sander. I work primarily on the front roller and sand off a shallow angle, half the thickness of the wood, on the desired edges. I finish sand the bevel on a 3-in. pneumatic drum sander with a well used 180-grit sleeve.

Cutting pieces—The sections are now ready to be cut into puzzle pieces. Some puzzle makers draw out a grid system as a basis for their pieces, a process illustrated in figure 2. But because I cut within such irregular shapes (and have years of practice), I freehand all my cuts, as I am doing in the photo at right. I plan out pieces in my mind about three or four ahead of the one I'm cutting and aim to keep each piece about ½ in. to ¾ in. square. I've always forced myself to make them as small as possible within the limits of my equipment.

Mass-produced cardboard puzzles are stamped out by machine, resulting in virtually no space between pieces. A wooden puzzle, in contrast, always has some slack from the sawkerf, and the interlocking pieces should be shaped so that they cannot slide apart. This requires a lobe-and-socket connection on each side. As further security, on about every fifth to tenth piece, depending on the size of the puzzle, I make pieces with two-to-one connections, as shown in the drawing.

As I cut each piece, I assemble the puzzle on newsprint paper so I don't lose track of which piece goes where. When all the pieces are in place, I put the frame around the puzzle so that I can sand the surface to remove any burring from the cutting. Next I polish with 00 steel wool.

To flip the puzzle without jumbling the pieces, I use a manila file folder, placing the edge of the puzzle at the crease, closing the folder, turning it over and reopening it.

I finish the centers of the puzzles first, leaving the frames for later. I brush the assembled pieces with Watco oil on both sides, flipping the puzzle as before and placing it back on newsprint. After a few hours, I wipe off the excess oil. The next day, I wipe both surfaces with tung oil.

I glue the frame pieces to a backing board of 4/4 alder, trim the assembly square with the radial-arm saw, then sand the back and sides to round and soften the edges. Using a Foredom tool with a small Dremel burr, I inscribe the back of the puzzle with the different kinds of woods used, my signature, the date, and the title if applicable. After a bit more hand sanding and steel wooling, the backed frame is ready for oiling. After the oil is dry, I slide the puzzle pieces off the newsprint into the frame and wipe on a final coat of tung oil.

To get away from woodworking for a moment, many of my puzzles contain inlaid metal—sterling silver wire, for example, used as stars in landscape scenes. Inlaying can be done before or after relief beveling, but is best done before cutting the puzzle pieces, because it's much easier to manipulate the work. I drill clear through with various small drills equal in diameter to the gauges of silver wire (available at most jewelry stores with repair departments or from jewelry supply houses). I epoxy the wire into place, then snip it off, leaving a small amount extra on both top and bottom to be sanded flat later.

Edge-beveling, which gives an illusion of depth, can be roughed out over the end roller of a belt sander.

Each segment of a layered puzzle is sawn into interlocking pieces. Typical sawing patterns are shown on the facing page.

The puzzle now waits to be dumped and played. Although some of the puzzles have as few as 30 pieces, they still can be quite an entertaining challenge. Since the pieces are finished on both sides, the puzzle builder has to determine whether each piece is right side up or not—the trick is to learn to visualize each piece in reverse. Some of the larger puzzles become very challenging. The use of layering not only adds depth but also difficulty. Each layer goes completely underneath the one above it with different shaped pieces and, in some cases, with the same wood. So one can easily start constructing the edge pieces on the wrong level only to discover this false start later, when trying to assemble the interior pieces. This may seem like a dirty trick, but it's the sort of deception that delights puzzle fans. □

Steve Malavolta also makes letter openers and sculptural lighting fixtures at his studio, Selected Grains, in Albuquerque, N.M. Photos of work in progress by Marc Coan.

Thomas Moser

Marketing is as important as making

by Paul Bertorelli

By now, the story of the highly-paid white-collar worker chucking it all for the simpler life of a craftsman is a familiar one. Fourteen years ago, Thomas Moser was one of them, abandoning a comfortable job as a college English professor for the grittier calling of a furniture designer-maker. His experience wouldn't warrant much attention were it not for the fact that last year Moser managed to make and sell some $1.6 million worth of furniture, all of it solid wood and all of it handmade, albeit not in the usual way.

Numbers like that suggest that Moser's business has more in common with a factory in High Point or Grand Rapids than with a designer-craftsman shop where furniture is made patiently, one piece at a time. Yet, in the course of three visits to Moser's shop in Maine, I learned that even though furniture practically spews out of a big, very busy shop, the vestiges of the craft shop Moser founded in 1972 are still faintly visible.

On my first trip to Maine last December, I was anxious to see what sort of a shop was capable of building more than a million dollars worth of furniture a year. More important, how do you market that much work? My first stop was the Thos. Moser Cabinetmakers showroom, an old building in downtown Portland, Maine, whose spruced-up Georgian architecture goes well with the period feel of Moser's furniture. Inside, the place glows with the warm, red hue of oiled cherry. Most of Moser's furniture is made of solid cherry. No exotics here, and no plywood or veneer either.

On two austerely decorated floors are examples of the 60 or so pieces in Moser's catalog. The place has the look of a toney gallery without the precious feel; customers are encouraged to sit in the chairs and peek in the drawers. It's a soft sell. The showroom's ten-person sales and administrative staff is mostly invisible, spending most of its time engaged in Moser's main business: mail-order residential furniture sales, plus an aggressive effort to break into the lucrative contract furniture market.

Judging from its uncertain start, Moser's business seems to have achieved its commercial vitality as much by serendipitous good fortune as by calculated design. "When I started out," Moser says, "all I wanted to do was make furniture. I really didn't have anything in mind. No grand plan." An abandoned grange hall in New Gloucester, Maine, housed Moser's first shop. Assisted by his wife, Mary, Moser hung out a shingle in 1972 announcing the founding of Thos. Moser Cabinetmakers. Like so many woodworkers lured to the professional crafts by the promise of making unique objects of high quality, the Mosers hoped to support themselves on a modest output of custom woodwork. "We started out tentatively the first year. We did almost anything. We did a staircase for a house, a bathroom, a front door. . .anything to keep busy."

There was plenty of work, little of it profitable. "We lost money for the first three years. We didn't really have to sell our house, but we ended up doing it anyway because it took some of the pressure off," says Moser. "We followed that track for five years. A lot of what we made I wasn't terribly proud of because I was basically subservient to the client's taste, which I didn't always respect. But I needed to feed four boys, so I went along and made it anyway."

Five years of hand-to-mouth struggle left Moser with an empty bank account and a harsh view of how furniture ought to be sold. "I decided that making custom furniture wasn't the way to live. You either posture yourself as a maker of your own designs and starve to death waiting for someone to buy them, or you yield to the market and make something that you don't consider good design." The dilemma should be instantly recognizable to any craft furnituremaker. Its solution is rarely as apparent.

"Mary and I established two rules at the start: First, we refused to sell wholesale. We had approached a department store in Boston but they wanted to decide what the furniture was worth, not us. We didn't think it was fair to get only half of what someone was going to pay for what we made. Second, we didn't want to show our stuff at craft fairs next to someone selling pots or macramé. We positioned ourselves to be outside of that kind of craftiness." On its face, selling a $500 chair through the mail makes even less sense than peddling it at a craft fair, but that's just the strategy Moser devised.

Relying almost entirely on advertising, Moser scratched his way into the mail-order business. He'd always advertised in local newspapers and magazines, generating sales from well-to-do vacationers looking to furnish their Maine summer homes. To a large extent, his market is still strongly regional. About 75% of Moser's furniture is sold within a day's drive of Maine, largely to customers who buy through the catalog without bothering to visit the showroom. Sensing that the tastes of educated, affluent buyers in Kansas City might not be all that different from those in Kennebunk, Moser began buying ads in the *New Yorker* magazine in 1978. The campaign brought in a steady, though not overwhelming, number of inquiries, slowly expanding sales to a national clientele. Those who sent in a buck got back a tasteful catalog and a price list describing the various Moser wares, which initially included about 25 standard pieces, plus the option of custom work.

In Moser's recent catalog, there's a furniture design for every purpose: chairs and tables for the dining room; stools for the den; bedroom case pieces, large and small; desks and clocks for an office. Moser's prices are in line with what you might pay for

moderately priced one-of-a-kind work. For instance, a 6-ft. harvest table with two rule-jointed leaves sells for $1,200. A seven-drawer dresser, 56 in. high, costs $2,650.

Chairs and benches in a dozen different versions are the big sellers, followed by beds and tables, then casework. Marketing this considerable output (about 2,000 pieces last year) occupies much of Moser's time, and it takes a pile of money to keep the commercial engine ticking. Last year, Moser spent some $165,000 on catalogs, advertising and promotion—about 10% of his gross receipts. "It is not a self-sustaining market," says Moser. "It takes continuous maintenance. You can't run one ad here and there and expect it to draw well. You've got to build identification over months and years with a continual effort."

Since about 1981, Moser has expended much of that effort in establishing a foothold in the contract furniture industry. The architects and designers who furnish offices and public buildings don't look to the *New Yorker* for new wares, thus Moser has gotten to them through freelance sales agents in Dallas, Chicago, Los Angeles and a number of other major U.S. cities where Moser's furniture is beginning to turn up in some of the furniture marts where contract buyers shop. Last year, half of Moser's sales went to the contract field, and he expects the proportion to increase in 1986. It's great work if you can get it. Contract clients aren't nearly as fussy about price as residential buyers tend to be and, because they buy in greater numbers, the sales are cheaper to close on a per-order basis. Moser's entry in the contract field has not gone without notice. Knoll International, the giant contract furniture concern, thought enough of Moser's operation to hire him to produce architect Robert Venturi's post-modern plywood and laminate chairs derived from traditional forms, a job that has proven profitable and prestigious (see box, p. 75).

A Portland woodworker I talked with observed that Moser's designs are to furniture what easy listening is to music. It's as apt a description as any. His furniture is very hard to pin down stylistically but overall, Moser's work tends toward safe, solid interpretations of popular period forms. He's best known as a producer of Shaker-style pieces, an association that isn't entirely accurate but one he brought upon himself with the publication of his first book, *How to Build Shaker Furniture*, in 1979. In Moser's furniture you do find the sense of proportion, the straightforwardness of construction and lack of ornament common to Shaker work. Yet, much of what Moser builds finds no equivalent in any of the Shaker furniture I've seen. Some of his round tables, for example, have squarish, tapered legs and curved aprons that look, to me, more Federal than Shaker. Moser's small desk-on-frame with a fall-flap front could be a Shakerized interpretation of a Queen Anne lady's writing desk.

The period influences surely come from Moser's early experiences in woodworking and from ideas exchanged with early associates. Moser is self-taught, having acquired his woodworking knowledge while growing up as the son of a printer in Chicago during the 1940s. Like most kids, he knocked apart old furniture and scrounged scrap wood for his own projects. "You really learn a lot taking apart an old case," he says. "You get a feel for what works and what doesn't because you have the benefit of all that hindsight." Skills (woodworking and business) learned early on helped Moser and his wife earn enough to pay for graduate school at the University of Michigan. "We'd buy basket cases. . .an old dry sink, chests of drawers, clocks, whatever. . .fix them them up and sell them at a consignment market in Ann Arbor."

Somewhere along the way Moser developed an appreciation for 20th-century industrial design, which shows up in his furniture and in the showroom itself, where expensive Italian-modernist lamps cast an agreeable glow over a pair of cherry tabletops. Moser's liberal seasoning of 18th- and 19th-century styles with a more contemporary aesthetic works better in some of his pieces than in others. I think it succeeds best in his top-selling piece: a continuous-arm chair. This chair descends from a style of Windsor popular in 18th-century New England. Where the traditional Windsor had a coat of paint, Moser's exudes woodiness. It's made of cherry with ash legs and back spindles turned cleanly, without the baluster-and-ring ornament found on old Windsors.

Moser further updated his continuous-arm chair by dropping the H-stretcher arrangement in favor of laminated braces meant to keep the splayed-out legs from cracking the chair bottom. Moser's early designs had braces only at the back, and sure enough, the front legs did crack the seats. For my style of sitting, the chair is not entirely comfortable. I like to lean back, pitched slightly skyward. The Moser chair keeps you relatively upright and the seat plane is nearly parallel to the floor, so there's a tendency to slide out of the seat. Still, I find this chair aesthetically appealing and at $465 (plus shipping) it offers a one-off feel at a middle-class price. The continuous-arm chair is an eye-catching centerpiece for many of Moser's *New Yorker* ads. "Ours is a small shop," intones the ad copy, "producing quality furniture."

Calling a 35-man, 18,000-sq.-ft. shop stuffed to the rafters with industrial woodworking machines "small" is a bit of reverse hyperbole, but it's an image that Moser has carefully cultivated. The shop is housed in a two-story converted slaughterhouse just outside Auburn, an old Maine shoe-and-textile town hard hit by foreign competition. Moser bought the building four years ago after outgrowing the New Gloucester grange hall. Lee Bradley, who Moser hired two years ago as production supervisor, gave me a quick tour, then turned me loose to poke around.

On the lower floor, I wandered through a clean, spacious machine room. There aren't any lightweight tools in sight. Moser has a penchant for orphaned cast-iron machinery, which he buys cheaply and overhauls. The day I arrived, a worker was gluing up acres of tabletops using an enormous rotating clamp rack Moser bought from a defunct furniture factory. The worker was drawing his material from a mountain of gorgeous cherry delivered a few days earlier. Most of Moser's cherry comes from Pennsylvania and West Virginia. For a premium price, a Boston lumber broker sorts it by the truckload, picking through for uniform color and figure.

Climbing a steep flight of stairs, I arrived in a bustling, open bench room on the second floor. It's divided into three sections, one each for chairs, tables and case goods. Another area, separated from the dusty bench room by a plastic curtain, provides space for finishing. Besides a complement of handtools, each workstation has a compressed-air outlet. Moser is a believer in air tools and everywhere you turn there's the hiss and whine of pneumatic drills and sanders. Even a pair of old pattern vises are air-operated, their lead screws having been replaced with a pneumatic cylinder activated by a foot pedal.

When I descended into the basement, I found myself in what could well be the shipping room of a kit furniture factory. Carefully stacked on rows of steel shelving, were hundreds of furniture parts: neatly mortised table legs, rails and stiles for cabinet doors, drawer fronts sawn from one board and taped together to hold the grain match. All were awaiting individual customer orders before being assembled into finished furniture, a way of

Inside Moser's shop

An example of each of some 60 pieces of furniture is displayed in the Moser showroom, above, in downtown Portland, Maine, but most of it is sold, sight unseen, through a slick color catalog. A ten-person sales and marketing staff runs the showroom, which is where Moser, left, spends most of his time.

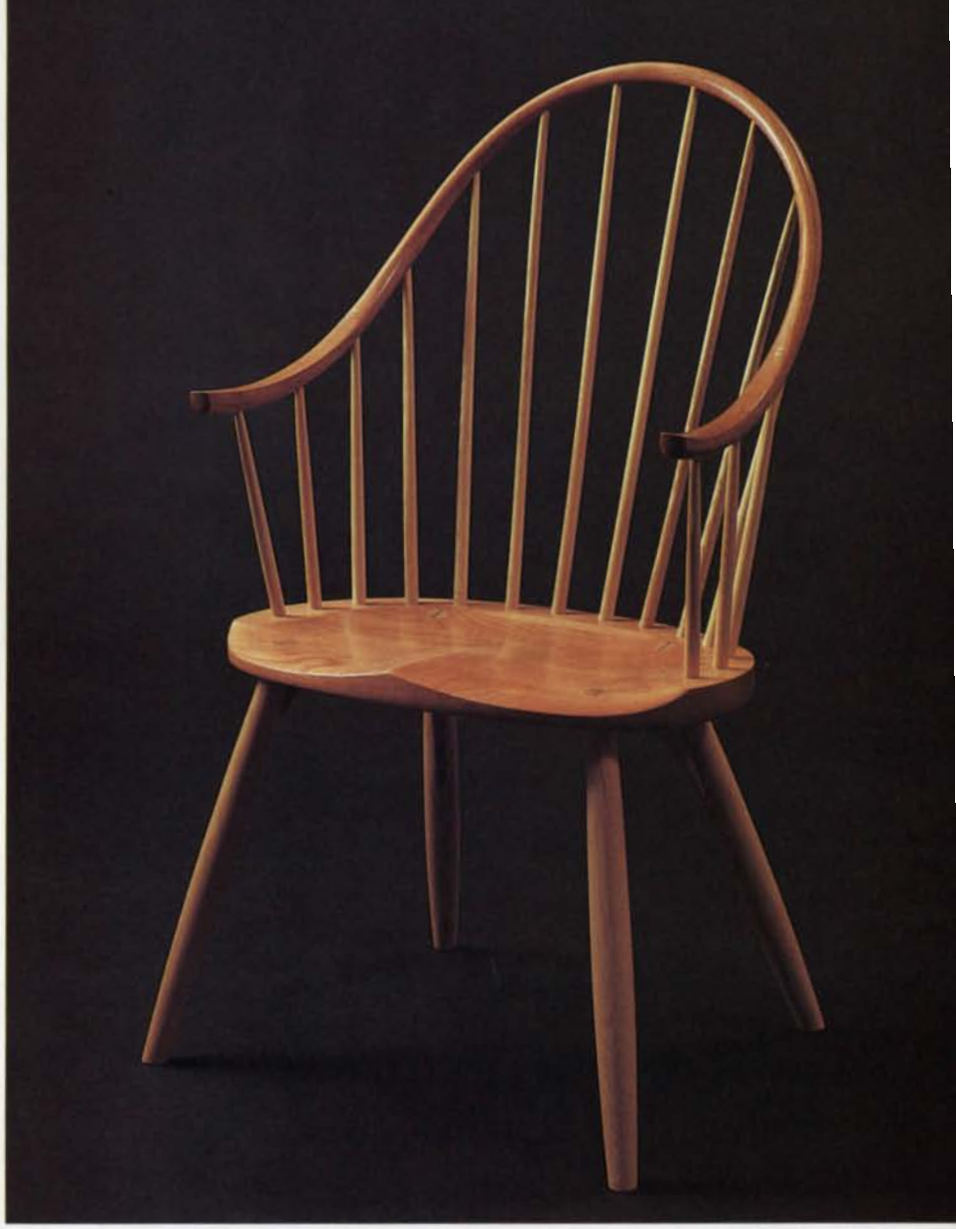
The furniture itself is built in a renovated slaughterhouse in Auburn, Maine, where parts are made in batches, then stored until orders are received. Parts are made largely by jigged machine tools but there's plenty of handwork, like the headboard being shaped by Malcolm Libby at right. Some parts, like chair spindles, are farmed out then sorted for color when they're delivered.

Once orders are received, shop supervisor Lee Bradley, below right, gathers parts and delivers them to the bench room for assembly. Moser promises delivery within 16 weeks, so there is time to allow orders to accumulate for economic batch assembly. The bench room

is divided into sections, one each for chairs, casepieces, and tables and desks, plus a separate room for finishing. Each workstation has a compressed-air outlet for pneumatic drills and sanders, and there's a centrally located complement of small machine tools. Mary Woodward, above, uses a bench room bandsaw to trim spindles on a headboard.

Casework and tables are usually made by a single worker, but chairbuilding is more an assembly line operation. Below, John Leavitt drives home wedges in the back of a continuous-arm chair. He will then pass the chair on to someone else for sanding and later install the legs and knee brackets.

The cherry and ash continuous-arm chair, above right, is Moser's best selling piece. Its design was inspired by a type of Windsor popular in New England during the late 18th century. In casepieces, like the chest of drawers shown at bottom right, the Shaker motif Moser is best known for is evident. The entire piece, including the carcase back and drawer bottoms, is of solid wood.



Photos above and below courtesy of Thomas Moser

work that's the economic foundation of Moser's business.

Essentially, furniture from parts works like this: Inventories of parts for each piece are kept on hand, the inventory level based on which items sell best. Bradley receives orders from the showroom every day (Moser promises delivery within 12 to 16 weeks) and, when he gets anywhere from three to perhaps 30 or more orders for a particular piece, he collects the parts and hauls them to the bench room for assembly. Because stored parts are, in effect, stored money that doesn't earn interest, Bradley holds his inventory to a minimum, monitoring his stock with a microcomputer programmed to tell him when more parts are needed.

Economies of scale accrue from batching assembly work. "If we get an order for one sidestand, we won't make just one. It's just too inefficient," says Bradley. "We'll make three and hope to sell the other two within 45 days." There can be too much of a good thing, however. An order of 60 chairs is liable to be split up into two or more smaller batches, otherwise the shop floor gets cluttered with work in progress and the output eventually chokes the finishing shop. Bradley's computer figures prominently in cost control, too. When I asked how final selling prices were determined, he produced a fat booklet of printouts listing construction steps for each piece and a time and dollar value for each parts-making and assembly step. Bradley employs a value-added costing mechanism whereby the cost of each step is added incrementally to arrive at a true cost of goods. Thus, lumber arriving on the loading dock at $1.55 per board foot is first marked up 35% to cover handling and waste. Time for planing, ripping and gluing up panels is accounted for (at an average of $19 per shop hour), then added to the marked up cost of the lumber, and so on. Time for each step is meticulously recorded by the workers on detailed cutting lists they are issued for each job. No item, be it a single screw or a dollop of wax, is overlooked.

Bradley's cost of goods is multiplied by two to arrive at the customer's final price. Until recently, the Auburn shop was a company unto itself and actually "sold" finished goods to the showroom. Bradley earned a profit which he could then reinvest in new machines or whatever other improvements he deemed worthwhile. Early this year, however, the company was reorganized into a single entity. "One thing I never realized as a craftsman," Moser says "is that you have to make money making furniture and you have to make money selling it, too. The idea that design or sales is a free service is wrong thinking."

The lopsided concentration of woodworkers in the bench room (usually about 22 people) indicates how handwork-intensive Moser's furniture is. Much energy is devoted to jigs that will produce accurate parts and some, like chair spindles and legs, are farmed out to outside shops equipped with automatic lathes. Still, there are always tenons to be trimmed, holes to be bored, surfaces to be flushed up after assembly. And then there's the sanding. "We spend a third of all our hours sanding. Everybody sands at one time or another," Bradley explains. The finished work shows it. The surfaces are flawlessly smooth by the time two coats of linseed oil are given a final wax rubdown.

Moser's production set-up doesn't leave a lot of room for flights of technical or aesthetic fancy and in that sense, a graduate from a studio woodworking school might find the work uninspiring. By the time parts arrive at the bench, design has long since been settled and the bench worker is left to do what is essentially an assembly job. Workers doing case pieces, who tend to be the most skilled, have correspondingly more independence. They usually carry the job through from start to finish, drawing parts that consist chiefly of glued up and sized panels that must be joined by through dovetails cut on Leigh router dovetail jigs. Drawers are made up from pre-cut parts, but they also have to be individually dovetailed and fitted.

The shop produces less custom work of late, but for a premium price, customers can have a catalog piece altered to a particular size or purpose. Mostly, that means slight changes in the size or in the configuration of doors and drawers. Sometimes alterations are extensive enough to amount to a true one-off piece, in which case the cabinetmaker will make up all the parts himself, relying on standard elements from the Moser design vocabulary. Door stiles, for example, are always 2-in. wide, tenons are always pinned in the same fashion, and so on.

It's in chairmaking that the Moser shop most sharply departs from the way furniture is made in a typical craft furniture business. The parts arrive from the storeroom in a higher state of completion, and construction steps tend to be passed back and forth among a handful of workers in semi-assembly-line fashion. One morning, I watched John Leavitt, a Moser employee for four years, build continuous-arm chairs. He began with a pre-shaped, pre-drilled seat blank into which he inserted the 14 back spindles. Eyeballing the angles, Leavitt bored spindle holes in the continuous arm with a pneumatic drill, glued then wedged the spindles before handing the legless chair on to someone else for sanding. Later in the day, the chair might come back to Leavitt to have legs installed or it could go to another worker. Including parts making and finishing, it takes about 12 hours spread over several days (or weeks) to make a continuous-arm chair.

Moser's hand-rubbed oil finish

Part of the handcrafted appeal of Thomas Moser's furniture comes from a lustrous linseed oil and wax finish that provides protection against dirt without hiding the wood beneath a thick, transparent film.

It couldn't be simpler to apply. Chuck Jones, who oversees the finishing department, showed me how it's done. In the assembly shop, the wood is rough sanded with progressively finer grits, beginning with 100 or 120 and ending with 150 grit. Final sanding is done with a polyester-backed paper made by 3M. It's called Imperial Microfinishing Film (for a local distributor, write 3M at 3M Center, St. Paul, Minn. 55144) and is designated by the micron size of its silicon-carbide abrasive particles. Using pneumatic orbital sanders, the surfaces are sanded first with 80-micron paper followed by 60-micron. In the finishing shop, final hand sanding is done with 40-micron paper, the equivalent of 320-grit paper.

Using rags soaked in pure boiled linseed oil kept at about 100° to 120° on a hotplate, Jones applies a heavy coat that's allowed to soak into the wood for up to four hours before the excess is rubbed off. "You have to be careful with the excess. It will get sticky if you let it sit too long," says Jones. A second coat follows 24 hours after the first.

Before giving the wood a coat of Butcher's wax, Jones lets the second coat dry for 48 hours, then removes any dust with a fine, synthetic abrasive called Scotchbrite, another 3M product. A thin coat of wax is applied with white felt, then evened out with a Scotchbrite buff. Periodic waxing will renew the luster.

Making Venturi's chairs

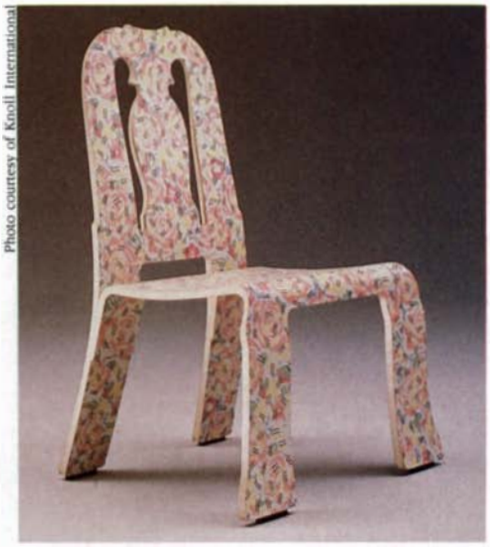


Photo courtesy of Knoll International

Moser is one of two shops Knoll International selected to manufacture Robert Venturi's post-modern plywood chairs. Moser cabinetmaker Michael Fleury, right, routs chair profiles using a series of vacuum-clamped templates provided by Knoll's prototype shop.

Knoll International's giant factory in East Greenville, Pa., makes the contract furniture industry's cash crop: desks and office systems. Out-of-the-ordinary work, however, like Robert Venturi's line of postmodern furniture is about as welcome there as a handful of sand in a well-oiled watch. Knoll farms out its limited-production work to small commercial shops like Moser's.

Even at that, the Venturi chairs are surely a loss leader for Knoll, a company accustomed to selling furniture by the truckload. At prices ranging from $916 to $1,373 depending on the style, Venturi's chairs have sold in the hundreds, mostly to a sophisticated residential clientele. Such sales probably don't amortize the work a Knoll design team invested in refining Venturi's foam-board mock-ups into a producible chair, but Knoll's payoff comes not in cash but in publicity. Venturi's furniture has enjoyed wide press coverage, each photo caption dutifully noting Venturi's post-modernist message while keeping Knoll's name well-connected to a designer of some stature.

Knoll cooked Venturi's models into many prototypes, submitting ideas to the architect for approval at every step. Intending a cheaper chair, Knoll designers hoped to die stamp the chair's plywood parts, cookie-cutter fashion. But die cutting left the plywood too ragged, so Knoll turned to template-guided routers. As the chair's detailing improved, its chances of being produced industrially diminished.

Knoll offered Moser the job chiefly because of his reputation as a hand-builder. Knoll supplies Moser (and a second Pennsylvania shop producing the chair) with laminated chair blanks, each laid up of $\frac{1}{16}$-in.-thick maple veneer faced with the plastic laminate sheet that carries the color pattern. In Moser's shop, the bent blanks are clamped on a vacuum table and the profile is roughed out with a saber saw. A vacuum-clamped template guides a router for final shaping and for cutting the piercework. The exposed plywood edges, sometimes burned and chipped from the router, are laboriously hand sanded then lacquered with a brush. It's hardly a chair for the masses. When the hours are added up, the Venturi chair design is nearly as labor-intensive as Moser's solid-wood Windsor. —*P.B.*

The brisk pace of production is a long way from the romantic shop Moser envisioned in 1972. The evolution from craft shop to manufacturer has wrought some stressful changes on Moser and on some of his early associates, several of whom have left to pursue a way of furnituremaking more in tune with Moser's early philosophy. Last winter, the New Gloucester grange hall was closed, finally severing the ties with Moser's vision of a one-man, one-bench refuge from the workaday world.

On my last visit to the Auburn shop, I chatted with the finishing crew as they readied chairs for shipment. As each was upended for a final rubdown, I noticed the date and a hand-scrawled signature of a Moser employee on the chair bottoms. A nice touch, but also a ploy that suggests that one craftsman produced what was, in fact, the work of many hands. A triumph of image over substance? I don't think so. Moser's furniture holds its own with a lot of the one-off work I've seen, and I can't imagine his chairs being better if they'd been made without help from machines and batched assembly methods. What matters most is that Moser has discovered a niche in which he can profitably make distinctive furniture that satisfies both his and his clients' tastes. □

Paul Bertorelli is editor of Fine Woodworking. *Thomas Moser's three books are available from Sterling Publishing Co., Two Park Avenue, New York, N.Y. 10016.*

Turning Balls

by Ernie Conover

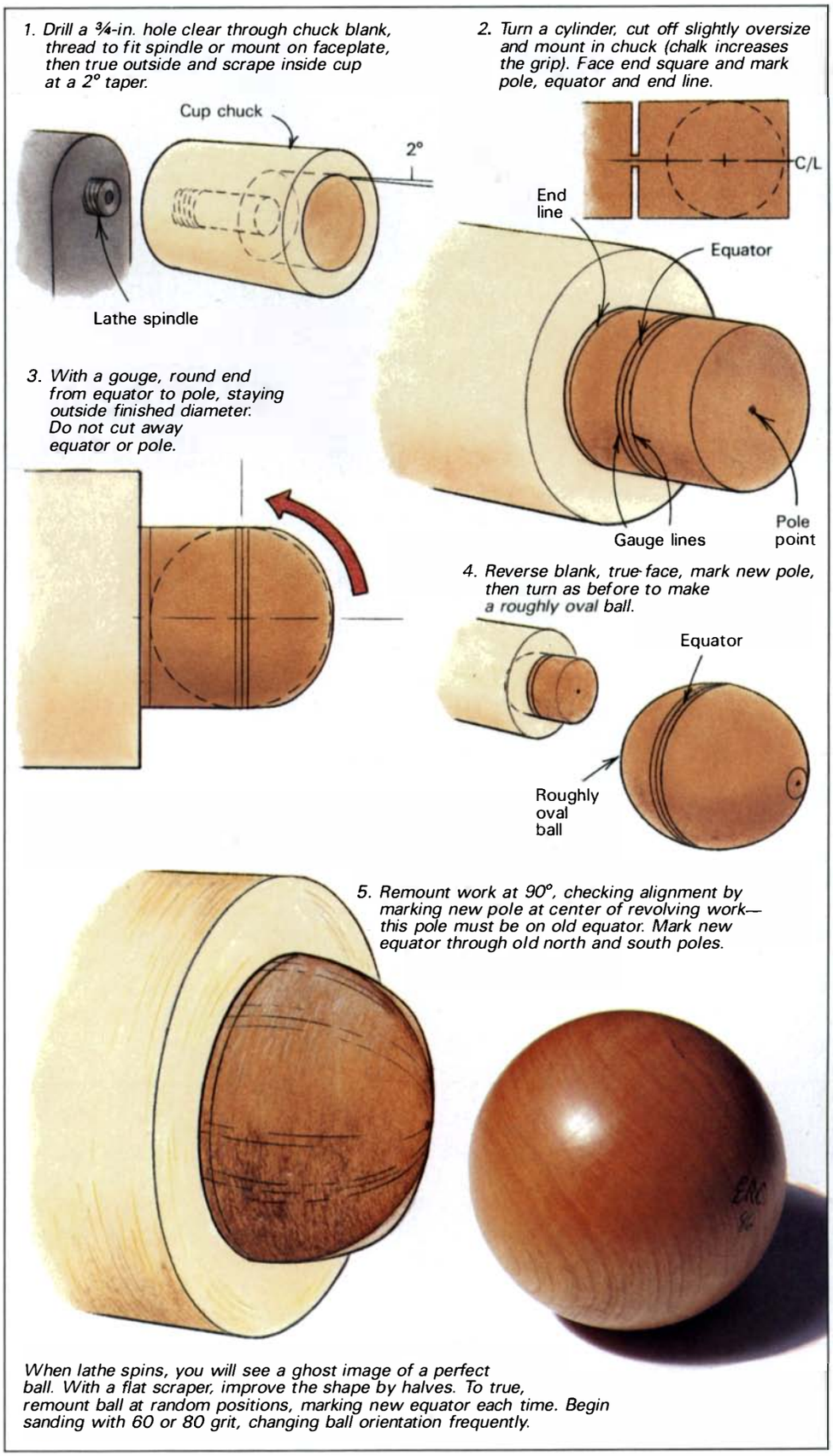
First make the cup chuck shown in step **1**. You can chase threads into the endgrain so it will mount directly on the spindle (see p. 53), or you can screw it to a faceplate. Scrape the inside walls to an included taper of 4°, with an opening equal to the diameter of the ball. Take note that if the chuck sits around for more than a day or so it will distort and have to be retrued.

Prepare the stock by turning a cylinder the diameter of the ball. If turning a few balls, make the cylinder long enough to include them all. Then part each ball blank off, completing the cut with a backsaw to avoid tearout.

Force the stock into the chuck and tap it with a hammer until it runs true, turning the lathe by hand. Square off the endgrain with a roundnose scraper, step **2**, then mark the pole point with a pencil dot. Use vernier calipers to measure the radius of the work, and transfer this dimension to mark the equator and the far end of the ball. Also, make two gauge lines parallel to the equator and shade them in—this will help in the final stages of turning.

With a gouge, turn the end of the ball slightly outside true diameter, then reverse the work to round the other end (steps **3** and **4**). Next rotate the work as shown in step **5**, and draw a new equator through the old poles. When the lathe turns, you will see a ghost of a perfect sphere. Scrape down to the image using a square-end chisel—the trick is to cut away the gauge lines without removing the equator. The ball can be further trued by remounting it at random positions. In the final stages, you can knock the work out of the chuck by inserting a dowel through the spindle, or, if you have a solid spindle, by drilling an angled hole from the middle of the cup out through the side of the chuck. Mark a new equator line with each position change and turn just up to it and no further. Have patience, stop the lathe frequently for inspection and don't get excited if you blow a few. □

Ernie Conover works wood and makes lathes in Parkman, Ohio.



Mortising Machine

A shop-built combination of router and precision sliding table

by Samuel Butler

A mortising machine can be an economical, precise alternative to hand work in any custom furniture shop. Sam Butler built his machine, above, with a stock router and an Inca sliding table. The rack on the base is for storing bits and cutters.

The speed and accuracy of a horizontal milling machine make it an important mortising tool for anyone who builds a lot of furniture. Commercially available machines can cost more than $2,000, but, for about $270, I combined my Bosch 2¼-HP router and a stock Inca mortising table to come up with the sturdy home-built model shown above. Equipped with a standard double-fluted cutter (see p. 79) the router is fast and powerful enough to make short work of most mortises, unlike many moderately priced mortisers, which are notoriously slow.

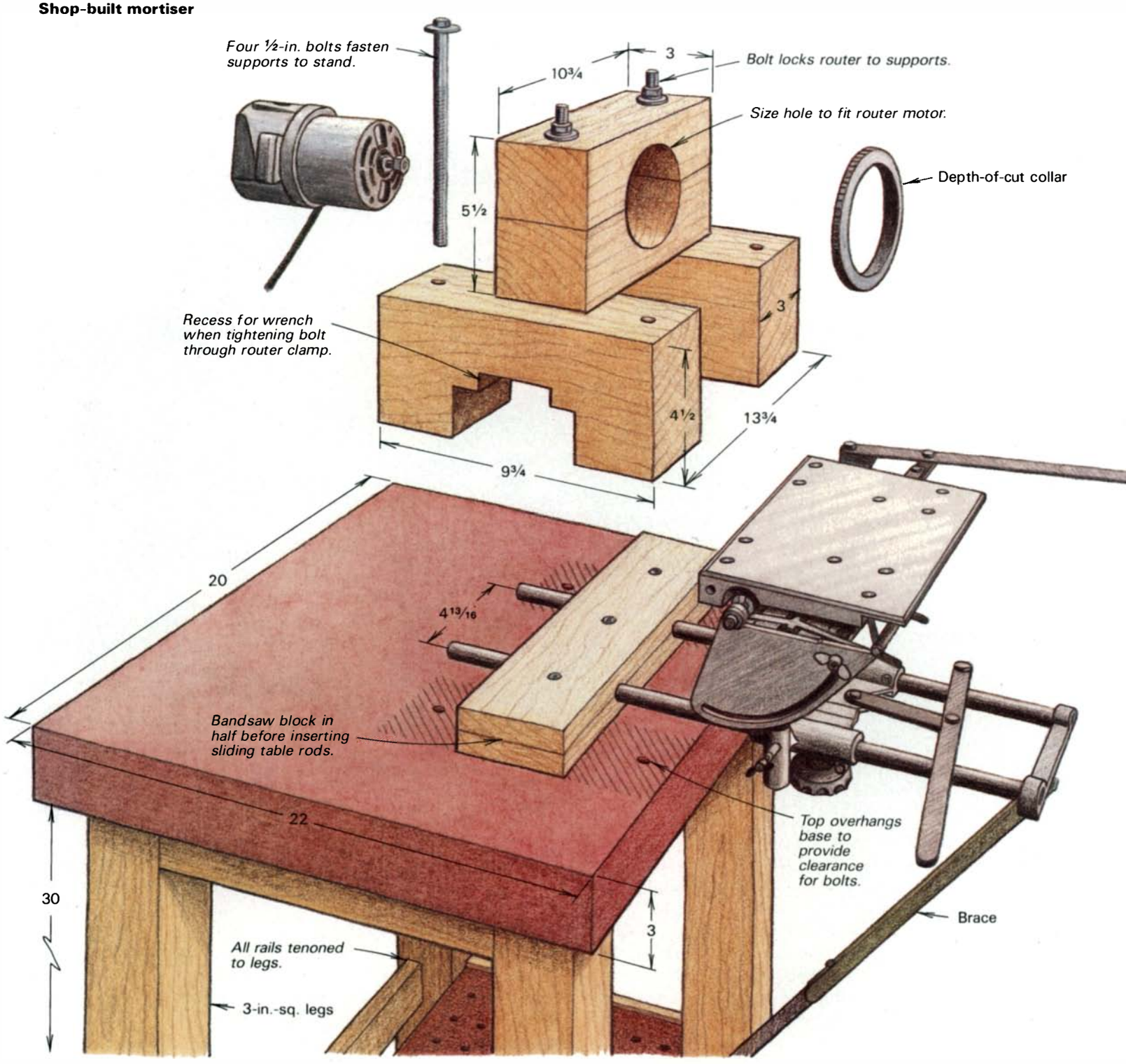
The key to my machine's versatility is the Inca table, which can move back and forth enough to make a 4-in.-long mortise. A handwheel and threaded-rod system also lets me move the table up and down enough to cut a 2½-in.-wide mortise without unclamping or shimming the wood in any way. The two nylon cam clamps supplied with the table are capable of gripping wood up to 4 in. thick. The table also has several precisely scored lines running perpendicular to its long edges. These marks are ideal for lining up workpieces or cutter bits. If the score marks aren't in the right position for lining up a cut, it's very easy to make temporary pencil marks on the aluminum table. As an added bonus, the sliding table tilts up to 90°, making it handy for cutting angled mortises for chair parts.

Despite the router's power, I don't hog large cuts in one pass. I seldom cut more than ¼ in. deep in a single pass, although I'm sure the machine could handle heavier cuts. I think this produces a neater mortise without straining the router or excessively heating the cutter. Actually, the lighter cuts don't take very long. Once the wood is clamped in place, you can adjust the Inca's horizontal stops, which work very much like the margin tabs on a manual typewriter, to control the length of the mortise. The depth of cut is set with a simple stop and setscrew arrangement. By working the machine's two control levers, one to move the table from side to side and one to slide the table in, you can make gradually deepening passes from horizontal stop to horizontal stop until you hit the depth stop. To widen the cut, you use the handwheel to raise or lower the table. Each turn of the handwheel moves the table about 1/16 in.

The cutters I use most often for mortising are Onsrud ⅜-in. and ½-in. double-fluted bits (part number 48-150 348 and 40-139 ½ AAK, available from C.R. Onsrud Inc., P.O. Box 416, Highway 21 South, Troutman, N.C. 28166). Because these cutters are shaped just like drill bits, the machine cuts mortises with round corners. Instead of squaring the corners with a chisel, I prefer to leave them round and shape the mating tenons. The machine could be rigged to cut tenons, but I find it easier to cut them on a tablesaw, then round the edges with a rasp and sandpaper. A jig for cutting the tenons with a hand-held router is shown on p. 81.

To hold the router assembly at a comfortable work height, I

Shop-built mortiser



built a stand with 3-in.-square hardwood legs and a 3-in.-thick top made by laminating four pieces of particleboard. I covered the top with a piece of wear-resistant, easily cleaned Formica. The design of the stand shown in the drawing is not important, as long as it's sturdy and heavy enough to minimize vibration, and to allow large pieces (like bed frames) to be mortised without tipping the machine over. I made my stand about 30 in. high, which puts the sliding table slightly above the level of my wrists when my arms are hanging by my sides. This height is especially important when working with long pieces. For a bed rail, for example, I clamp the end to be mortised on the table, reach over and support the wood with one hand while operating the table levers with my other hand.

After building the stand (using mortise-and-tenon joints), I cut two pairs of mahogany blocks, as shown, to secure the router to the laminated top. The Bosch router is ideal for horizontal mounting because the cylindrical motor unit can be removed from its housing and clamped in a bandsawn block of wood. Since the electrical cord is independent of the housing, the router doesn't have to be rewired. Just plug it into a switch-controlled receptacle after the motor is clamped to the table. You could use any router with a removable housing, but I'd recommend you pick one with at least a 1½-HP motor.

To bolt the sliding table to the stand, I improvised a simple wooden clamp to accept the two metal support rods that come with the Inca table. Once the rods are sandwiched between the

two halves of the wooden clamp, the whole assembly is bolted directly to the table. You must be very careful when making this clamp. Since the clamp also provides tracks for sliding the table in and out, the two rod holes must be parallel to each other. Otherwise, the rods will twist when they are forced into the blocks and the table assembly won't move freely back and forth, making it difficult to vary the depth of cut or align the machine. I made the clamp from a piece of hardwood 1¾ in. by 3¾ in. by 13¾ in. long. Accurately square up the block before you bore two ¾-in. holes centered 4$^{13}/_{16}$ in. apart. Again, accuracy is important, so make sure you bore the holes with a properly aligned drill press. Next, resaw the drilled block in half and clamp it around the rods. The bandsaw kerf removes enough wood to allow the two halves to clamp the table supports snugly when the block is bolted to the table. Before tightening the bolts all the way, square up the wooden block with the front of the table and position the table so that 14 in. of each rod hangs over the front edge of the stand. This will give you enough room to vary the depth of cut from a fraction of an inch up to about 3 in. without extending the table precariously from the stand. Inca also provides a metal table brace that goes from the end of the rods to the base of the stand. I think the rods and wooden clamp system

Bits for horizontal milling

by Rich Preiss

To get the best results from horizontal mortising or milling equipment, you need high-quality, well-designed bits. I've found two basic types of cutters, shown in the photo below, to be suitable: the mortise drill, which is patterned for wood, and the machinists' end mill, which is designed for metalworking but has many advantages for the woodworker.

Mortise drills resemble extra-long router bits. They are available in at least three types. The simplest one has a single, straight flute with occasional serrations on the long cutting edges to help chip clearance. The second type, the mortise miller, has a straight cutting edge and an additional row of deeply cut teeth that promote quick chip ejection, which leads to faster and cleaner mortises. The double-edge spiral cutter looks like an end mill but is designed for routing wood. Its flat cutting nose and spiral flute make for quick, smooth plunges and rapid chip ejection. These short cutters are ideal for mortising with a plunge router.

Two types of metal-cutting end mills work extremely well for mortising wood. Two-flute, center-cutting spiral mills provide the best combination for plunging and clean cutting. They leave smooth-walled mortises and eject waste rapidly. If you select double-ended cutters, you'll have twice as long between sharpenings for less than the cost of two separate cutters. For you carbide fanatics, end mills are available in carbide, including straight-flute router mills designed for metal. The carbide greatly extends cutter life in hardwoods or abrasive materials.

Over time, end mills have greatly outnumbered my mortising-style drills for many reasons. For one thing, end mills are more readily available in a greater variety of sizes at a significantly lower cost. The performance of end mills versus even the specialized mortise miller bits is virtually the same, although plunges are not quite as smooth due to the lesser rake angle of the nose's cutting edges. When sharpening is needed, end mills don't require the more exotic specialty grinding needed for the toothed-type or carbide cutters. In Charlotte, N.C., where I live, sharpening an undamaged, dull end mill costs $3. Carbide sharpening normally costs about twice as much. End mills, especially the smaller diameters, tend to come in shorter lengths than comparable diameter mortising drills, but this hasn't been a problem because narrow mortises are generally shallow. Because end mills are available in larger sizes, your ability to cut wider mortises in one pass is limited more by the chuck size of your machine than by the cutter selection. □

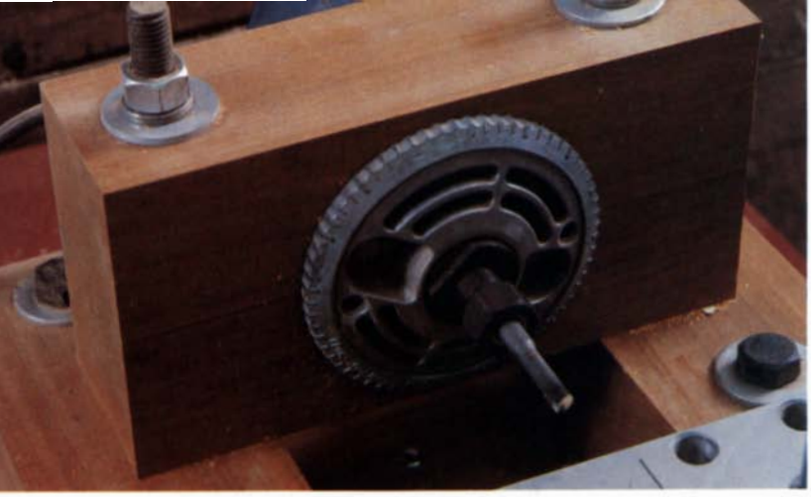
Rich Preiss supervises the architectural woodworking shop at the University of North Carolina at Charlotte.

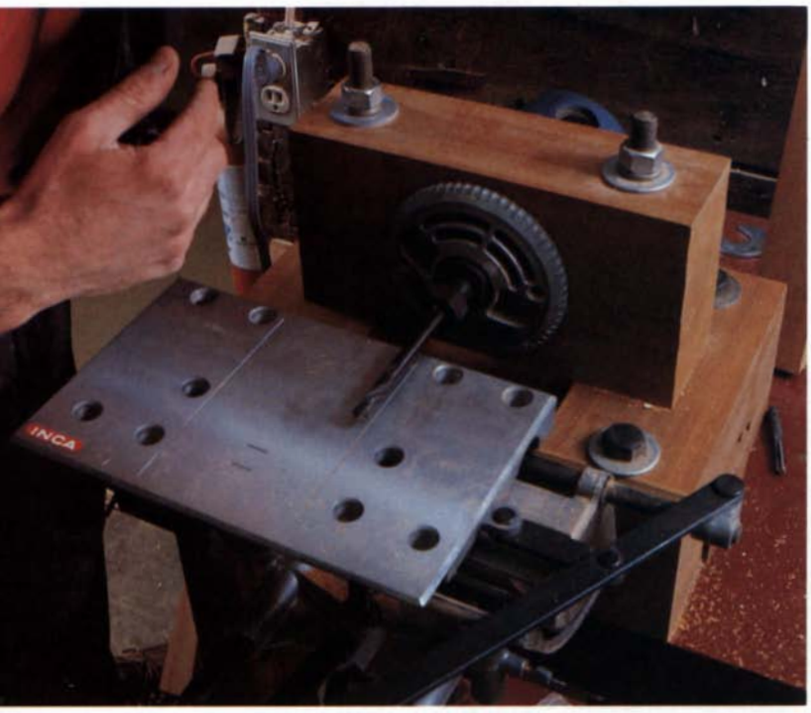
A mortising drill (1) resembles a router bit with one or two notches in its long cutting edges for chip clearance. The mortise miller (2) has a long cutting edge and a row of chip-clearing teeth. The double-edge spiral cutter (3) has a flat nose and deep flutes for quick plunging and clearing. Two-flute spiral mills, flat (4) or round nose (7), plunge well and cut smoothly. Double-end cutters extend time between sharpening. Four-flute end mills (5) produce the smoothest cuts, but feed more hesitantly. Bits for aluminum (6) work well with abrasive hardwoods.

Sources of supply

Double-edge spiral cutters are available from Woodworker's Supply of New Mexico, 5604 Alameda, N.E., Albuquerque, NM 87113 and Garrett Wade, 161 Ave. of the Americas, New York, NY 10013. Mortise drills and miller bits are available from Garrett Wade.

Double-flute end mills and solid-carbide mills are available from Manhattan Industrial Supply, 151 Sunnyside Blvd., Plainview, NY 11803 and C.R. Onsrud, P.O. Box 416, Troutman, N.C. 28166.





Butler reversed the base on his Bosch router to make a flange that prevents the router from being pushed through its support blocks. To align the mortiser, he loosens the clamp bolts and twists the blocks until a long drill bit lines up with the scribe marks on the table (not safe for actual mortising).

are adequately strong without the brace, but since it came with the table I figured I might as well install it.

The dimensions of the blocks used to clamp the router motor to the stand are shown in the diagram. These dimensions allow for the 4 in. height adjustment of the table. Size the router hole to fit the motor of the machine you will be using. Again, bandsawing the block in half will give you enough clearance for snug clamping when the router is bolted to the table. When you remove the motor from its housing, also remove the depth-of-cut collar from the router. Flip the collar over so that the flat side, the side the router usually rides on, faces the motor. After inserting the motor in the wood clamping blocks, thread the collar back onto the base of the motor, as shown in the top left photo. The flat side of the collar makes a strong flange that prevents the router motor from being pushed back through the blocks under the strain of mortising.

You will notice from the drawing that ½-in. bolts secure the table clamp and the two router supports to the table. Another set of ½-in. bolts secure the router and hold it to the two supports. I bored ⅝-in. holes for all these bolts. The oversize holes allow enough free play to shift the router assembly slightly to align the motor shaft perpendicular to the table. When making this alignment, place a long bit in the router collet, move the table forward on its tracks and pivot the router/block assembly so that the router bit is exactly parallel to the lines Inca has scribed into the table surface, as shown in the photo at left. Caution: the bit is for alignment only. Don't use a drill bit in a router; the bits can't withstand a router's high RPMS. Since these lines are exactly perpendicular to the edge of the table, the router and the table will be aligned. Tighten the bolts and begin cutting mortises.

I like the speed and quality of this mortiser, and I'm also pleased that I did not have to give up a router to get a mortising machine. Once the mortising is done, the router can easily be removed from the blocks and used in its own housing for standard router work. □

Samuel Butler builds custom furniture in Kennebunkport, Maine. Inca mortising tables are available from Garrett Wade, 161 Avenue of the Americas, New York, NY 10013.

A commercial mortiser for small shops

If you don't want to build a mortising machine, a new tool called the Easy Mortise might be a low-cost solution for your shop. The machine shown on the facing page is a router stand married to a sliding table. Mount any 1-HP or larger router to the $398 stand, and you're ready to work.

Without the router, the Easy Mortise weighs 40 lb., hefty enough to operate without being clamped down. The 22-in.-long by 19-in.-wide by 16-in.-high machine is constructed of ⅛-in.-thick sheet metal, which is rigid enough to support the router and the workpiece without twisting. The router is bolted to a vertical plate that is raised or lowered with a threaded rod controlled by an easy-to-use palm-size plastic knob. After setting the router height, you tighten two more plastic knobs to lock the plate and the router in position.

Wood to be mortised is clamped on the machine's sliding table, which is large enough to easily accommodate a large board. My favorite aspect of the Easy Mortise is the 20-in. universal-joint control arm, which moves the table both into and across the router bit in one motion. The table moves on ball-bearing wheels that track on sheet metal ways beneath the table. Stop washers for the table movement are tightened onto a ⅛-in. steel rod with a thumbscrew. The rod is attached to the machine at only one end, making a wobbly, but adequate mechanism. Initially, I thought the wobble might be a problem, but all the joints I cut were true and accurate. Even so, a manufacturer's representative told me that new models will have attachments at both ends of the rod.

I didn't find much use for the pointer gauge and ruler mounted on the table front. The pointer didn't logically line up with the router bit, so I found myself referencing the cuts from marks I drew on the stock. This was somewhat awkward because the vertical router mounting plate makes it difficult to see where the router bit actually contacts the stock.

A lever-action mechanism holds the stock to the table and can be adjusted for different thicknesses by moving a series of nuts up or down on a threaded rod. At the end of the hold-down arm is a heavy rub-

Router tenoning jig

by David Marshall

I have developed a simple router jig that will cut "perfect" tenons at the rate of around 60 an hour. All you need are two pieces of plywood, three offcuts from the stock to be tenoned, and about 15 minutes assembly time.

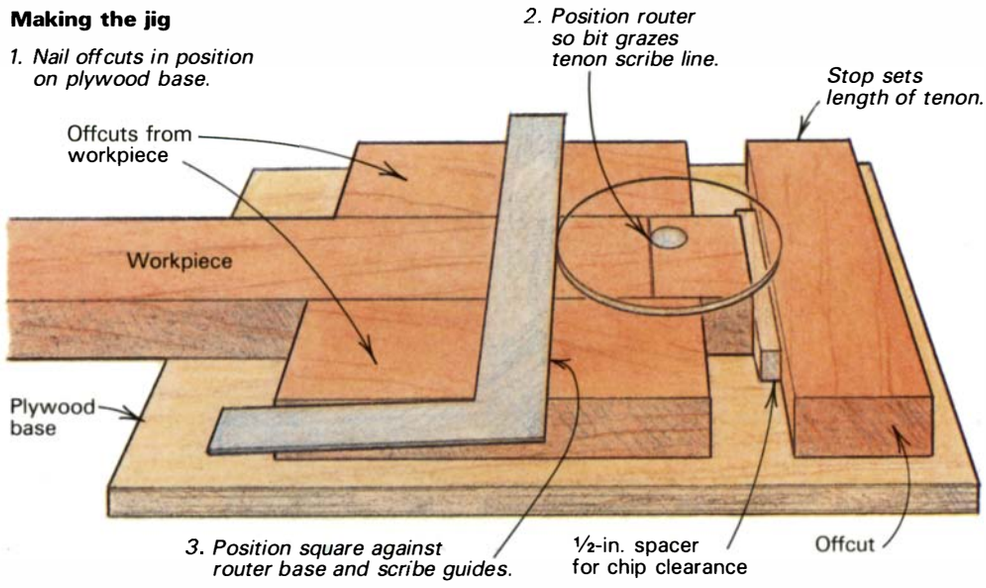
Two offcuts are used to support the router base during the cut and form a channel to align your workpiece, as shown. A third piece is a stop to set the length of the tenon. When you build the jig, put paper between the workpiece and the two offcuts, so you'll be able to move the tenon stock easily. Clamp the three pieces together and nail the offcuts to the baseboard from underneath.

Cut the tenon with any sharp, parallel-sided, straight router cutter ⅜ in. or ½ in. in diameter. Insert the bit and adjust the router's depth-of-cut mechanism until the bit just begins to cut. Insert the workpiece in the guides, put the router on the jig and rotate the cutter by hand until it grazes the shoulder line. Then place a square against the edge of the guide and the router base and mark across the guides with a knife.

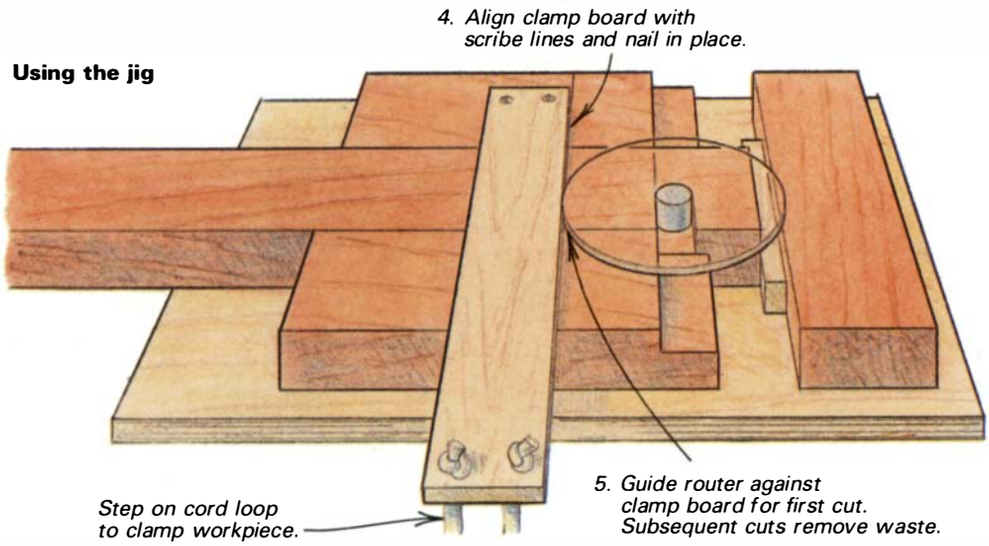
Step on the clamp cord to back the fence down, push the router across the jig and adjust the depth of cut. On the return cut, remove the waste at the end of the tenon. From there, work toward the fence as you cut away the waste. If the shoulder cut isn't exactly right, shim the stop block with paper or veneer, or pare the block thinner. To complete the tenon, flip the stock over and repeat the process. □

David Marshall is a woodworker in Gwynedd, North Wales.

Making the jig



Using the jig



ber stop (like an industrial doorstop) that deflects onto the stock when the handle is lowered. Flanges protrude at the front of the table and on one side of the rear. When the stock is butted against these flanges, it's referenced either parallel to the router plate for mortising, or perpendicular for tenoning. You can cut accurate tenons if you set up a jig and stop block to cut the shoulders at the same depth. The mortise is the guide for setting the bit to cut the tenon cheek to be just above the height of the lower mortise wall, then the stock is set to overhang the table and the bottom cheek is shaved off with the cutter. The piece can be flipped over, realigned against the stop jig you built and the other side cut, or the bit can be raised and realigned against the mortise for the top cut.

I found the Easy Mortise to be a reasonable value. Unlike some inexpensive machines, the control knobs on the Easy Mortise are large enough to grab hold of. The rubber pads the machine sits on keep vibration to a minimum, though I would bolt the machine to the table so long stock won't cause it to tilt. A heavier-gauge sheet metal would beef-up the machine, but if you're willing to take light passes and not bang the bit into the end of the mortise, the Easy Mortise won't flex excessively. On the negative side, I thought the hold-down mechanism was fickle when adjusting for thickness and it won't accept stock thicker than 2½ in.

All in all, the Easy Mortise, which is distributed by N.J. Cote Enterprises, P.O. Box 182, Cooper's Mills, Maine 04341, can do good work once you align it and devise stop references to suit your needs. The manual provided with the machine also showed some interesting ways to cut reeds and flutes and make shutters, but I didn't try any of those operations. —*S.R.B.*

On the Easy Mortise machine, a single lever moves the sliding table in and out, as well as from side to side.

Photo: Robert Reck

Photo: Tom Tennies

John Sheriff's walnut secretary (left and below) looks somewhat stripped down at first glance, yet it abounds with subtle details that deserve a second look. Alejandro Puig's mahogany sideboard (top) features full-width maple veneer doors with handles and inlay of laminated bloodwood.

Woodwork from the Southwest

Santa Fe gallery mounts a regional show

by Jim Cummins

Photos left and right: Bruce Peterson

Photo: David Bayles

Bill Hedden's impressive serpentine-front chest of drawers (left) obviously has its roots in the 18th century, but its design is Hedden's own, no copy. Two centuries have proven how hard it is to second-guess Mr. Chippendale, but this piece succeeds with stunning clarity. Above, with detail at right, is Bruce Peterson's Hummingbird Sideboard, made of mahogany, bloodwood, aspen, ebony and local tamarisk. Below, an occasional cabinet by David L. Trapp. Surface veneer is resawn and bookmatched putumuju, set off by bird's-eye maple, with legs and details of ebony.

Photo: Jim Elder

It's no secret that Santa Fe is a boom town for Western painting and crafts. The Southwest, with its heightened awareness of hand work and tradition, isn't a bad place for a serious furnituremaker either. Here are a few works from a major show held this summer at Jane Gann's Contemporary Craftsman Gallery. This furniture doesn't shout, but quietly offers evidence of long thought about standard forms and their embellishments.

High-school woodworking teacher John Sheriff, a native of New Mexico, has steadily built furniture for several years. He aims to make enjoyable, friendly pieces that grow on you.

Bill Hedden is a former neurobiologist with a Ph.D. from Harvard, who now lives with his family on a homestead in southeastern Utah, making everything from houses and farm implements to million-gallon watertanks. In his spare time he teaches astronomy and serves on the governor's nuclear waste task force.

David Trapp, whose far-flung shop is in Idaho, paid his dues as a house framer and finish carpenter before deciding to concentrate on practical yet elegant furniture.

Cuban-born Alejandro Puig was raised near Philadelphia, and now lives in New Mexico with his wife and two daughters.

Bruce Peterson has run a one-man shop south of Taos for several years, and has a slight nagging feeling that he should be more in tune with the electronic age. Instead, he says he's drawn to wood and to natural themes—his sideboard's outer front panels were inspired by the lines of the yucca plant, and made from tamarisk that he harvested along the banks of the nearby Rio Grande. The hummingbirds on the doors are feeding on morning glory and Rocky Mountain columbine, a frequent sight outside his home. Occasionally, Peterson says, a bald eagle flies by, too bold a sight for this sideboard, but maybe next time. □

Jim Cummins is an associate editor of Fine Woodworking

Guilds for Woodworkers

Starting a Guild: Tips from Albuquerque

by Skip Sven Hanson

In the spring of 1981, Nick Claus, Scott Taylor and I met to discuss the possibility of forming a woodworking organization in Albuquerque, New Mexico, where we live and work. We each had very different reasons for wanting to form a group, and very different ideas of its goals and activities, but we all agreed it could somehow be a good thing.

Several weeks later we called all the woodworkers we could identify. In addition to woodworking friends and acquaintances, we drew on a list of participants in a recent large local arts and crafts fair. "Show up at 1:00 P.M. and bring a six-pack of your favorite refreshment" were the only instructions. About fifteen of the thirty-five or so contacted came. We milled around for a while, then called the group to order.

"Don't waste a lot of time organizing. Just meet and do something!" we were advised by a veteran woodworker at the meeting. The groups he'd joined in the past, he explained, all got tied up in bureaucratic doodling until everyone got tired of the whole thing and quit. We've followed his advice pretty closely. In fact, every goal we've reached has been due to concerted individual effort, not committee activity.

For the second meeting Nick gave an informal, 30-minute demonstration in his shop on Chinese joinery. This began a custom of having some sort of demonstration at every meeting. Given by members, the demonstrations entertain, educate, loosen people up (especially the demonstrator) and give the members a sense of purpose. We meet at the shop of a different member each month, which we've found draws more people than meeting at a fixed location.

We've had five years of consecutive monthly meetings. Every month, we meet no matter what—hot weather, cold weather, holiday time, Fair time—we meet the third Saturday of the month. This has really worked for us. Volunteer shop hosts are told that their hostship is a sacred trust that they *must* perform. I don't recommend meeting in living rooms, having potlucks, or opening meetings to spouses and non-woodworking friends. The business of a woodworking group is to seriously socialize about woodworking. As soon as playing softball and roasting wienies becomes dominant, the group begins to lose focus, and members.

By our third meeting we had a newsletter. Published without fail *every* month, it informs members of upcoming meetings and tells what happened at the last one. (Only about 25% of our members come to each meeting.) It's also a bulletin board for swaps and sales, and a forum for information or opinions on woodworking. Photo-offset printed from an Apple II-C dot-matrix master, the newsletter is mailed first class to keep it timely.

The newsletter is important, and it is also a major expense. While the highest membership we've had is 90, we've mailed as many as 300 copies of the newsletter, using it as a tool to draw new members and to inform other woodworkers of our activities. It's also easier to request sponsorship if the sponsor knows he or she will reach 300 people, rather than 90.

We chose a secretary and elected other officers soon after organizing. We set dues at $25 per year. That may strike some as a bit steep, but we wanted to make sure the group didn't become just a monthly drop-in bull session. For $25 people expect to get something, and they tend to get involved.

As we grew and became established, Bill Pike formed an education program. Lecturer/demonstrators were signed up, and a very nice-looking circular was printed. We sponsored 16 events last year. The standard event consists of two 2-hr. classes taught by a paid demonstrator. Some, like Sam Maloof, are from outside, but many are members. We also had a woodworking film festival, and a two-day seminar on turning. The education program gets us publicity, is a technique for recruiting new members and a point of pride for all of us.

It would be impossible to stage these events without the assistance of generous sponsors—woodworking shops and stores catering to woodworkers. We had a track record. We looked legit. We had a good explanation for how we would spend the money, and we were the only game in town. When asked for $200 or $500, they came through. We thanked them profusely, invited them to the event and listed them in the program. We gave them complimentary tickets to our other programs. And, when we dropped by to ask for a little more help, they were even friendlier than the first time.

In 1984, Tom Powell organized a members' show. He rented the city of Albuquerque's exhibition space, produced a postcard-size invitation and mailed it to the list of the city's largest arts organization. "Only bring your best work" was Tom's sole instruction to the show's 14 participants. The uniformly high quality in the show proved to me that members are perfectly capable of jurying themselves. No one wants to put a bad piece of work next to a great piece of work. I would advise groups to avoid having members judge each other's work. If you want a judged show, select outside judges and agree to live (and die) by their judgements. The show was funded from a $20 participant's entry fee. The gallery charged nothing up front, but took a commission of 20% on all sales—what more could be fairer? We're doing an all-New Mexico show in 1987; we'll jury it in 1986.

We also have an annual members' slide show, which encourages us to document our work, and gives us an opportunity to see the work that others have squirreled away at home or shipped off to clients.

Don't read this and then do just what we've done. At your first meeting, forget all your preconceived ideas and just go with the flow. Then, toss your ideas out for consideration, like everyone else's. People expect that a group naturally will be a democracy. You can't go against this just because you've started out with different ideas. When that first crowd assembles all you can really do is hang onto your hat and hope for an enjoyable ride, while fostering a positive, open, get-something-done atmosphere.

Skip Hanson writes and works wood in Albuquerque, N. Mex.

GUILD DIRECTORY

Woodworking groups have been around for a long time, but as woodworking has grown in popularity during the past twenty years, so, too, the number of groups increased. We decided that it might be helpful to publish a list of guilds, clubs and associations of interest to woodworkers. The groups range from a few friends who get together over beer and pretzels to large organizations with hundreds of members. We concentrated on those in the United States, but included a selection from other countries.

We have organized the listing into three parts. First are local groups, by state, then groups based in the United States that are regional, national or international in scope, and finally, groups based in foreign countries. If we missed your group, please let us know and we'll publish a follow-up list in a subsequent issue.

LOCAL GROUPS

ALABAMA

Alabama Woodworkers Guild
PO Box 327
Pelham, AL 35124
(205) 663-9453
Spruce A. McRee, President

ARIZONA

Arizona Assoc. of Fine Woodworkers
PO Box 44264
Phoenix, AZ 85064
Dave McDowell, President

CALIFORNIA

Baulines Craftsmans Guild
Schoonmaker Point
Sausalito, CA 94965

Early American Industries Assoc.–West
869 "A" Avenue
Coronado, CA 92118
(619) 435-8458
Albert Bennett, President

Butte County Woodworkers Assoc.
PO Box 4835
Chico, CA 95927
(916) 891-1686
Del Stubbs

Mendocino Woodworkers Assoc.
PO Box 991
Mendocino, CA 95460
(707) 937-3132
Clyde Jones

Orange County Woodworkers Assoc.
PO Box 2
Placentia, CA 92670
Andy Goldman, President

West Marin Woodworkers
PO Box 875
Point Reyes, CA 94956
Bill Booras, President

San Diego Fine Woodworkers Assoc.
PO Box 99656
San Diego, CA 92109
Chuck Meecham, President

Bay Area Woodworkers Assoc.
PO Box 421195
San Francisco, CA 94124
John Grew-Sheridan

Santa Cruz Woodworkers Assoc.
120 Hall Street
Santa Cruz, CA 95062
(408) 429-8389
Sandor Nagyszalanczy and Steven Hammond

Sonoma County Woodworkers Assoc.
PO Box 1334
Santa Rosa, CA 95402
(707) 528-0422
Melody Bynon

Shasta Woodworkers Assoc.
PO Box 205
Shasta, CA 96087

San Joaquin Fine Woodworkers Assoc.
PO Box 3132
Visalia, CA 93277
(209) 781-4074
Mark R. Webster

California Carvers Guild
13557 Remington Street
Pacoima, CA 91331

COLORADO

The Woodworkers Guild of Colorado Springs
PO Box 9594
Colorado Springs, CO 80932
(303) 632-8548
John H. Lewis, Secretary

Colorado Woodworkers Guild
PO Box 5305
Denver, CO 80217
(303) 935-2381 or 571-5151
Rudy Rodriguez, President

Rocky Mt. Tool Collectors
11315 W. 46th. Ave.
Wheat Ridge, CO 80023
(303) 422-6617
Gregg Helser, Vice President

CONNECTICUT

Woodworker's Guild of Connecticut
PO Box 7453
Bloomfield, CT 06002
Ron Curtis, President

ATTIC [Tool collectors]
60 Fourth St.
New Britain, CT 06051
Francis Dorion

WASHINGTON, D.C.

Washington Woodworkers Guild
1311 Floral Street, N.W.
Washington, D.C. 20012
Dan Jordan, Secretary

FLORIDA

Florida Craftsmen, Inc.
PO Box 8254
Jacksonville, FL 32239

Florida Woodworkers Assoc.
PO Box 1023
Fort Walton Beach, FL 32549
George Tapper, President

Central Florida Woodworkers Guild
715 Raven Avenue
Longwood, FL 32750
Bob Kopec

Masters Conservators & Restorer's Guild
7190 N.W. 6th Court
Miami, FL 33150

Woodcrafters (Tampa Bay)
3301 Mullen Ave.
Tampa, FL 33609
Charles Mullen, President

GEORGIA

Woodworkers Guild of Georgia, Inc.
PO Box 1113
Conyers, GA 30207

IDAHO

Creative Woodcrafters of Ada County
PO Box 6026
Boise, ID 83707
(208) 362-1366
James Gauntlett, President

ILLINOIS

Kishwaukee Woodworkers Guild
420 Oak Street
DeKalb, IL 60115
Bud Holtkamp, President

Knox County Home Workshop
1248 Beecher Avenue
Galesburg, IL 61401

IOWA

Mid-Iowa Woodworkers
713 East 5th Street, North
Newton, IA 50208
Ron Toppenberg, Chairman

KENTUCKY

Kentucky Guild of Artists and Craftsmen
Box 291
Berea, KY 40403
(606) 986-3192
Maggie D. Rifai

Kentucky Woodworkers Assoc.
PO Box 22018
1016 Rushwood Court
Lexington, KY 40522

MAINE

Kennebec Valley Woodworkers Assoc.
RFD #2
Oakland, ME
(207) 362-3873
Bob Gassett, President

The Woodworkers of Southern Maine
RR 1, Box 847
Sanford, ME 04073
John Leeke

Maine Woodworkers' Association
PO Box 34
Bath, ME 04530
(207) 785-5339
Peter Niels, President

MARYLAND

Baltimore Woodworkers Guild
Towson State College
Baltimore, MD 21212
(301) 486-1744
Dave Meng

Baltimore-Washington Woodworker's Guild
1133 William Street
Baltimore, MD 29230

Potomac Antique Tools & Industries Assoc.
5020 Nicholson Ct. #201
Kensington, MD 20895
Gene Kijowski, Secretary/Treasurer

MASSACHUSETTS

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144 Moody Street
Waltham, MA 02154
(617) 894-3238

MICHIGAN

Michigan Woodworker's Guild
PO Box 7802
Ann Arbor, MI 48107

MINNESOTA

Hastings Woodworkers Guild
1509 Forest
Hastings, MN 55033
Jim Jacobs

Northern Minnesota Woodworkers Guild
Star Route 3, Box 267
Remer, MN 56672
Al Abbott, Secretary

Minnesota Woodcarvers Association
10309 Thomas Avenue, South
Bloomington, MN 55431
Will Bondhus, Secretary

Minnesota Woodworkers Guild
PO Box 8372
Minneapolis, MN 55408

3M Woodworking Club
11455 20th St. No.
Lake Elmo, MN 55042
(612) 733-6220

MISSOURI

Augusta Woodworkers
PO Box 15
Augusta, MO 63332

Kansas City Woodworkers Guild
3023 Holmes St.
Kansas City, MO 64109
(816) 931-3050
David Baird, Secretary

Midwest Woodworkers Assoc.
2512 Lynnwood
Columbia, MO 65201
(314) 442-0731
John Cunningham, Membership Chairman

St. Louis Woodworkers Guild
5605 North Lindbergh
Saint Louis, MO 63042
(314) 731-2761
Bruce Denslow

South West Tool Collectors Assoc.
3619 W. Mt. Vernon, Rt. 21
Springfield, MO 65802

NEBRASKA
Missouri Valley Wrench Club
R 1, Box 151
Malcolm, NE 68402
(402) 796-2532
Alfred W. Schulz

NEVADA
Reno Nevada Guild
6200 Meadowood Circle, #1137
Reno, NV 89502

NEW HAMPSHIRE
League of New Hampshire Craftsmen
205 North Main Street
Concord, NH 03301
(603) 224-1471
Lee Schuette,
Director of Education

NEW JERSEY
Guild of Designer-Woodworkers
c/o Kean College of New Jersey
Fine Arts Dept.
Vaughn-Eames Hall
Union, NJ 07083
(201) 527-2301
Prof. Stuart Topper

Crafts of New Jersey
Collectors of Rare and Familiar Tools Society of N.J.
Box 243
Whitehouse, NJ 08888
Stephen Zluky, President

NEW MEXICO
Albuquerque Woodworkers Assoc.
12000 Prospect NE
Albuquerque, NM 87112
(505) 294-2525
Robert Steffan Sterba

NEW YORK
Early Tools & Crafts
36 Spinner Lane
Commack, NY 11725
Ray Wisniesky

Rochester Woodworkers Society
PO Box 67054
Rochester, NY 14617

Western New York Antique Tool Assoc.
7325 Dryer Rd.
Victor, NY 14564
(315) 924-3562

NORTH CAROLINA
Piedmont Craftsmen, Inc.
411 North Cherry St.
Winston-Salem, NC 27101
Jan Detter, Executive Director

NORTH DAKOTA
Souris Valley Woodworkers Assoc.
PO Box 3042
Minot, ND 58702
(701) 839-5452

OHIO
Ohio Tool Collectors Association
PO Box 261
London, OH 43140
George E. Woodard,
Secretary/Treasurer

Western Ohio Woodworking Club
5920 S. Peters
Tipp City, OH 45371
Walter Jason, President

Parma Woodcarvers Guild
3109 Ralph Ave.
Cleveland, OH 44109
Stanley C. Stary

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Ashland, OR 97520
(503) 482-4829
Tom Phillips

Guild of Oregon Woodworkers
PO Box 1866
Portland, OR 97207
(503) 744-2139
Stephen Grove

PENNSYLVANIA
Western Pennsylvania Woodworkers Club
Box 8558
Pittsburgh, PA 15220
Thomas Peer

Guild Ten Gallery
RD 4, Box 197
Quakertown, PA 18951
Steve Ripper, President

Society of Philadelphia Woodworkers
c/o Chestnut Hill Academy
500 W. Willow Grove Ave.
Philadelphia, PA 19128
Albert LeCoff, President

Three Rivers Tool Collectors
39 S. Rolling Hills
Irwin, PA 15642
Robert Kendra, President

Endless Mountains Woodworkers Assoc.
RD 2, Thunder Rd.
Gillett, PA 16925

SOUTH DAKOTA
Blackhills Woodworkers Assoc.
Box 304
Keystone, SD 57751
Dean Larson

TENNESSEE
East Tennessee Woodworkers Guild
6800 Ball Camp Pike
Knoxville, TN 37931

TEXAS
North Texas Woodworkers' Guild
PO Box 224886
Dallas, TX 75222
Wayne Woods

East Texas Woodworkers
121 Railroad Avenue, South
Humble, TX 77338
Hank Beymer

Austin Woodworkers Guild
225 Congress, Suite 156
Austin, TX 78701

San Antonio Woodworker's Guild
PO Box 680892
San Antonio, TX 78268
(512) 681-8743
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Secretary

VERMONT
ACTIVE
8 Rudgate Rd.
Colchester, VT 05401
Donald B. Johnston,
President

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Northwest Guild of Fine Woodworkers
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Seattle, WA 98117
Corrine Anderson, President

Guild of American Luthiers
8222 South Park Avenue
Tacoma, WA 98408
Debra G. Olsen,
Executive Director

Inland Empire Woodworkers Guild
PO Box 7413
Spokane, WA 99207
(509) 466-1723
Dennis Hueber

The Center for Wooden Boats
1010 Valley St.
Seattle, WA 98109

WISCONSIN
Northeastern Wisconsin Woodworkers Guild
1541 W. Marhill Road
Green Bay, WI 54303
(414) 499-7922 or 432-6395
Ralph Tingley, Jr., President

Wisconsin Woodland Owners Assoc.
PO Box 188
Madison, WI 53701

Wisconsin Woodworkers Guild
PO Box 137
Milwaukee, WI 53201
Frank S. Obremski

NATIONAL AND REGIONAL GROUPS

International Wood Collectors Society
601 Burkwood Court, East
Urbana, IL 61801
(217) 367-5806
Gene Himelick, Editor

Woodworking Association of North America
PO Box 706
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PO Box 982
San Marcos, TX 78667
(512) 396-8689
Robert Rubel,
Administrator

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PO Box 310
Lufkin, TX 76901
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TNT [Tools and Trades]
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Amherst, MA 01002
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President

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Lexington, MA 02173
Rip Stangroom,
Membership Secretary

American Carousel Society
470 South Pleasant Ave
Ridgewood, NJ 07450
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Membership

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7424 Miami Avenue
Cincinnati, Ohio 45243
(513) 561-9051
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Cambridge, MA 02142

American Crafts Council
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New York, NY 10016
(212) 696-0710

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PO Box 2128
Empire State Plaza Station
Albany, NY 12220
John S. Watson,Treasurer

Pacific Northwest Tool Collectors
24575 Butler Road
Elmira, OR 97437
(503) 485-6984
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Western Woodcarvers Association
World Forestry Center
4033 S.W. Canyon Road
Portland, OR 97221
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2801 Marshall Court
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(608) 231-1361
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Membership Coordinator

Wooden Canoe Heritage Association
PO Box 5634
Madison, WI 53705
(608) 231-2355
Jill Weber Dean

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2825 Jackson St.
LaCrosse, Wisc. 54601
Morris Olson,
Treasurer

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Martin Corbin

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Darwin 5794
Northern Territory
81 6615
Joy Grove, Director

Crafts Council of Queensland
GPO Box 1867
Brisbane, 4001
Queensland
229 2661

Crafts Council of South Australia
PO Box 17
169 Payneham Rd.
St. Peters, S.A. 5069
42 4001

Crafts Council of Tasmania
77 Salamanca Place
Hobart, 7000
Tasmania
022 23 5622

Crafts Council of Victoria
7 Blackwood St.
North Melbourne, 3051
03 329 0611
Kay Morrissey

Marquetry Society of Victoria
21 Hendra Grove
Ringwood, North Victoria 3134
John Hassal, Secretary

Crafts Council of Western Australia
GPO Box D 178
Perth, W.A. 6001
325-2799

Crafts Council of Australia
100 George St.
Sydney, 2000
(02) 241 1701

Woodworkers' Group of New South Wales
2 Colette Place
East Killara, N.S.W. 2076
Launie Oliver, Secretary

Crafts Council of the Australian Capital Territory
1 Aspinal St.
Watson, ACT 2602
062 41 2373

Australian Picture Framers Assoc. Ltd.
c/o Victorian Employers' Federation
21 Burwood Road
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Australian Association of Musical Instrument Makers
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Woodcraft Guild of the A.C.T
Redgrave Place
Chapman, A.C.T. 2611
R.N. Cromer, Secretary

The Woodturners Guild of N.S.W.
21 Woodburn Avenue
Panania, N.S.W. 2213
Alan Reay, Secretary

Woodworkers Group of N.S.W.
588 Bourke Street
Surry Hills, N.S.W. 2010
Robert Neville, Secretary

The Woodcraftsmans Guild of Queensland, Inc.
Lot 4, Wallowa Court
Elanora, QLD. 4221
Carlene Howitt, Secretary

The Woodturners Society of Queensland
5 Monteith Street
Sunnybank, QLD. 4109
Ben Flack

ENGLAND

Tools and Trade History Society
275 Sandridge Lane
Bromham
Chippenham
Wiltshire SN15 2JW, UK
W.L. Goodman, President

The Society of Ornamental Turners
2 Parry Drive
Rustington, Littlehampton
Sussex, BN16 2QY

The Guild of Master Craftsmen
The Society of Wood Craftsmen
166 High Street
Lewes
East Sussex, BN7 1YE
(0273) 478449
A.E. Phillips, Secretary

British Crafts Centre
43 Earlham St.
London WC2H 9LD
01-836-6993
Tatjana Marsden, Director

Crafts Council
12 Waterloo Place
London SW1Y 4AU
01-930 4811
Dr. David Dougan, Director

CANADA

BRITISH COLUMBIA

Crafts Association of British Columbia
1411 Cartwright St.
Granville Island
Vancouver V6H 3R7
(607) 687-6511
Gail Rogers,
Executive Director

Pacific Woodworkers' Guild
PO Box 58447
Station L
Vancouver V6P 6K3
Peter Rainier

Vancouver Island Woodworkers Guild
PO Box 6584, Station C
Victoria V8P 5N7
George Dufour

NOVA SCOTIA

Nova Scotia Designer Crafts Council
PO Box 3355 South
B3J 3J1
(902) 423-3837
Marie Palmer,
Executive Director

Atlantic Woodworkers Association
PO Box 3501
Halifax South Postal Station
Halifax
(902) 435-0691

ONTARIO

Ontario Crafts Council
346 Dundas Street, West
Toronto M5T 1G5

Ontario Wood Carvers Assoc.
3275 Sheppart Ave. E
Scarborough M1T 3P1
Joe Chapman

Marquetry Society of Ontario
c/o John Sedquick
RR #1
Stoney Creek L8G 3X4

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Newfoundland & Labrador Crafts Development Association
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St. John's A1C 5W1
(709) 753-2749
Anne Manuel, Exec. Dir.

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Labrador Craft Producers Assoc.
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Happy Valley AOP 1EO
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Debby Briffett,
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Prince Edward Island Crafts Council
156 Richmond St.
Charlottetown C1A 1H9
(902) 892-5152

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New Brunswick Crafts Council Inc.
Box 1231
Fredericton E3B 5C8
(506) 455-8564
Anne-Marie Picot,
Office Administrator

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Metiers d'art du Québèc à Montréal
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Montreal H2X 3L7
(514) 849-2133
Jean-Pierre Tremblay, Exec. Dir.

La Corporation des Artisans de Québèc
61, Petit Chamblain
Québèc City G1K 4H5
(418) 694-0260
Pierre Belanger, President

MANITOBA

Manitoba Crafts Council
202-89 Princess St.
Winnipeg R3B 2X5
(204) 942-1816
Jim Romanow,
Executive Director

SASKATCHEWAN

Saskatchewan Craft Council
PO Box 7408
Saskatoon S7K 4J3
(306) 653-3616
Michael Martin, Exec. Dir.

Saskatchewan Woodworker's Guild
Box 7196
Saskatoon S7K 4J2
(306) 664-4605
Ralph Reid, President

South Saskatchewan Woodworker's Guild
2825-23 Avenue
Regina S4S 1E7
(306) 787-6124
Don Helfrick

ALBERTA

Alberta Crafts Council
#509 McLeod Bldg.
10136-100 Street
Edmonton T5J OP1
(403) 428-1654

Northern Alberta Wood Carvers Association
11424-77 Avenue
Edmonton T6G 0L8
(403) 436-2470
William Pridmore, President

Northern Alberta Woodcrafters Guild
c/o NAIT
11762-106 Street
Edmonton T5G 2R1
(403) 471-8653
Cliff Rondon, President

Southern Alberta Woodworkers Society
c/o Bayot Heer
#20, 5550-36 Street S.E.
Calgary T2C 1P1
(403) 236-3668

St. Albert Woodcarvers
63 Glaewyn Estates
St. Albert T8N 2S6
(403) 459-5849

NEW ZEALAND

Auckland Guild of Woodworkers
PO Box 37 517
Parnell
Auckland
B. Verey, President

North Shore Woodturners Guild
c/o R. Jones
133 Stapleford Cresc
Browns Bay
Auckland

The Guild of Woodworkers, Nelson Inc.
Cable Bay
RD 1
Nelson

The Guild of Woodworkers, Wellington Inc.
PO Box 6427
Te Aro
Wellington
John Spittal, President

The Guild of Woodworkers Canterbury Inc.
PO Box 25-161
Christchurch
596-913

The Otago Woodturners Guild Inc.
50e, Hocken St.
Dunedin
34919
Angela Donaldson,
Secretary

BleneHeim Woodturners Guild
BleneHeim
John Glundell

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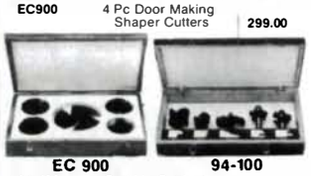

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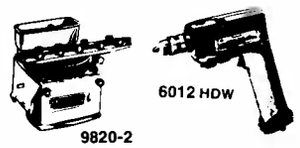

9820-2 6012 HDW

9820-2	Blade Sharpener	159.00
6012HOW	⅜" C/less Clutch Drill	96.00
6010DWK	⅜" C/less Drill w/case	88.00
DP3720	⅜" VSR Drill	47.00
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DA3000R	⅜" Angle Drill VSR	102.00
DA3000DW	⅜" Angle Drill VSR Cordless	98.00
6800DBV	0-2500 RPM Drywall Screwdriver	85.00
6801DBV	0-4000 RPM Drywall Screwdriver	85.00
6802BV	0-2500 RPM TEK S'dvr	109.00
HP1030W	⅜" VS Hammer Drill	97.00
8419B2W	¾" 2 Spd Hmmr Drill	149.00
6905B	½" Drive Imp. Wrench	139.00
JR3000V	VS Recip Saw	119.00
LS1000	10" Miter Saw	198.00
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GV5000	5" Disc Sander	53.00
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9207SPC	7" Electronic Sdr/Plshr	129.00
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5402A	16-5/16 Circular Saw	299.00
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3612BR	3 hp Router	174.00
3700B	½ hp Trimmer	79.00
3700DW	Cordless Trimmer	85.00
3705	Offset Laminate Trmr	119.00
4300DW	Cordless Jig Saw	99.00
4301BV	Var Speed Jig Saw	124.00
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9035DW	1/3 sheet C'less Sndr	78.00
9045B	1/2 Sheet Sander	90.00
9045N	1/2 Sheet Sndr w/bag	105.00
9900B	3x21 Belt Sndr w/bag	119.00
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9924DB	3x24 Belt Sndr w/bag	129.00
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6507	Var Speed Sawzall	124.00
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695	Shaper Table with 1½ hp Router	189.00
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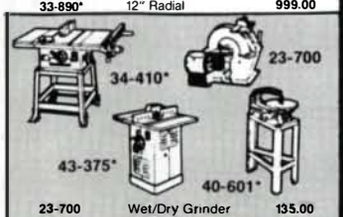

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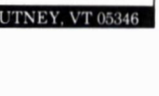

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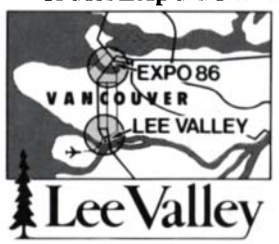

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87100	3x24" dustless belt Sand.	208	140
87200A	4x24" dustless Belt Sand.	269	165
D100VR	3/8" VSR 0-1200 rpm drill.	91	49
W640	7¼" 13 amp circular saw	158	99
W740	8¼" 13 amp circular saw	171	109
JS60	Jig Saw-Single Speed	172	99
JSE60	Jig Saw-electronic v/speed	198	123
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R330	2 H.P. Router	220	138
R500	3 H.P. Router	265	163
E3800	Drywall screwdriver 0-4000	126	79
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0222-1	3/8 drill 3.3A 0-100 rpm	146	99
0228-1	3/8 drill 3.3A 0-1000 rpm	129	92
0375-1	3/8 close quarter drill — NEW — 3.5 amp	175	118
0210-1	3/8 cordless drill — NEW — 2 speed	154	95
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1007-1	½" drill 4.5A D-Hdle	199	145
1107-1	½" drill 4.5A D-Hdle	204	145
3300-1	magnum rt angle drive kit	249	170
3102-1	Plmbrs rt angle drill kit	263	180
1676-1	HD Hole Hawg w case 2 sp	333	235
5395	3/8 sgle sp hammer drill kt	203	150
5397	3/8 var sp hammer drill kit	208	155
5371-1	HD mag. hammer drill ½"	287	207
5373	HD mag. ham. drill 3/8"	240	175
6511	2 speed Sawzall w/case	181	122
6226	port band saw 2 sp w/case	382	280
6234	TSC band saw port w/case	382	280
6405	8¼" circ. saw 13 amp	179	127
6460	10¼" circ. saw 15 amp w/case	349	245
6165	12" Chop saw 15 amp 4200 R.P.M.	285	189
6255	v/sp Jig Saw 3.8 amp	199	140
6245	sgle sp Jig Saw 3.8 amp	175	125
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LU73M010	Cut-Off	10"	60	79.65	36
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LU84M010	Combination	10"	40	70.99	36
LU84M011	Combination	10"	50	74.51	37
LU85M010	Super Cut-Off	10"	80	110.88	62
LM72M010	Ripping	10"	24	84.85	34
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6010DWK	3/8" Cordless Drill Kit	152	88
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DA3000DW	3/8" Angle Drill	176	98
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6012HDW	3/8" 2 spd Driver Drill w/Bat & Metal Case	178	98
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40-500	15" Scroll Saw	105	85
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23-880	8" Grinder Bench	99	85

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99008	3"x 21" belt sander	198	119
99248	3"x 24" belt sander	189	130
9924DB	3"x 24" b/sand. w/bag	214	130
9035	⅓ sheet finish'sander	79	48
9045B	½ sheet finish sander	156	90
9045N	¼ sht fin. sand. w/bag	158	105
4200N	43/8 circ. saw 7.5 amp	152	93
5008N8	8¼ circ. saw 13 amp	178	105
5201NA	10¼ circ. saw 12 amp	348	215
4300BV	v/sp jig saw 3.5 amp	192	120
4301BV	orbv/spjigsaw 3.5amp	208	125
JR3000WL	2 sp recip saw w/cse	168	120
JR3000V	vs recip saw w/case	178	120

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792210-7A	Carbide Bld for above	45	31
9820-2	Blade Sharpener	244	159
741074-9	60 (coarse) Grdg Whl	33	23
741070-7	1000 (med) Grdg Whl	30	22
741071-5	6000 (fine) Grdg Whl	43	30

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1100HD	3¼" planer w/case	278	160
3608BK	¾ hp router w/case	132	85
3601B	1⅜ hp router	168	115
3700B	½ hp trimmer 28,000 rpm	124	82
BO4530	6" Round Sander	84	48
DA3000	3/8" angle drill	158	105
DP4700	½ v/sp w/rev" 4.8 amp	154	92
HP1030W	3/8 v.s.r. hammer drill w/case	145	98
6300LR	½" angle drill w/rev.	229	152
8419BB-2W	½" s sp. hammer drill w/case	238	150
GV5000	Disc Sander	79	53
6800DB	2500 rpm 3.5 amp	123	79
6800DBV	0-2500 rpm 3.5 amp	133	89
6801DB	4000 rpm 3.5 amp	123	79
6801DBV	0-4000 rpm 3.5	133	89
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FREE DELIVERY TO
48 STATES

SUPER CORDLESS SPECIALS from BLACK & DECKER

Model	DRILL KITS	List	Sale
1930	3/8" rev/hi speed	165	110
1950	3/8" High Torque	165	110
5930	Reversible Hammer	179	120
1970	3/8 rev/hi torque screwdriver	179	120
1980	Rev/adj. clutch Scrudrll	179	120

BRAND NEW! SUPER SPECIALS from MILWAUKEE

		List	Sale
0214-1	3/8" c/less drive/drill	159	109
8975	H.D. heat Gun, 11.6A Low 570°F - High 1000°F	74	49
5920	belt sander 3x24 w/o bag	289	199
5925	belt sander 3x24 w/bag	309	215
5930	belt sander 4x24 w/o bag	299	209
5935	belt sander 4x24 w/bag	319	214

PORTER-CABLE = NEW ITEMS +

Model		List	Sale
655	Drywall Driver 0-4000 Rev	115	85
367	3¼" Plane 6.5A	170	115
5009	Mortise & Tenon Jig	50	34
351	3" x21" Belt Sander	189	125
352	3" x21" Belt Sndr w/bag	199	135
9810	Cordless Screwdrvr kit	175	115
320	Abrasibe Plane 3A	129	91

★ ★ ROUTER RIOT ★ ★ by PORTER-CABLE

Model		List	Sale
100	7/7 H.P. 6.5 amp	141	98
630	1 H.P. 6.8 amp	150	100
690	1½ H.P. 8 amp	194	130
691	1½ H.P. D-Hdle 8 amp	218	145
536	1½ H.P. Speedmatic Double Handle	300	190
537	1½ H.P. Speedmatic Double Handle	315	215
520	3 H.P. Production	460	270
518	3 H.P. Micropressor 5-sp	490	345

TRIMMERS BY PORTER-CABLE

309	3.8 amp laminate trimmer	130	90
310	3.8 amp laminate trimmer	190	135
312	offset base laminate trim	205	140
319	tilt-base laminate trim	215	150

★ X-TRA SPECIALS ★

MAKITA TOOLS

		List	Sale
6010DL	C/less Drill w/flashlight-charger & case	162	90
DP3720	3/8 drill Rev. 0-1800 rpm	90	47
6510LVR	3/8 drill Rev. 0-1500 rpm	116	67
6013BR	½" Drill rev. 6 amp	174	100
5402A	16" Circular Saw-12 amp	468	315
2414	14" Cut Off Saw-13 amp	282	169
3612BR	3 HP Plunge Router	286	175
9401	4x24 belt Sander w/bag	248	160

PORTER-CABLE

		List	Sale
696	H.D. Shaper Table	150	105
695	H.D. 1½ hp Router/Shaper	278	190
399	Drywall Cut-Out Unit	100	70
736	V/Speed *Speedtronic* Band Saw	450	330
7564	½" X.H.D. Drill 8 amp	205	145

BOSCH TOOLS

		List	Sale
1581VS	Top Handle Jig Saw	225	126
1582VS	Barrel Grip Jig Saw	126	118
1604	1¾ H.P. Router	199	118
1942	Heat Gun 650°-900°	99	85
1272	3x24" Belt Sander	259	159
1272D	3x24" Belt Sander w/bag	274	169
1273	4x24" Belt Sander	274	169
1273D	4x24 Belt Sander w/bag	289	179

DELTA

		List	Sale
34-010	Motorized Mitre-Box	231	149

★ NEW LOW PRICES ★ PONY CLAMP FIXTURES

Model		List	Sale	Lots of 12
#50	for 3/4" Black Pipe	11.23	7.15	79.00
#52	for 1/2" Black Pipe	9.36	6.10	67.50

JORGENSEN HAND SCREWS

Model	Jaw Length	Open Cap.	List	Sale	Box of 6
#5/0	4"	2"	11.59	7.25	39.15
#4/0	5"	2½"	12.45	8.10	43.75
#3/0	6"	3"	13.36	8.50	45.95
#2/0	7"	3½"	14.36	8.95	48.35
#0	8"	4½"	15.97	9.95	53.75
#1	10"	6"	18.25	11.35	61.25
#2	12"	8½"	20.84	13.60	72.95
#3	14"	10"	26.56	16.75	91.35
#4	16"	12"	34.55	23.75	128.25

JORGENSEN BAR CLAMPS STYLE 37 — 2½" Throat ¼" x ¾"

Model	Jaw Length	List	Sale	Lots of 8
#3706	6"	7.88	5.50	29.70
#3712	12"	8.73	5.95	32.13
#3718	18"	9.84	6.95	37.53
#3724	24"	10.54	7.35	39.89
#3730	30"	11.76	8.25	44.55
#3736	36"	12.85	8.95	48.33

Who Has The Saws That Cut It Across The Board?

BLACK & DECKER of course!!!

Model	WORM DRIVE SAWS	List	Sale
3050	6½" 12 amp - 4600 rpm	247	169
3051	7¼" 13 amp - 4300 rpm	232	149
3052	8¼" 13 amp - 4300 rpm	247	169
	SUPER SAWCATS		
3047-09	7¼" w/brake - 12.5 amp	226	149
3048-09	8¼" w/brake - 13 amp	240	155
	BUILDERS SAW CAT		
3030	7¼" 13 amp - 5800 rpm	155	100
3035	8¼" 13 amp - 5800 rpm	175	125
3034	7¼" 13 amp - 5800 rpm	162	115
3033	6½" 13 amp - 5800 rpm	162	115
	JIG SAWS		
3157-10	var/sp orb action d/hdl	174	115
3153-10	var speed 4.5A 0-3100	158	105
3159-10	2/sporb action barrel grip	178	120
	CUT SAW KITS		
3103	2 sp 6 amp-2400 strokes	163	100
3105	v/sp 6 amp-2300 strokes	170	110
3107	v/sporb6A0-2300strokes	183	119
4300	Drill Bit Sharpener	289	205
1321	½" drill 450 rpm 6 amp	175	115
4010	Palm Sander	80	48
4015	½ Sheet Finish Sander	160	105
	DRYWALL GUNS		
2034	v.s.r. 0-4000 rpm	121	79
2037	v.s.r. 0-4000 rpm	139	89

"Door Openers" from MAKITA

		List	Sale
9501B	4" Grinder Kit	119	55
2708	8¼" Table Saw	348	199
5007NB	7¼" Circ. Saw	158	94

MILWAUKEE BUY OF THE YEAR

Model 6365 — 7¼" Circular Saw
List $159.00 Sale $99.00
Lots of 3 — $289.00

Brand New • PORTER CABLE
Model 7548 Top Hdle Jig Saw
LIST 199 — SALE 129.95
Model 7648 Barrel Jig Saw
LIST 199 — SALE 129.95

PORTER-CABLE

		List	Sale
9548	HD v/s bayonet saw w/case	255	169
9627	2 sp. tiger saw kit 8 amp	193	130
9629	V/sp. tiger saw kit 8 amp	204	135
505	H.D. ½ sheet finish/sander	175	100
330	spd bloc sander ¼ sheet sz	87	54
304	Professional 7" disc sander	169	120
305	Professional 7" polisher	169	120
7511	3/8" xtrahvy v/s drill 5.2 amp	164	115
7554	½" xtra h vy drill 8 amp	210	150
9652	Versa-Plane Kit	419	285
9118	Porta Plane Kit	289	190
	DRYWALL SHOOTERS		
7544	5.2 amp — 2500 rpm	158	105
7545	5.2 amp — 0-2500 rpm	158	105

AEG POWER TOOLS

Model		List	Sale
EZ 501	C/less Scrwdrvr Brand New	59	35
EZ 502	C/less Scrwdrvr-190 rpm	98	52
EZ 505	C/less Drill/Driver	139	79
EZ 506	C/less Electronic Dril/Drvr	159	94
EZ 581	C/less Caulk Gun var/sp	179	106
SCR1E	Drywall Screwgun 0-2000	125	74
SCR11E	Drywall Screwgun 0-4000	125	74
BE8RL	3/8" var/sp drill 3 8 amp rev	86	51
BE10RL	3/8" var/sp drill 5 amp rev	125	74
S8E401RL	3/8" Ham Drill v/sp h.d	88	52
SE2E13RL	½" Ham Drill 2 sp h.d	169	101
TC25E	Tech Driver v/sp 5 amp	150	89
PC70	7¼" Circular Saw 12 amp	157	93
VS130	Orb Sndr 20,000 OPM ⅓ sh	75	48
VS280	Orb Sndr 25,000 OPM ½ sh	156	88
VSS260	Orb Sndr 25,000 OPM w/bag	189	118
Hbse75S	Belt Sander v/sp 3" x 21"	199	118
BSPE60	JigSaw Orb v/sp 4.6 Aw case	214	127
RSK800	Recip Orb Saw 10 amp	229	136

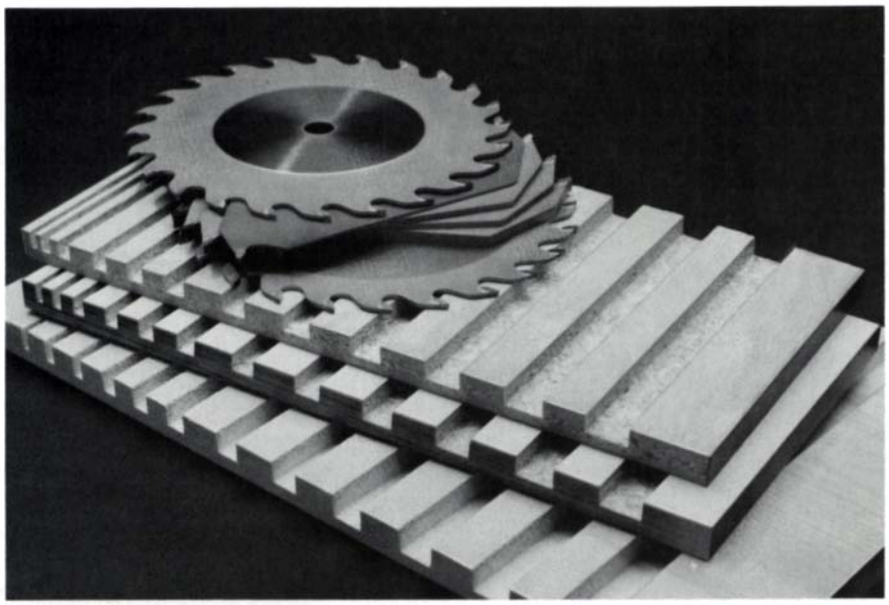
ROTARY HAMMERS

		List	Sale
PHE 16RL	3.8 amp 5/8" capacity in concrete	269	175
PH 210	5.2 amp 3/4" capacity in concrete	398	260
PHE 20	Same as above — except var/sp 0-750	418	270
PHD 28	6.3 amp 1" capacity in concrete	495	320
PH 38	7.5 amp 1½" capacity in concrete	549	355

All above complete with cases

SKIL TOOLS

		List	Sale
551	5½" Circ. saw 6.5A	99	73
77	7¼" Worm Saw	240	135
367	6½" Worm Saw	239	135
825	8¼" Worm Saw	270	185
807	7¼" Skilsaw 13A-Super	153	100
808	8¼" Skilsaw 13A-Super	172	110
2018-02	3/8" Cordless Drill complete W/Charger, Case & 2 batteries	199	95



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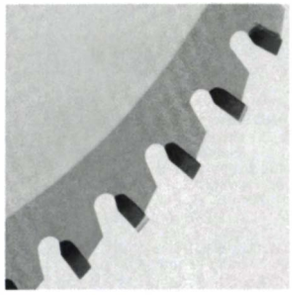

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¾" CUTTING LENGTH
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FLUSH TRIM 3 FLUTE
47114
½" DIAMETER
1" CUTTING LENGTH
¼" SHANK

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49504
¼" RADIUS
¼" SHANK

LIST $25.50
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SLOT-CUTTER ASSEMBLY
53410
¼" KERF
¼" SHANK
½" DEPTH OF CUT

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55300
⅜" RADIUS
⅜" RABBET
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SPECIAL $44.10

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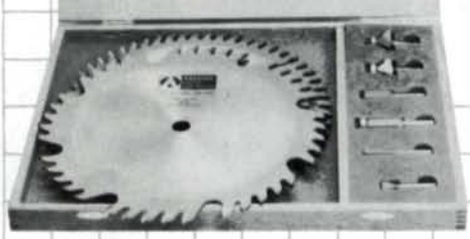

Tool No. 45804 Dovetail Bit List $16.50
Tool No. 45226 ½" Dia. Plunging List $13.50
Tool No. 45210 ¼" Dia. Plunging List $11.60
Tool No. 47104 ½" Dia. Flush Trim List $14.40
Tool No. 49400 Chamfer Bit List $24.50
Tool No. 49504 ¼" Corner Round List $25.50

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AMS-100

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• **TOOL NO. 610504**	10" x 50 teeth	Combination	List	$71.25

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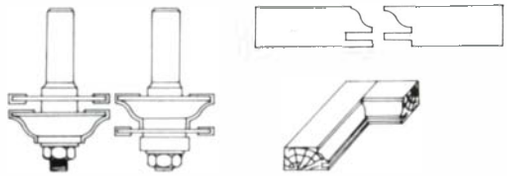

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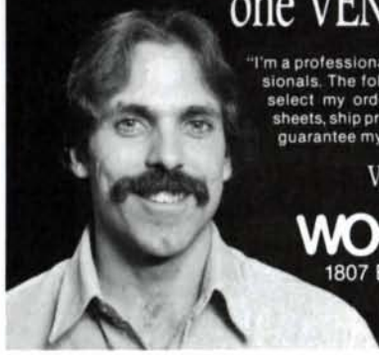

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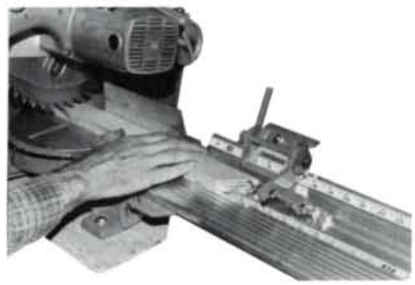

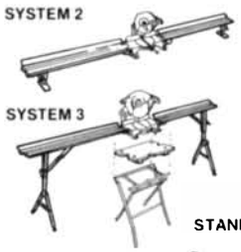

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BMS103	**Table Saw,** 12-14" 1ph 5hp, 72" rls	2450	2350
BMS105	**Sliding Table** for BMS100 & BMS102	545	499
BMS107	**Contractor Saw,** 10", 1-1/2hp	399	349
BMS200	**Jointer,** 8", 1ph 2hp, std mag	749	699
BMS201	**Jointer,** 12", 1ph 3hp, std mag	1899	1799
BMS207	**Jointer,** 6", 1ph 1hp, encd std	399	369
BMS308	**Planer** 15", 1ph 3hp, std mag	899	899
BMS310	**Planer** 18", 1ph 5hp, std mag	1799	1699
BMS302	**Planer** 20", 1ph 5hp, mag	2249	2149
BMS306	**Planer** 25", 3ph 10hp, pw bed	4999	4799
BMS400	**Shaper,** 1ph 2.5 hp rev. mag	1099	1049
BMS406	**Shaper,** 1/2" spindle, 1hp, std	349	329
BMS502	**Dust Collector,** 1ph 2hp, 2 bag	395	349
BMS503	**Dust Collector,** 1ph 3hp, 4 bag	645	575
BMS600	**Bandsaw,** 14", encd std 3/4hp	349	299
BMS601	**Bandsaw,** 18", open std, 1ph 2hp	699	649
BMS610	**Bandsaw,** 14", encd std 3/4hp, 4spd	396	366
BMS702	**Sander,** edge, 6 × 89, 1-1/2hp	599	545
BMS703	**Sander,** blt/disc, 12"disc, 6×48"blt	399	349
BMS900	**Scroll Saw,** 18", 1ph 1/3hp	399	349
BMSMD116	**Drill Press,** 16", 12 spd, 3/4hp	275	249

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66	**Table Saw w/Biesemeyer**	$1623	$1757	$1718
26	**Shaper,** 1ph 3hp rev mag	1499	1649	1549
60	**Jointer,** 1ph 1.5hp std	1249	1355	1286
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Speed-Bloc Sander model 330 **54.**

7511	3/8" VSR Drill	112.
7514	1/2" VSR Drill	119.
686	3/8" T-handle drill	119.
7556	2-Spd. rt. angle drill	179.
303	Pro 7" paint remover	159.
304	Pro 7" disc sander	118.
306	Pro 7" disc polisher	118.
320	Abrasive plane	95.
367	3¼" plane	115.
9118	Porta-plane kit	189.
9652	Versa-plane kit	285.
309	Laminate trimmer	89.
310	Laminate trimmer	133.
312	Offset base lam. trimmer	139.
319	Tilt base lam. trimmer	145.
399	Drywall cutout unit	69.
100	7/8 HP router	99.
518	3 HP microprocssr, 5spd.	340.
536	1½ HP speedmatic	189.
537	1½ HP spdmatic, d-handle	210.
630	1 HP router	98.
690	1½ HP router	125.
691	1½ HP router, d-handle	140.
696	Router table	105.
505	½ Sht pad sander	105.
352	3 x 21 dustless belt sander	135.
360	3 x 24 dustless belt sander	169.
362	4 x 24 dustless belt sander	198.
503	3 x 24 wormdr bit sand w/bag	339.

PORTER-CABLE

2-spd Tiger Saw w/case model 9627 **119.**

314	4½" Trim saw	109.
315-1	7¼" Top handle saw	99.
548	Heavy duty bayonet saw	158.
7548	VS, var orbit d-handle jigsaw	129.
7648	VS, var. orbit jigsaw	129.
9629	Var. spd Tiger saw w/case	135.
622	VSR fastener drill/scdriver	119.
655	Drywall driver, 0-4000 rpm	85.
7523	Pos. clutch screwdriver	135.
7542	TEKS Driver	119.
7545	VSR Drywall driver	105.

HITACHI

½" Plunge router model TR12 **165.**

C8DA	6-¼" Cordless circular saw	119.
F20A	3-¼" Plane w/case	89.
TR8	Laminate trimmer	85.
TR8	1/4" Plunge router	119.
CR10V	VS, Var. orbit recipro saw	109.
DRC10	3/8" Cordless driver/drill	85.
W6V	0-4000 drywall screwgun	59.

SKIL

7¼" Worm Drive Saw model 77 **135.**

367	6-½" Worm drive saw	135.
5510	5-½" Trim saw	72.
807	7-¼" Circular saw	99.
810	10-¼" Circular saw	215.
825	8-¼" Circular saw	159.

BLACK & DECKER/DEWALT

7790	12" Contractor s radial arm saw	725.*
7770-10	10" Contractor's radial arm saw	539.*
1712	10" Folding radial arm saw	275.*
3047-09	7¼" Super saw cat	145.
3034	7¼" Builder's saw cat	112.
2034	0-4000 VSR drywall gun	75.
3051	7¼" Worm drive saw	135.
3107	VS, orbital action cut saw	115.
3934	14" Chop saw	189.
9425	8¼" Compound miter saw	115.

BOSCH

Var.speed. var. orbit jigsaw model 1581VS **125.**

1158VSR	3/8" VSR Drill	59.
1920VSRK	3/8" VSR Cordless drill	95.
1921VSRK	3/8" VSR Cordless drill w/clutch	115.
1196VSRK	3/8" Hornet II hammer drill kit	89.
1157VSR	3/8" 2-Spd., VSR drill	115.
1199VSR	½" VSR hammer drill	115.
11203	1½" Rotary hammer	389.
11207VS	7/8" TNT SDS Rotary hammer	259.
11212VSR	5/8" VSR bulldog SDS rotary hammer	175.
11304	Brute breaker hammer	1199
11305	Demolition hammer	599.
1323	9" sander/grinder	99.
1347	4½" mini-grinder	69.
1500	16 gauge shears	185.
1520	18 gauge pistol grip shear	125.
1942	Heavy duty heat gun	59.
3288	Std. duty heat gun	49.
3258	3¼" Power plane	99.
90086	3/4 HP Trim router	89.
90086	3/4 HP Laminate trimmer	105.
912853-5	Tilt-base laminate trimmer kit	199.
1600	2½ HP, D-handle router	245.

BOSCH

1 HP Router model 1601 **89.**

1604	1¾ HP Router	118.
1606	1¾ HP, D-handle router	129.
90300	3¼ HP Production router	295.
1272D	3"x24" dstlss belt sander	149.
1273D	4"x24" dstlss belt sander	159.
1288-034	Orbital finishing sander	99.
1288-944	Dustless orbital fin. sander	109.
3270D	3"x21" dstlss belt sander	119.
3228VS	VS, var orbit std duty jigsaw	79.
1582VS	VS, Var orbit jigsaw	118.
1651	7¼" Builders circular saw	99.
1652	8¼" Builders circular saw	109.

Makita

3¼" Plane kit model 1900SW **92.**

DP3720	3/8" Drill, medium duty	49.
DP4700	1/2" Drill	96.
6010SDW	3/8" Cordless drill	49.
6012HDW	2-spd. cordless driver/drill kit	98.
6013BR	1/2" Drill, rev.	105.
6510LVR	3/8" Drill, heavy duty	89.
GV5000	5" Disc sander	55.
9207SPC	7" Electronic sander/polisher	135.
1100	3¼" Planer kit, heavy duty	175.
1805B	6-1/8" Planer kit	275.
6905B	1/2" Electric impact wrench	145.
3608BK	3/4 HP Router kit	89.
3612BR	1/2", 3HP Plunge router	182.

Makita

Finishing Sander model BO4510 **45.**

9030	1-1/8" x 21" Belt sander	135.
9045B	1/2 Sheet finishing sander	95.
9401	4"x24" Dustless belt sander	163.
9900B	3"x21" Dustless belt sander	125.
9924DB	3"x24" Dustless belt sander	135.
JR3000V	VS recipro saw w/case	119.
4300DW	Cordless jigsaw	99.
4301BV	VS., var. orbit jigsaw	129.
5006BA	5½" Circular saw	105.
5007NB	7¼" Circular saw	99.
DA3000-DW	Cordless angle drill	105.
DA4511	1/2" Angle drill	185.

NORTON

Multi-Oilstone **99.** model 85960-9

Milwaukee

3/8" VSR Drill model 0222-1 **92.**

0212-1	3/8" VSR cordless w/clutch	125.
0214-1	3/8" VSR cordless drill w/clutch	108.
0224-1	3/8" Magnum holeshooter	109.
0234-1	1/2" Magnum holeshooter	112.
0375-1	3/8" close-quarter drill	117.
1676-1	Hole-hawg kit	235.
3002-1	Electricians rt. ang. drill kit	175.
3102-1	Plumbers rt. ang. drill kit	179.
5397-1	3/8" VS hammer drill kit	145.
5347	1½" Rotary hammer	389.
5332	34 Lb. demolition hammer	835.
8975	Heat gun	49.
5620	1 HP router	165.
5680	1-½ HP router	175.
5680	2 HP router	219.
5192	Die Grinder	169.
5925	3" x 24" Dustless belt sander	210.
5935	4" x 24" Dustless belt sander	219.
6012	1/3 Sheet pad sander	109.
6014	1/2 Sheet pad sander	114.
6215	16" Electric chainsaw	149.
6228	2 speed bandsaw w/case	250.
6232	Deep cut bandsaw w/case	269.
6245	Single speed jigsaw	124.
6511	2 Spd. sawzall	119.
6255	Variable speed jigsaw	139.

Milwaukee

Var. Spd. Sawzall w/case model 6507 **125.**

6305	6½" cordless circular saw	125.
6365	7¼" Top handle circular saw	99.
6377	7¼" Worm-drive saw	145.
6405	8¼" Circular saw	126.
6539-1	Cordless screwdriver	62.
6543-1	VSR Screwshooter	139.
6750-1	VSR Drywall driver	79.
6754-1	VSR Magnum drywall driver	115.
6798-1	Adj. clutch screwshooter	105.
8950	8 Gal. wet/dry vac.	115.

Stationary Tools

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34-763	10" Unisaw, 3 HP, 1 HP	1449.*
33-150	Sawbuck	499.
33-990	10" Radial arm saw	429.*
40-601	18" Electronic VS scroll saw	749.*
28-243	14" Wd Bandsaw w/std, ½ HP motor	509.*
11-950	8" bench drill press	99.*
17-900	16.5" Drill press	219.*
22-651	RC-33 13" Planer	850.*
37-223	6" Jointer w/¾ HP motor	815.*
37-315	8" long-bed jointer w/electricals	1300.*
31-730	6" Belt, 12" disc w/electricals	1139.*
43-122	Shaper, lt duty, 1 HP, 1 PH	475.*
43-375F	2-speed shaper, 3 HP, 1 HP	1399.*

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10" Portable Plane model AP10 **379.**

Makita *FOB BERKELEY

8" Table Saw model 2708 **209.** (includes freight) w/carbide blade

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2040	15-5/8" Planer	CALL!
LS1000	10" Mitersaw	205.
2414	14" Cut-off saw	179.

HITACHI

Deluxe 10" Miter Saw model C10FA **269.** (includes freight)

F1000A	12" Planer/6" jointer combo	1249.*
C15FB	Deluxe 15" miter saw	399.
B600A	Band saw	1329.*
C12Y	12" Table saw w/o motor	1169.*
C12Y	12" table saw w/3 HP Hitachi motor	1269.*
P100F	12" Planer	919.*

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Deluxe Low Angle Block Plane model 12-060 **19.95**

1"x25" Powerlock Tape Measure Model 33-435 **8.75**

33-430	1" x 30' Powerlock tape	9.75

FREUD

90-100	15 pc. router bit set	135.
94-100	5 pc. router cabinet set	185.
CS112	12 pc. carving set	95.
DB-050	50 pc comb drill bit/brad pt set	179.
DS-306	6" Dado	90.
DS-308	8" Dado	103.
EC-600	5 pc. door making shaper cutter set	195.
FB-100	16 pc. Forstner bit set	179.
LM72M008	8"x24T rip	36.
LM72M010	10"x24T rip	34.
LU72M008	8"x24T gen. purpose	36.
LU73M010	10"x60T ATB	36.
LU78M008	8"x64T TCG gen. purpose	59.
LU82M010	10"x60T TCG gen. purpose	39.
LU84M008	8"x40 4&R combination	44.
LU84M001	10"x50T 4&R combo	35.
LU85M008	8"x64T ATB fine cut-off	54.
LU85M010	10"x80T ATB cut-off	59.
LU85M014	14"x108T ATB fine cut-off	99.
PS203	7¼"x24T ATB gen. purpose	17.
PS303	7¼"x40T ATB gen. purpose	21.
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WC106	6 pc. chisel set	27.

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RYRA2500S Basic Model **$395.00**
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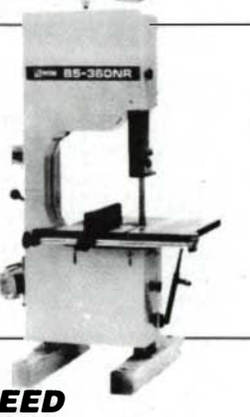

Cuts wood up to 12 3/8" thick. Constant blade tension device. rubber – lined blade wheels. Blade cover for safety. Accepts blades of 1/4" to 3" widths. Includes 3" blade. guide rule.

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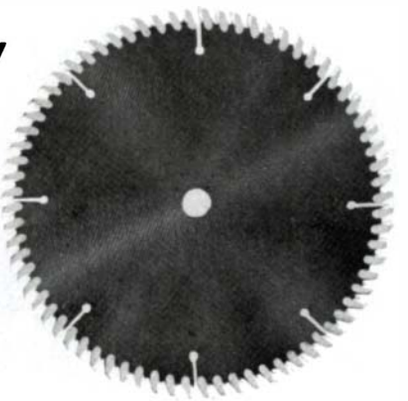

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Listings are free, but restricted to happenings of direct interest to woodworkers. Our Nov./Dec. issue will list events between Oct. 15 and Jan. 15; deadline Sept. 1. Our Jan./Feb. issue will list events between Dec. 15 and Mar. 15; deadline Nov. 1.

ARIZONA: **Seminar**—A Day with Todd Hoyer: Woodturner, Sept. 13, sponsored by the Arizona Woodworkers Association. Wilreb Wood Products, 555 Blackbird Roost, Flagstaff 86001. (602) 774-2362 or 774-7172.
Exhibition—Wood, fiber and clay, Sept. 12–Oct. 17. Coconino Center for the Arts, North Fort Valley Rd., Flagstaff.

ARKANSAS: **Juried exhibition**—Heart of the Ozarks annual fall arts and crafts, Oct. 3–5. Fairgrounds, Harrison. Entry deadline Sept. 7. Contact Marcel (Joe) De Fyn, PO Box 1475, Harrison 72601. (501) 743-1608.

CALIFORNIA: **Workshops**—Woodworking for women, beginners and advanced, traditional furnituremaking, focus on handtools. Contact Debey Zito, 103 Wool St., San Francisco 94110. (415) 648-6861.
Juried show—California State Fair–California Works: Realist and Functional Aesthetics, Aug. 15–Sept. 1. California State Fair, California Works, PO Box 15649, Sacramento 95852. (916) 924-2015.
Show—Woodcarving, Sept. 6–7. The Barn, Pacific Ave., Livermore. Contact Liz Finigan (415) 447-3186.
Show—Northern California Woodworking, featuring demonstrations, seminars, Nov. 21–23. San Jose Convention and Cultural Center, Exhibit Hall, 291 South Market St., San Jose. Contact Irene Devine, (800) 826-8257.
Exhibition—1986 Western Regional "Images in Marquetry," Oct. 1–31. Entry deadline Sept. 1. Center Hall Gallery, 931 N. Harbor Blvd., Anaheim. Contact Gordon C. Olson, 16707 Garfield St., No. 1217, Paramount 90248. (213) 630-2922.
Exhibition—Valencia arts and sports festival, Sept. 7. Valencia Meadows Park, Valencia. Contact Ms. Grant, 24107 N. San Fernando Rd., Newhall 91321. (805) 259-1750.
Workshop—Building a recreational single rowing shell, Simon Watts, Oct. 9–18. National Maritime Museum Association, 680 Beach St., San Francisco 94109. (415) 673-0700.
Workshop—Building a Herreshoff Pram, Simon Watts, Sept. 27–Oct. 4. Contact Grew-Sheridan Studio, 500 Treat Ave., San Francisco 94110. (415) 824-6161.

COLORADO: **Juried exhibition**—2nd annual Colorado Woodworkers, Oct.–Dec. 16. Pioneers' Museum of Colorado Springs, 215 S. Tejon, Colorado Springs. Contact Woodworkers Guild of Colorado Springs, Box 9594, Colorado Springs 80932. (303) 632-8548 or (303) 630-1422.

CONNECTICUT: **Juried exhibition**—18th Annual Celebration of American Crafts, Nov. 10–Dec. 23. Write Roz Schwartz, Creative Arts Workshop, 80 Audubon St., New Haven 06511.
Juried exhibition—51st annual, Society of Connecticut Craftsmen, Inc., Sept. 7–28. The Arts and Crafts Association of Meriden, 53 Colony St., Meriden 06450. Contact Society of Conn. Craftsmen, Inc., PO Box 615, Hartford 06142.
Show—Woodworking World, New York, Sept. 26–28. Sheraton Hotel and Towers, Stamford. Sponsored by Woodworking Association of North America, Plymouth, NH. Contact Convention Designs, Inc., PO Box 485, Plymouth, NH 03264. (603) 536-3768.
Workshops—Boatbuilding, Sept. 26–Oct. 12; birdcarving, Sept. 18–Nov. 6; woodworking, Sept. 17–Nov. 16. Contact Brookfield Craft Center, PO Box 122, Brookfield 06804. (203) 775-4526.
Exhibition—"Just for fun," multi-media, Oct. 5–25. The Mill Gallery, Guilford Handcrafts Center. 8th annual holiday, Nov. 8–Dec. 23. Contact Pat Seekamp or Amy Lentz, Guilford Handcrafts, Inc., PO Box 221, 411 Church St., Guilford 06437. (203) 453-5947.

DISTRICT OF COLUMBIA: **Exhibition**—George Kaufman collection of American furniture, opening Oct. 12. National Gallery, Washington. (202) 737-4215.

GEORGIA: **Show**—1986 International Woodworking Machinery & Furniture Supply Fair—USA, Sept. 6–9, Georgia World Congress Center, including 11th biennial student furniture design competition, Sept. 5–8, Atlanta Civic Center. Early registration advised. Contact International Woodworking Fair, Cahners Exposition Group, 999 Summer St., Stamford, Conn. 06905. (203) 964-0000.

ILLINOIS: **Show**—1986 Woodworking World—The Chicago Show, Oct. 17–19. O'Hare Expo Center, Rosemont. Contact Convention Designs, Inc., PO Box 485, Plymouth, NH 03264. (603) 536-3768.
Exhibition—2nd annual American craft, Sept. 12–14. McGraw Hall Welsh Ryan Arena, Northwestern Campus, Evanston. Contact Carol Sedestrom Associates, 240 East 27 St., New York City, NY 10016. (212) 686-2291.
Show—16th annual midwestern woodcarvers, Nov. 1–2. Belle-Clair Exposition Hall, 200 South Belt East, Belleville. Contact Don Lougeay, 1830 East "D" St., Belleville 62221. (618) 233-5970.
Seminar—Illinois Woodworking Teacher's Association, Nov. 7. Illinois State University, Circus Room of University Union, Normal. Contact Steven M. Pille, 11502 West Grubb Road, Mapleton 61547.

INDIANA: **Juried show**—Wood furniture, modern, classic, traditional, Sept. 1–Oct. 12. Chesterton Art Gallery, 115 South 4th St., Chesterton. Contact Marsha Demkovich, Chesterton Art Gallery, PO Box 783, Chesterton 46304. (219) 926-3041.
Juried exhibition—Madison Chautauqua of the Arts, Sept. 27–28. Vine St. near Lanier Mansion, Madison. Madison Chautauqua of the Arts, c/o Dixie McDonough, 1119 West Main St., Madison 47250.

IOWA: **Show**—11th annual old-time country music and crafts, Aug. 29–Sept. 1. Pottawattamie Fairgrounds, Avoca. Contact Traditional Country Music Assoc., Inc., 106 Navajo, Council Bluffs 51501. (712) 366-1136.

MASSACHUSETTS: **Workshops/seminars**—Numerous events. Contact The Woodworkers' Store, 2154 Massachusetts Ave., Cambridge. (617) 497-1136.
Workshops—Woodworking for high-school students, summer sessions. Craft retreat, Aug. 18–25. Horizons: The New England Craft Program, 374 Old Montague Rd., North Amherst 01002. Contact Jane Sinauer (413) 549-4841.
Juried show—7th Annual Fair of Traditional Crafts, Nov. 1 & 2. Contact Frank G. White, Old Sturbridge Village, Sturbridge 01566. (617) 347-3362, ext. 236.
Show—Wooden furniture invitational, Aug. 16–Sept. 18. Salmon Falls Artisans Showroom, PO Box 176, Ashfield St., Shelburne Falls 01370. Wheelchair accessible. Contact Nancy Dean.
Exhibition—The Cabinetmakers of South Acton. Fine period and contemporary furniture; 8 exhibitors; demonstrations. Sept. 6–21, Sat. & Sun. only, 12–5. Jones Tavern, 128 Main St. (Rte. 27), S. Acton Village.
Exhibition—Wood sculpture, Robert St. Pierre, through Sept. Art Complex Museum, 189 Alden St., Duxbury 02331. (617) 934-6634.

MICHIGAN: **Show**—Metro-Detroit Woodworking, featuring machinery, tools, supplies, Sept. 26–28. Michigan Exposition and Fairgrounds, Mart Building, 1120 West State Fair Ave., Detroit. For more information, (800) 826-8257.
Workshop—Timber framing, hands-on, Sept. 14–20. Riverbend Timber Framing, PO Box 26, Blissfield 49228. (517) 486-4044.

MINNESOTA: **Workshops/seminars**—Numerous events. The Woodworkers' Store, 3025 Lyndale Ave. S., Minneapolis. (612) 822-3338.
Class—9th annual kiln drying short course, Sept. 15–19. University of Minnesota, St. Paul Campus, St. Paul. Contact Harlan Petersen, Ext. Forest Products Specialist, 202 Kaufert Laboratory, University of Minnesota, 2004 Folwell Ave., St. Paul 55108. (612) 624-3407.
Show—Twin Cities Woodworking, featuring machinery, tools, supplies, Oct. 10–12. Minneapolis Auditorium and Convention Hall, Lower Exhibit Hall, 1403 Stevens Ave. South, Minneapolis. (213) 477-8521 (in Calif.);, (800) 826-8257.
Juried exhibition—4th annual Northern Woods, sponsored by Minnesota Woodworker's Guild, Oct. 8–12. Contact the Guild, Box 8372, Minneapolis 55408. (612) 483-3489.

MISSOURI: **Workshop**—Bill Oakley, build your own cabinets, Sept. 19–21. Ananda Kanan, Ozark Retreat, Rt. 2, Box 45, Willow Springs 65793. Contact Michael McClure, (417) 469-3143.

NEW HAMPSHIRE: **Tour**—Switzerland, two weeks, guide Wayne Barton. Sponsored by Woodworking Association of North America for woodworkers and woodcarvers. Sept.30–Oct. 14. Contact W.A.N.A., PO Box 706, Plymouth 03264. (603) 536-3876.
Convention—94th Hoo-Hoo International, Sept. 14–18. Mount Washington Hotel and Resort, Bretton Woods. Contact Laura Schoepf, Furman Lumber, Inc., PO Box 96, Astor Sta., 108 Massachusetts Ave., Boston, MA 02123. (800) 843-9663.

NEW JERSEY: **Juried exhibition**—New Jersey arts annual, fiber, metal and wood, Nov. 1–Jan. 11. New Jersey State Museum, 205 West State St., Trenton 08625. (609) 292-5420.
Seminar—Making furniture, woodworking jigs, Tage Frid, Oct. 18. Brookdale Community College, Newman Springs Rd., Lincroft 07738. Contact Dr. Gabriel Longo, (201) 842-1900.
Exhibition—3rd annual woodworking: tools of the trade, sponsored by Force Machinery, Oct. 10–12. Westfield Armory, Westfield. (201) 688-6222.

NEW YORK: **Workshops**—Hand tools, ongoing, Robert Meadow. The Luthierie, 2449 West Saugerties Rd., Saugerties 12477. (914) 246-5207.
Juried shows—Furniture, architectural crafts, Aug. 30–Sept. 1. Ulster County Fairgrounds, New Paltz. Contact Scott and Neil Rubinstein, Quail Hollow Events, PO Box 825, Woodstock 12498. (914) 679-8087 or (914) 246-3414.
Juried exhibition—Mixed media, Dec. 6–7. Schenectady Museum & Planetarium, Nott Terrace Hgts., Schenectady. Contact Karen Engelke, 1791 Central Pkwy., Schenectady 12309. (518) 372-9155.
Classes—Beginning to advanced woodworking levels, Maurice Fraser, Sept. 15 through Jan. Registration Sept. 15. YWCA, Craft Student League, 610 Lexington Ave. (corner 53rd), Manhattan. (212) 755-4500.
Juried exhibition—33rd annual national, sponsored by Mamaroneck Artists Guild, Oct. 24–Nov. 9. Community Unitarian Church, Rosedale Ave., White Plains. Contact Open Juried Exhibition, Mamaroneck Artists Guild Gallery, 150 Larchmont Ave., Larchmont 10538.
Exhibition—FRESH–never shown in N.Y. market, Sept. 11–Nov. 2. Contact Vanessa S. Lynn, The Gallery at Workbench, 470 Park Ave. South, New York 10016. (212) 481-5454.
Conference—Sponsored by Cryder Creek Wood Shoppe, lecturers/demonstrators, Ellsworth, Stirt, Sharpless, Loar, Nov. 1. Alfred University, Alfred. Contact Cryder Creek Wood Shoppe, Box 35, Whitesville 14897. (607) 356-3304.
Juried show—1st annual international carving, art of the wooden bird, Nov. 15–16. Best Western Red Jacket Inn, Niagara Falls. Contact Melvin J. Ott, Dovetails Etc., 324 Ward Rd., North Tonawanda 14120.
Show—Hudson Valley Woodcarvers 3rd annual woodcarving, Oct. 11. Hyde Park Dutch Reformed Church, Rt. 9, Hyde Park. Contact James R. Curran, RD 1, Haight Rd., Box 350, Poughkeepsie 12601. (914) 452-1737.

NORTH CAROLINA: **Workshops**—Tools, furniture, techniques, design, turning, through Sept. 19. Penland School, Penland 28765. (704) 765-2359.
Workshops—Green-wood chairmaking, Aug. 18–22; white-oak basketry with Darry Wood, Sept. 1–5. Contact Drew Langsner, Country Workshops, 90 Mill Creek Rd., Marshall 28753. (704) 656-2280.
Show—1986 Woodworking World—The Charlotte Show, Nov. 21–23. Charlotte Civic Center, Charlotte. Contact Convention Designs, Inc., PO Box 485, Plymouth, NH 03264. (603) 536-3768.
Workshop—Timber framing, hands-on, Oct. 19–25. Contact Riverbend Timber Framing, PO Box 26, Blissfield, MI. (517) 486-4044.

OHIO: **Juried exhibition**—Contemporary woodworking, Sept. 12–Oct. 12. Sponsored by Dairy Barn Southeastern Ohio Cultural Arts Center, Athens. Contact American Contemporary Works in Wood, PO Box 747, Athens 45701. (614) 592-4981.
Juried exhibition—Cincinnati Woodworking, Nov. 29–Dec. 21. Emery Galleries, Edgecliff Campus, Xavier Univ., 2220 Victory Parkway, Cincinnati 45206.
Juried show—3rd annual national furniture invitational, Sept. 26–Oct. 26. Sylvia Ullman American Crafts, 13010 Larchmere-Woodland, Cleveland 44120. (216) 231-2008.
Show—27th Indian Summer arts and crafts festival, Sept. 12–14. Contact Indian Summer Festival, Box 266, Marietta 45750. (614) 373-8027.

OREGON: **Juried show**—"Masks," mixed media, Oct. 9–Nov. 9. Hoffman Gallery, Oregon School of Arts and Crafts, 8245 SW Barnes Rd., Portland 97225.
Exhibitions—Life-size bird carvings, Del Smith, Nov. 9; New Zealand craftsmen, their native materials, Dec.–Jan. The Gallery, World Forestry Center, 4033 SW Canyon Rd., Portland 97221. (503) 228-1367.

PENNSYLVANIA: **Exhibition**—Wharton Esherick, sculpture, furniture, utensils, daily. The Wharton Esherick Museum, PO Box 595, Paoli 19301. (215) 644-5822.
Juried show—8th annual Longs Park Art and Craft Festival, Aug. 30–Sept. 1. Contact Dick Faulkner, Longs Park Art and Craft Festival, PO Box 5153, Lancaster 17601.
Juried exhibition—1st annual Pennsylvania national arts and crafts and Christmas, Dec. 5–7. Entry deadline, Oct. 1. David Lawrence Center, Penn. Ave., Pittsburgh. Contact Kay Kishbaugh, Pa. National Christmas Show, PO Box 11469, Harrisburg 17108. (717) 763-1254.
Seminar—Woodturning, David Ellsworth, Oct. 18. Olde Mill Cabinet Shoppe, RD 3, Box 547-A, York 17402. (717) 755-8884.
Workshop/slide presentation—Beeken/Parsons woodworkers, Oct. 15. Rosanne Somerson, furniture maker, Oct. 16. Philadelphia College of Art, 333 South Broad St., Philadelphia 19102. Contact Michael Hurwitz, (215) 875-1048.

RHODE ISLAND: **Show**—6th annual wooden boat, Aug. 21–24. Newport Yachting Center, Newport. Contact Abby Murphy, (401) 846-1600.

TENNESSEE: **Juried exhibition**—"Space: New Form, New Function," mixed media, Oct. 25–Jan. 24. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg 37738. (615) 436-5860.
Show—20th annual fall, Nov. 14–16. Civic Center, Oak Ridge Turnpike, Oak Ridge. Contact Foothills Craft Guild, Inc., PO Box 99, Oak Ridge 37831.

TEXAS: **Conference**—Annual meeting Los Amegos del Mesquite, including technical sessions and exhibits, Sept. 11–14. Fiesta Plaza, San Antonio. Contact Ken E. Rogers, PO Box 310, Lufkin 76901.

VERMONT: **Fair**—Kennedy Brothers 4th annual discovery crafts, Oct. 10–12. Fairgrounds, Vergennes. Contact Kennedy Brothers, 11A Main St., Vergennes 05491. (802) 877-2975.

VIRGINIA: **Juried show**—Annual hand crafts, Oct. 24–26. Radisson Hotel, Lynchburg. Contact Lynchburg Fine Arts Center, 1815 Thomson Dr., Lynchburg 24501. (804) 846-8451.

WASHINGTON: **Show**—6th annual woodcarving, sponsored by Northwest Carvers Association, Nov. 8–9. Western Washington Fairgrounds "Expo Hall," 9th and Meridian, Puyallup. Contact Evelyn Gosnell, 115 Del Monte Ave., Fircrest 98466. (206) 564-3278.
Show—Western Washington woodworking, Oct. 31–Nov. 2. Seattle Center, Exposition Hall, 305 Harrison, Seattle. Contact Irene Devine, (800) 826-8257.
Classes—Basic and precision woodworking and furniture making, Sept. 15–24; Nov. 1–15. Contact George Herrmann, Everett Community College, 801 Wetmore Avenue, Everett 98201. (206) 259-7151, ext. 448.
Classes—Japanese woodworking, use of Japanese squares, Sunday, Oct. 19.; cutting 5-10 tenon miter joints, Nov. 16. Contact Charles Mastro, 4268 10th Avenue South, Seattle 98108. (206) 767-9185.
Workshops/demonstrations—Tools-In-Action series, free, every Saturday, 10 AM. Boatbuilding, woodcarving, sharpening, other woodworking topics. The Wooden Boat Shop, 1007 NE Boat St., Seattle 98105. (206) 634-3600.

WEST VIRGINIA: **Juried exhibition**—Mid-Atlantic woodworking, functional, sculptural, through Aug. 24. Oglebay Institute, Stifel Fine Arts Center, 1330 National Rd., Wheeling 26003. (302) 242-7700.

BRITISH COLUMBIA: **Exhibition**—Freeform woodturning, functional, sculptural, Jason Marlow, through Aug. 29. Seymour Art Gallery, 1204 Caledonia Avenue, North Vancouver V7G 2A6. (604) 929-7981.

ONTARIO: **Show**—The Woodstock Wood, Oct. 3–5. Woodstock Fairgrounds, Woodstock. Contact The Woodstock Wood Show, PO Box 1272, Woodstock N4S 8R2. (519) 539-7772.

ENGLAND: **Exhibitions**—Contemporary new work, through Aug. 30; carved birds, Guy Taplin, Sept. 5–Oct. 4. British Crafts Centre, 43 Earlham Street, Covent Garden, London WC2H 9LD. 01-836-6993
Show—3rd Annual International Creative Marquetry, Oct. 13–18. Exhibition Hall, The Corn Exchange, Ipswich, Suffolk. Entry deadline Sept. 1. Contact International Creative Marquetry Show, 63 Church Lane, Sproughton, Ipswich, Suffolk IP8 3AY.
Exhibition—Edward Barnsley furniture, Sept. 28–Oct. 26. Stockport Memorial Gallery, Cheshire. Contact The Bee House, Froxfield, Petersfield, Hants. GU32 1BB. Hawkley (073084) 329.

La Marqueterie by Pierre Ramond. *Editions H. Vial, 8 rue des Moines, Dourdan 91410, France; Fourth printing, 1983. Francs 410 (about $40), hardcover, 232 pp.*

At first glance, there seems to be two immediate obstacles to the purchase of this book by American woodworkers: the financial barrier and the language barrier. Admittedly, the book is on the expensive side, but is probably worth every penny, and, as its value lies mainly in the wealth of its full-color illustrations, the language barrier becomes a secondary consideration.

Its ambit is obvious—to be the definitive book on marquetry by the traditional techniques, from its "modern" rebirth in 15th-century Italy to the latest productions of contemporary marquetarians. The range of illustrations covers the whole spectrum, from a magnificent full-page photograph of choir stalls at Assisi (Italy) to recent "non-figurative" creations, via the now "classic" Spindler *tableaux* (*FWW* #45, p. 70) and Art Déco work by Ruhlmann (*FWW* #51).

The book has excellent color photographs of "parquetry" in the literal sense in that it illustrates several *parquets* (floors) of extreme complexity and beauty. As could be expected in a French book, the Boulle technique gets full illustrative treatment, as does what is arguably the best piece ever of French furnituremaking: the bureau of King Louis XV, including ink tracings of some of the more complex marquetry details. This doesn't mean that non-French work is neglected—witness the best photos I've seen of G.H. Blake's marquetry on Baron Foley's grand piano (London, c. 1840), in the Metropolitan Museum of Art, New York, or of Stephen Webb's (1849-1933) rosewood and ivory table, in the Victoria & Albert Museum, London.

Altogether, I'd say that the only readers likely to be disappointed are those for whom "marquetry" only suggests pictures to hang on a wall, as the book is heavily biased toward marquetries integrated into pieces of furniture, and no wonder since the author is a professor at the Ecole Boulle—the most celebrated of French cabinetmaking colleges.—***Antoine Capet***

Shaker Design by June Sprigg. *Whitney Museum of American Art, 945 Madison Ave., New York, N.Y. 10021. $40.00, hardbound; 228 pp.*

The Shaker Chair by Charles R. Muller and Timothy Rieman. *The Canal Press, Box 28, Canal Winchester, Ohio 43110. $39.95, hardbound; 232 pp.*

Shaker Design is an uplifting visual delight for those who find joy in objects created by the Shakers. The book is actually the catalog of one of the most comprehensive exhibitions of Shaker work ever presented—more than 100 objects from 40 collections, including several Shaker museums and the surviving communities at Canterbury, N.H., and Sabbathday, Me. The photographs, most of them credited to Paul Rocheleau, are excellent. Together they present a poignant sense of a world where harmony, symmetry, proportion, and function were as essential to men and women as food and oxygen.

Each photograph is accompanied by a brief description by June Sprigg. In a lucid, precise style the Shakers themselves would admire, she describes each piece, tells of its history and makers, and points out distinctive features of its design or construction. For those who like to build from pictures, the basic dimensions are also given. Ms. Sprigg's essay introducing the exhibition is also one of the best I've read on the Shakers.

Woodworkers shouldn't close the book when they reach the end of the furniture section. The other sections, especially those on tools and household objects, have much to teach modern workers about line and proportion. They also offer a strong argument for one of the conclusions of Ms. Sprigg's essay. "The most appealing thing about Shaker design is its optimism. Those who would lavish care on a chair, a basket, a clothes hanger or a wheelbarrow clearly believe that life is worthwhile." The exhibit is at the Whitney Museum of American Art in New York City until Aug. 31 and will be at the Corcoran Gallery of Art in Washington, D.C., from Oct. 4 to Jan. 4, 1987.

Oval boxes, such as these, shown in rich color in Shaker Design, ***are among the best known Shaker artifacts.***

For admirers of Shaker chairs, *The Shaker Chair* offers a welcome reference. Examples of work from each community that manufactured the chairs are discussed and illustrated with photographs and line drawings. If you're looking for measurements or construction techniques showing step-by-step methods, this isn't the book for you. If you want to better understand the charm of the chairs and analyze the details that made each community's special, you'll enjoy what the authors have prepared.

The authors see the chairs, which the Shakers produced in quantity for sale to the outside world, as the material expression of the sect's most prized tenets: simplicity, separation from the world, utilitarianism, community and dedication of fine craftsmanship. They say the best were made in the Enfield, N.H., community and featured symmetrical pommel turnings, slender posts and a backward cant. They call the Enfield chair "the ultimate expression of the conservation of materials to create a functional form." Even if you disagree, it's interesting to compare this chair with the work of other communities, as well as Windsors and New England slat-back chairs made at the time.

In addition to design discussions, several excerpts from Shaker journals dealing with the chair industry and sales are presented. There are a few interesting tidbits about the chairmaking process and the jigs and machines the Shakers devised, including a duplicating lathe that could turn a chair rung in 20 seconds, a post in less than a minute. —***Dick Burrows***

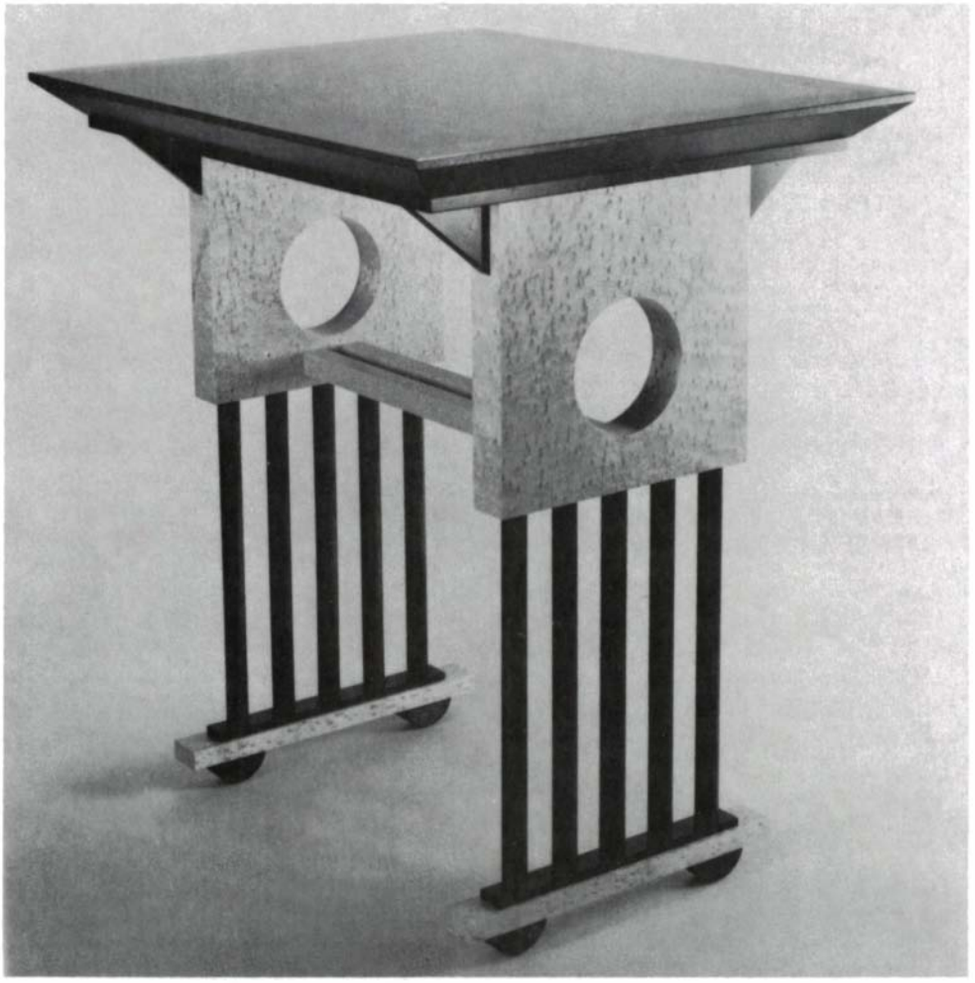
Antoine Capet teaches at the University of Rouen in France. Dick Burrows is an associate editor of Fine Woodworking.

Photo: Strong-Meyer Photography

April Show-ers

Steve LaDrew's tripod curio cabinet, shown below, made of wenge and curly zebrawood, stands about 6 ft. tall. Jeff Behnke's table, shown at right, made of bird's-eye maple, Honduras mahogany and Gaboon ebony is 28 in. tall.

Photos: left, Joel Breger; below, Brian Gulick



The Washington Woodworkers Guild mounted a major show, Out of the Woods, last April at the Art Barn Gallery, an early 19th-century stone barn in the nation's capital maintained by the National Parks Service. The show was juried by Guild members, who selected 40 pieces by 21 makers. Ribbons for outstanding work were awarded to eight exhibitors by a panel of judges from the staff of the Renwick Gallery. One of the beribboned was Steve LaDrew, of Arlington, Va., for the wenge and curly zebrawood tripod cabinet shown at left.

Farther north, in New Rochelle, N.Y., the Castle Gallery at the College of New Rochelle displayed work resulting from collaborations of furniture designer-makers with architects and designers. Selected by Rosanne Raab, an arts and crafts consultant, the show contained pieces by ten makers, most of them graduates of the School for American Craftsman at the Rochester [N.Y.] Institute of Technology. Jeff Behnke, who works in New York City, collaborated with architect Thomas Bishop on the table shown above, designed for a private living room.

SOFA meets at ACC fete

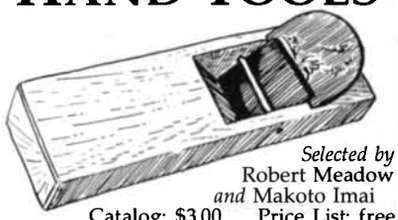
For all of its creative rewards, the life of a professional craftsperson has its share of frustrations. Chief among them—at least for those who don't share space with a colleague—is the imposed isolation of working long hours alone in the shop or studio. Without a fresh eye cast occasionally upon the work, it's hard for a solitary craftsman to measure his own progress, let alone fit it in with what's going on outside the shop walls.

Craft organizations pump a little air into the vacuum. They publish newsletters and magazines, sponsor shows and, as the American Craft Council did last June in Oakland, Calif., organize national conferences. As you'd expect from an umbrella group, the conference was broad, consisting mostly of lectures or panels covering some aspect of all craft media without focusing on any one in particular. One afternoon of the four-day conference, however, was set aside for gatherings of subgroups. One of these was a planning session of a new organization called the Society of Furniture Artists, whose appropriate acronym is SOFA.

Although formally unveiled in Oakland, SOFA is really about a year old, having been loosely formed in the spring of 1985 by a group of Boston-area studio furnituremakers. SOFA is aimed squarely at filling a gaping hole in the otherwise tight net of specialized craft organizations. Metal, clay, glass and fiber artists all have national groups dedicated to their special concerns, but woodworkers, or at least furnituremakers, have never managed to pull together their own. It's not for lack of trying. Two previous attempts foundered, both for organizational reasons and because the purpose of such a group hadn't as yet defined itself.

But as Alphonse Mattia, one of SOFA's

JAPANESE HAND TOOLS



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principal organizers sees it, a clear purpose has emerged and it's to document and promote what studio furnituremakers do. This it hopes to do through a newsletter, which will also provide a forum for reporting and much-desired critical writing about furniture. Within about a year, the group hopes to announce plans for a national conference. SOFA is not just for woodworkers. It's open to serious furnituremakers working in any material. To join the group or to contribute to the newsletter, write to SOFA, Box 416, Kendall Square Station, Cambridge, Mass. 02142. Dues are $40 per year.

SOFA's emergence at Oakland seemed particularly appropriate at a time when established, professional craftsmen seem more interested in philosophical issues than in technical and commercial matters. At ACC's last convention in 1977, the major craft shows were still big news. Now that regional shows and galleries have become more or less reliable marketing channels, there's time to reflect not just on how things are made and sold, but why. Accordingly, the bulk of ACC's program in June concerned itself with weighty discussions on the future of craft and the craftsmans' place in society. Over the course of the four-day conference, dozens of lectures and panels were presented, far more than one person could reasonably take in, even if they hadn't been scheduled concurrently. I most enjoyed a delightful, anecdotal talk by ceramic sculptor and art professor Stephen DeStaebler on the nature of his own creative process.

Other quick takes: Budget cutbacks notwithstanding, the Federal government still gives grants to artists and craftsmen through the National Endowment for the Arts. Richard Andrews, director of NEA's Visual Arts Programs, showed slides of work funded by NEA and explained how to apply for grant money. For more information, write NEA at 1100 Pennsylvania Ave. N.W., Washington, D.C. 20506.

Help in landing a job in the arts is available through a new organization called National Network for Artist Placement. The group publishes a newsletter and sponsors conferences. Write Kate Donahue, 6616 Woodland Place, Oakland, Calif. 94611 for more information.

The ACC has relocated to new quarters in New York City. The new address for the staff, museum and business office is 40 W. 53rd St., New York, N.Y. 10019. American Craft Enterprises, which runs the ACC craft fairs, will remain at P.O. Box 10, New Paltz, N.Y. 12561. ACC's new museum, which has some four times more exhibition space than its predecessor, will open with a major show on October 26. —*Paul Bertorelli*

Designing furniture for the disabled

Many woodworkers probably don't realize how much good they could do in their communities by helping to design furniture for the disabled. As a cabinetmaker, I have found that the problem-solving skills and design sensibilities needed to create this specialized furniture are the same as those needed for the best custom woodworking. You must carefully consider the needs of the client, evaluate the home or office where the furniture will be used, then respond with designs that are creative, yet economical and functional.

The disabled, their families and therapists often have nobody to help them customize or build special furniture. If an individual's needs cannot be met with an off-the-shelf item, the person is often out of luck unless a craftsman can provide furniture that fits and works. Sometimes this involves modifying commercial furniture by adding special padding or providing for greater lateral or vertical adjustments. Trays, work tables, or other accessories may be needed. Sometimes a new chair or table must be designed to fit one person's build and physical limitations. In addition to the design challenge and community involvement, it's gratifying to be involved in work that can truly improve a person's life. The mobility, comfort, and physical benefits of properly fitted equipment can help minimize the effects of a disability.

Wendell Oppewall

The positioner desk helps children with cerebral palsy, like 5-yr.-old Nate Johnson, stand, sit and rest without help.

I'm in no way suggesting, though, that everyone go out and begin a "do-it-yourself" campaign for the disabled. It's essential that you consult with a qualified clinician, most often a physical or occupational therapist, about the client's physical needs throughout the design and fabrication process. What I want to do is encourage designer/craftsmen to join a "design team" involving therapists, the disabled, their families, teachers and others who will be using the furniture.

I became interested in designing for the disabled while I was a furniture-design student at the State University of New York at Purchase. I built a reading stand for a handicapped friend. The stand was designed to swing over her bed, and was weighted so that she could pull it toward her and push it away with very little effort. After graduation, and a rather frustrating year in a custom cabinet shop in New York City, I started looking for a place where I could build furniture for special needs. Five years ago I began working with the Adaptive Design Services in Belchertown, Mass., a state agency providing custom equipment for disabled state residents.

We specialize in seating and positioning equipment and custom-fitted wheelchairs. Without this special equipment, many wheelchair users would be forced to sit all day in chairs that encourage bad posture and contribute to orthopedic problems. There have been some exciting developments in "sports chair" design (inspired by wheelchair sports, and some bright designers who also happen to be wheelchair users), but unfortunately much of this equipment is aimed at the highest functioning portion of the handicapped population. We have concentrated our efforts on those with more severe orthopedic and muscle-control problems.

One of our most promising designs is a positioner desk for children with cerebral palsy. Part of my satisfaction with the positioner desk is that it looks and works like something a woodworker would design, and the response we've gotten from families is that they like how it looks as a piece of furniture in their home.

What makes the positioner desk unique is that it enables many children to stand, sit or rest independently, without help from another person. These independent movements build confidence in the child and are an important part of a child's developmental sequence, encouraging proper alignment for developing bones (hips may dislocate unless the youngster stands enough to push the head of the femur into the hip socket). With a positioner desk, the child can often tolerate longer periods in weightbearing activities because he or she isn't locked into one position, as happens in some commercial equipment for standing activities. The desk also fits well into a classroom, and places the child at an appropriate height to play and work with other children.

I originally constructed the box frames

from ½-in. composition board, but changed over to ¼-in. phenolic resin board to eliminate finishing problems. Phenolic resin board is a paper-laminate product, made like Formica. It routs and cuts easily, and, with good shop ventilation, is not too awful to work. The box frames are put together using redwood trim strips and particleboard screws. The slots are cut with a router, with slot placement based on each child's needs. The padded and upholstered seats, chest or back pads, foot guides and knee bracing pieces are all adjustable laterally, vertically and horizontally.

The positioner desk is an example of what a craftsman can do. For those interested in getting involved, the first step is to contact the people in your community who prescribe commercial equipment—physical or occupational therapists at a rehabilitation hospital or other agency, for example. Let them know you're willing to help with customizing furniture and equipment. It may take some searching to find therapists with a special interest in equipment, but this connection is vital. If the clinical evaluation of the client's physical needs is flawed, no amount of craftsmanship will make a piece of equipment work.

If you've built furniture for the disabled, I'd like to hear about your experiences. Write to me at 128 Plumtree Rd., Sunderland, Mass. 01375. —*Tom Murphy*

Design Book deadline

The October 30 entry deadline is fast approaching for *Design Book Four.* Finish that piece, take those slides, don't put off entering any longer! Here's a quick review of the rules (see *FWW* #58 for entry form and complete information): You can enter up to three different pieces shown by no more than five color transparencies in all. Each different piece must be accompanied by its own entry blank. Only 35mm color slides or larger format color transparencies will be accepted; each must be in a protective clear plastic sleeve and each must be labeled with your name and address.

Low-tech screwdriving

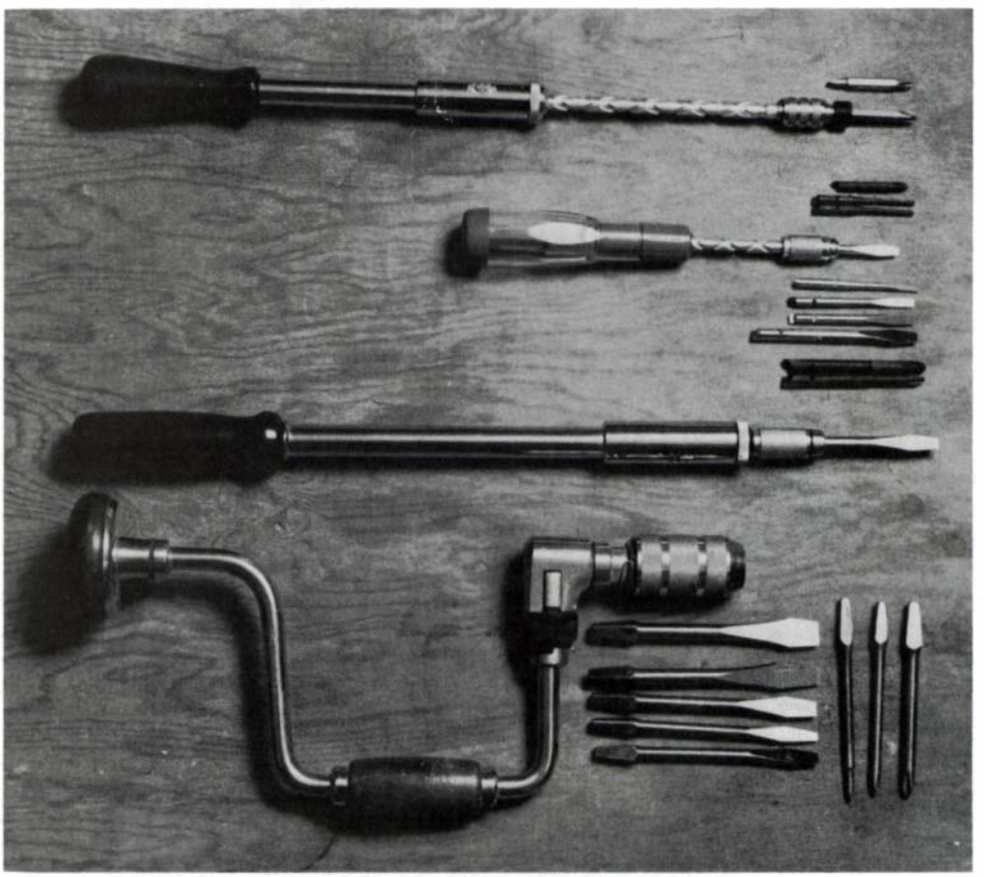
I "learned screws" from Clyde, a third-generation boatbuilder. I was 20 years old, and tired of my job in a production shipyard, so I hired on as an apprentice in Clyde's custom boatbuilding shop. Clyde was a cranky septuagenarian given to rambling lectures on the demise of craftsmanship and the problems with American youth. Not even minutes after I was hired, he announced that I would be more trouble than I was worth, as I had two years of bad shipyard habits to break before I would be worth a damn.

After examining my toolbox, Clyde proclaimed in his booming baritone that I was forbidden, under any circumstances, to use the expensive electric screw guns that I had scrimped and saved to buy. In Clyde's view, power screwdrivers only allowed one to strip screwheads and split expensive planking twice as fast as traditional methods. Had I not been fearful of the old man's pride and rage, I would have laughed out loud.

In spite of myself, Clyde was able to teach me, over the course of the next few years, that screws can be driven with great precision and finesse using methods other than power or hand screwdrivers. Two of the best are the brace and the spiral-ratchet screwdriver.

The brace, a tool with 15th-century origins, acquired its modern form in America during the last half of the 19th century. Today's 2- and 4-jaw, ball-bearing head, fully ratcheted, chromed braces are a joy to use. The turning motion, or sweep, of the brace lever arm is both positive and continuous. The ratchet feature is essential in tight corners, where it's not possible to make a full turn of the handle.

I find braces particularly useful when I have lots of screws to drive, and when correct torque pressure is a priority. The brace is fast and sensitive to variations in pressure. Only rarely do I over-tighten a screw, strip the head, or split wood when using a brace. A set of five slot-screw bits from Woodcraft Supply (P.O. Box 4000, Woburn, Mass. 01888) costs about $20; three Phillips bits, $13.



Power driving can be done with muscle as well as electricity. Brace and bits are shown at bottom. At center are two Stanley Yankee drivers. At top is a similar West German driver.

It was also in Clyde's shop that I came to appreciate the utility, compactness, and time-saving qualities of the spiral-ratchet, or "Yankee," manual driver. The ability to use this lightweight tool single-handed is probably the feature that appeals to me most—I twist a square drive or Phillips screw into the pilot hole, align the parts with my free hand while driving the screw with my other hand.

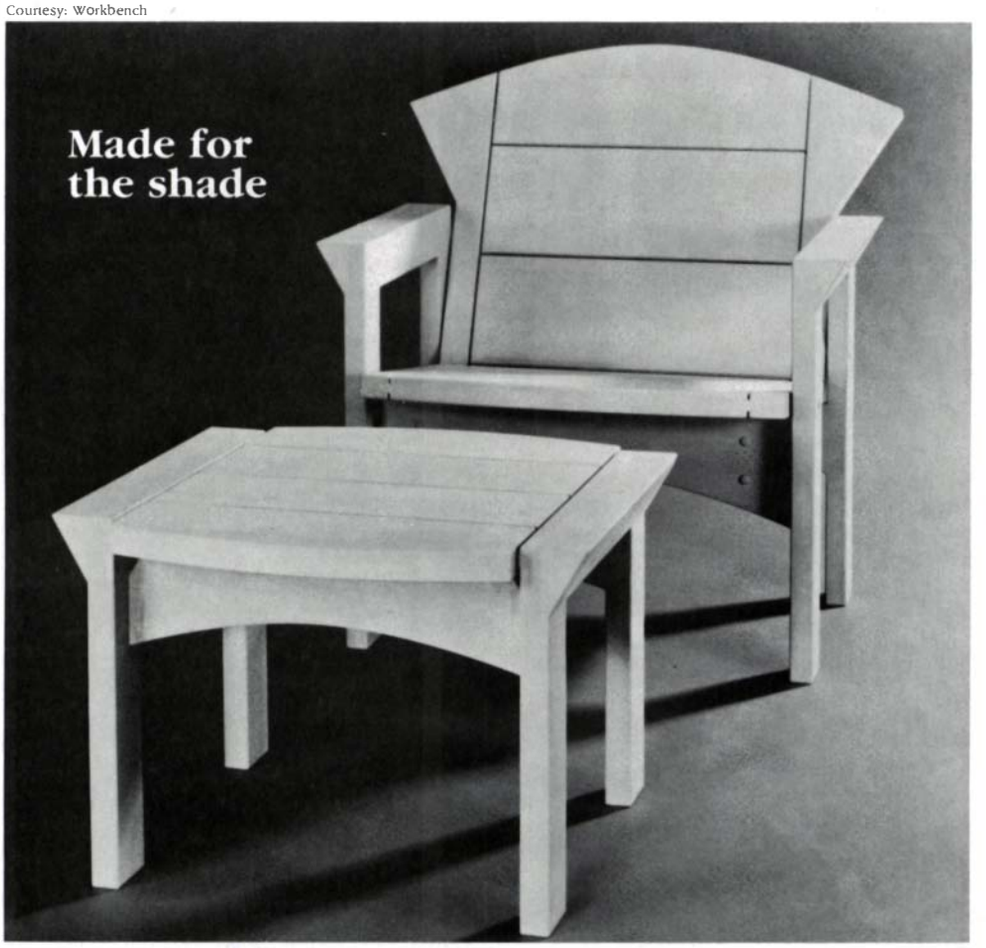
The tool's spindle has two spirals, one right hand and the other left hand, each with corresponding nuts. Bearings and ratchet pawls engage the spindle inside the shaft. The tool is simple to use: grasp the bearing sleeve near the tip with one hand and the handle with the other. Push on the sleeve to hold the bit tight to the screw and pump away with the other hand. The shaft runs down the spindle and revolves the bit. A spring pushes the shaft back, ready for another stroke. Simple adjustments allow the tool to drive in one direction and ratchet in the other, or

to lock the spindle completely, thereby making the tool a regular screwdriver.

Like the brace, the spiral-rachet screwdriver was perfected in New England—hence the "Yankee" designation. Stanley now makes Yankees in five sizes, ranging from the smallest at 7¾ in. closed, 9⅞ in. expanded (about $12), to the largest at 19½ in. closed, 27¾ in. expanded (about $50). Most hardware stores will carry at least one size. Two screwdriver bits come with each size, and drill bits come with the two smallest sizes. Additional screwdriver bits are available for all sizes. (I make square drives by brazing a short section of mild steel rod on a cut-down power-drive bit, then filing to fit the screw and driver.) A West German firm, Robert Schroder, also makes a spiral-ratchet driver. It opens from about 12 in. to about 20 in. and costs $19.90 from Garrett Wade (161 Ave. of the Americas, New York, N.Y. 10013).

—Larry Montgomery, Port Townsend, Wash.

Courtesy: Workbench



Asked by New York City's Gallery at Workbench for something summery, James Schriber reworked the old Adirondack standard and came up with the chair and ottoman shown above. Made of Honduras mahogany, they're finished with milk paint. Schriber, of New Milford, Conn., joined 18 other makers in the May-through-July show.

Oak: red or white?

Tired of guessing the species of oak you're about to buy? A simple chemical test is all you need, according to an item in the The Minnesota Forest Products Marketing Bulletin (Agricultural Extension Service, 20 Coffey Hall, University of Minnesota, St. Paul, Minn. 55108). Here's how it works. A 10% solution of sodium nitrate ($NaNO_2$) is brushed or sprayed on the heartwood. The naturally light-brown red oak heartwood will darken slightly, but white-oak heartwood will turn yellow-orange, then red-brown and finally dark green or purple to black. Reaction time is fastest on fresh or green wood and at warmer temperatures.

The Bulletin says the test is simple and reliable, and can be used by inexperienced people. Industrial applications include separation of red oak from white oak for export to Europe. Red oak must undergo costly phytosanitary fumigations against the oak wilt fungus before export. By reliably separating white oak from red, fumigation costs can be saved.

A brochure giving further details of the test is available from Lew Hendricks, 206 Kaufert Lab, 2004 Folwell Ave., University of Minnesota, St. Paul, Minn. 55108.

Guild goes under

During the spring of 1986 when all around was renewal and life, the Ontario Woodworkers Association entered into a deep sleep. Once 200 members strong, the group suffered declining membership, sporadic newsletters, fewer and fewer meetings—problems that nagged the executive committee, which resolved to find out where the energy had gone. A mailed questionnaire, telephone and personal interviews were used to determine the wishes and priorities of the general membership. I was given the task of analyzing the returns. They produced some surprises and definite conclusions.

The original goals, as expressed by the ten founding members in 1979, were apparently just as valid seven years later: "To promote communication and special services within the woodworking community," and "to provide a strong voice for that community in promoting its interests to the outside." Part of the problem was the diversity of woodworking interests to be addressed—the group included boat builders, furnituremakers, turners, toy makers, musical instrument makers, jewelers, carvers, and housebuilders.

There were different perceptions of the group by its amateur and professional members. The full-time professional trying to make a living needs an association that will assist in the marketing of his or her work. Time, energy and money are all in short supply and are reserved for the business of working, not volunteering. "If I don't get paid to do it, I can't take it on." Professional concerns of running a small business are of more interest to this group.

The part-time amateur or hobbyist woodworker seeks resource information, training and skill enhancement and relaxation through his or her work with wood. "Amateurs do woodworking to stop thinking about work; it's a form of relaxation." Neither of these two, broadly defined groups felt its needs were being met. The professionals saw it as a drain on their energies; the amateurs saw it as an elitist club. Interestingly enough, there was no hostility between these two groups and friendships were made between professionals and amateurs. Socializing was generally quite successful and a highlight of OWA activities for many people.

Major conferences and seminars, often featuring star-billing guest speakers, were well attended. However, to give Ontario's far-flung communities fair representation at bimonthly meetings meant moving around a very large province, so that time, distance and location became problems instead of opportunities. Eventually, regular meetings were dropped when attendance dwindled.

Touch Wood, the group's bimonthly

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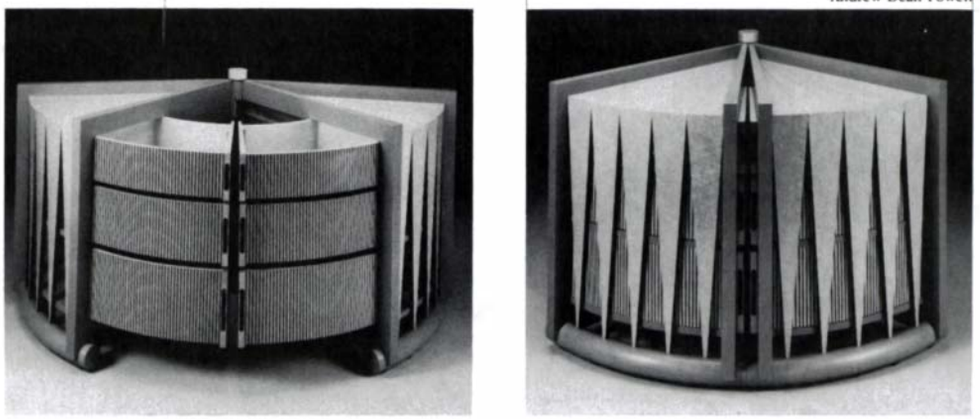
newsletter, provided a link between members, but it rarely received unsolicited material from woodworkers. Instead, *Fine Woodworking* was seen by many as almost a substitute for a domestic association. This is ironic considering *FWW* was instrumental in boosting the early membership.

The OWA executives reluctantly concluded that the association was no longer the priority it had once been. Rather than disband entirely, the group asked the Ontario Crafts Council to act as its archive, and award the interest from money remaining in its coffers as a special award in wood. By choosing to lie dormant, the hope is that in the future another wave of enthusiasts will make use of the experiences and body of information left behind and breathe new life into the Ontario Woodworkers Association. —*Marilyn Scott, Cambridge, Ont.*

Award winner

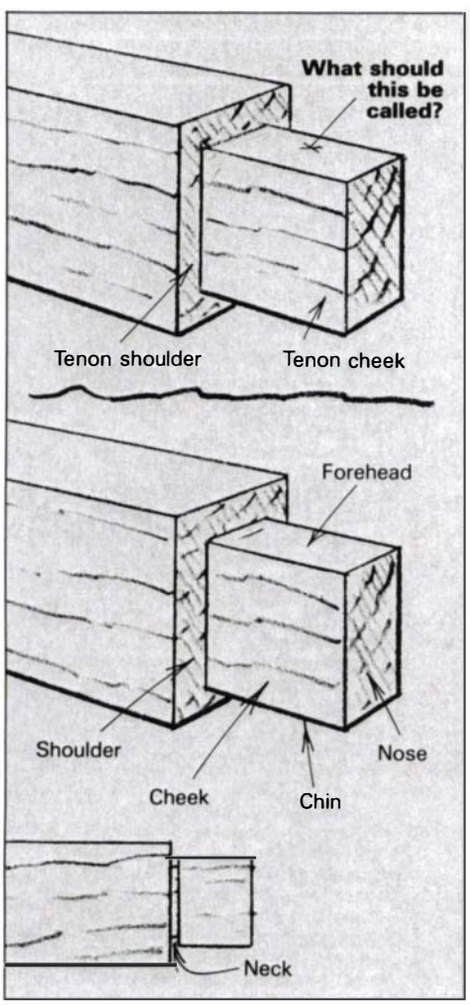
Andrew Dean Powell



Todd White's chest of drawers (shown above) was one of eight winners in Progressive Architecture *magazine's Sixth Annual International Furniture Design Competition. Of the 938 entries from 29 countries, most were one-off rather than production designs. White's 6-ft. by 3-ft. chest is plywood, bird's-eye maple veneer, aluminum and bronze.*

Tenon terms

Ever been brought up short, as you described the fine points of some woodworking dilemma, by the realization that the language doesn't provide a name for a crucial element? A friend recently posed a terminology puzzler that set my imagination going. His concern was with the tenon. It has shoulders and cheeks, but what of the surfaces joining the cheeks of a tenon, as shown in the drawing?



After giving it some thought, it occurred to me that the existing nomenclature is anthropomorphic in nature, alluding to anatomical aspects of the face and upper torso. Armed with this insight, I lost no time in going to my medical dictionary. After a few seconds of furious page turning, the answer lay clearly before me!

My suggested scheme for naming the various parts of the tenon is based upon augmenting the existing nomenclature with related anatomical terms. Because any presentation of a new system of terminology can be tricky to remember, I have presented the proposed terms in a manner similar to a song I remember from my childhood, called Dem Bones.

the forehead connected to the nose,
the nose connected to the cheek,
the cheek connected to the chin,
the chin connected to the neck,
the neck connected to the shoulder.

And there you have it! Forehead on top, chin below.

But WHOA, you say! There is no such thing as a neck in a tenon!

It's existence is a darkly kept secret. There are many of us who are aware of its existence, but inconceivable as it may seem (it's fair to assume that a conspiracy of silence exists), academics and publishers of glossy magazines choose to ignore that a tenon can, and often does, have a neck. The fact is, whenever you are cutting the shoulder and find that you have inadvertently cut a kerf into the corpus of the tenon, you have created a neck. Those of us who belong, with pride, to the "Order of the Legion of Woodbutchers" have been cutting necks in our tenons all along. Thus, although many may deny it, the existence of a neck in a tenon is an incontrovertible fact.

By the way, although regional bias may exist, the proper pronunciation for forehead, as applied to tenons, is fo'-hd.

Although I am tempted to claim that the puzzler has been solved, there is yet another matter to which I must direct your attention. The suggested system of nomenclature appears to resolve what to call the various parts of the tenon, but on further cogitation, it becomes obvious that the matter is much more complicated than it seems on the surface, and has not yet undergone complete resolution. Further elucidation must await study by those more learned in linguistics and etymology than I.

Let me give you examples of the problems that come to mind. Let us assume that the very end of the tenon is called the nose. The question that arises is this: If one were to make cuts into the tenon in order to insert two wedges, would it be proper to call that part of the tenon that is pushed out by the wedge, "nares?" Further, would one refer to the act of inserting the wedge as "flaring-out-the-nares?"

And, finally, in light of all these references to anatomical structures, would the word wedge still be an appropriate term to use? After all, would you tell someone to stick a wedge up their nose?

Problems, problems, problems. . . .

—*Yosh Sugiyama, Redding, Calif.*

Notes and Comment

What's new in woodworking in your area? Notes and Comment buys brief articles about interesting events, shows and people and welcomes all manner of commentary. Send manuscript, if possible with color slides or black-and-white photos (preferably with negatives), to Notes and Comment, Fine Woodworking, ***Box 355, Newtown, Conn. 06470.***

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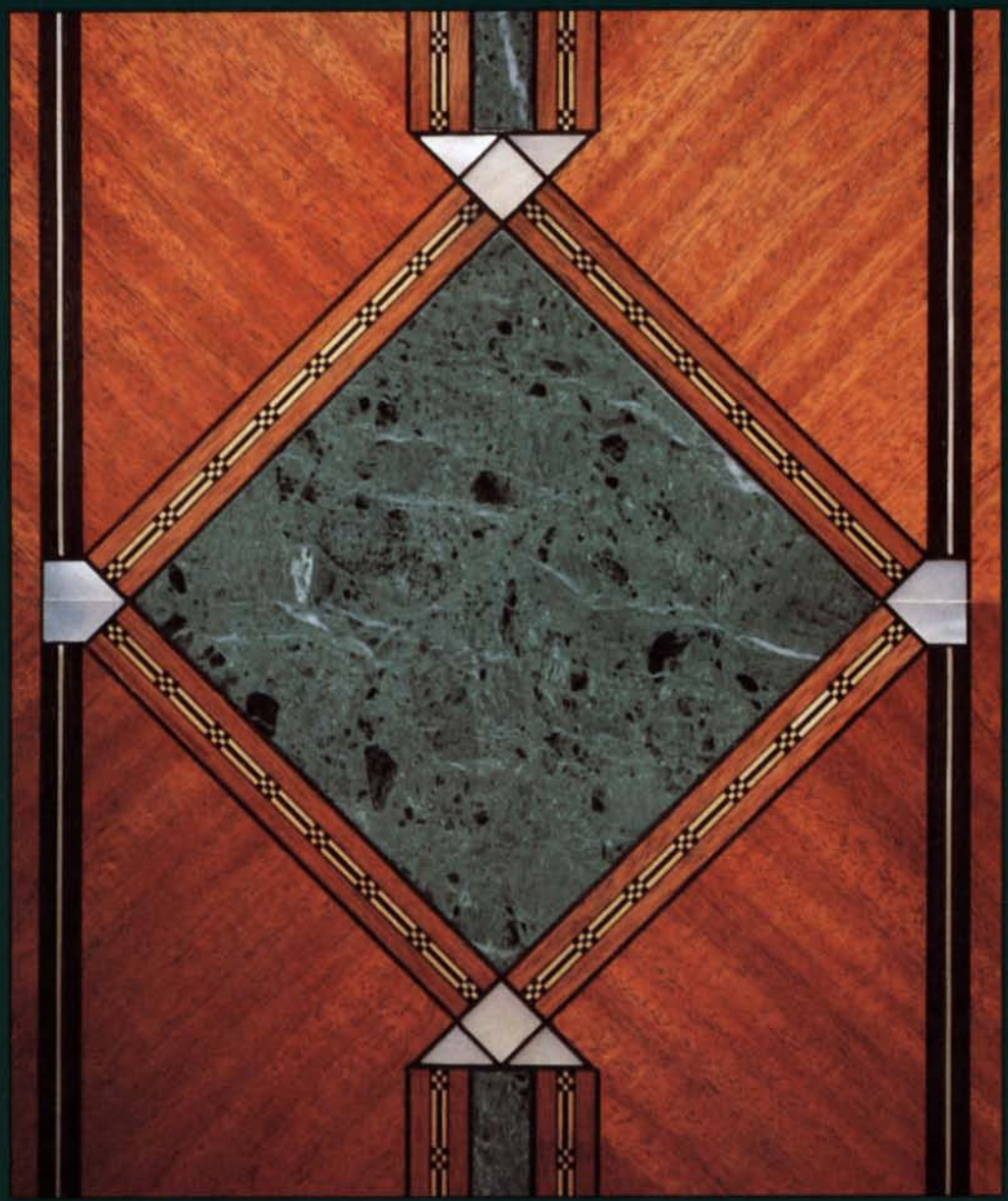

COMPANY JOB

Many woodworkers dream of landing a fat corporate commission. Rick Wrigley's chance came when Home Box Office (HBO) asked him to make the conference table shown here for their new headquarters in New York City. Referred to Wrigley by New York City's Workbench Gallery, HBO's architects had a general idea of what they wanted; it took six months of collaboration and numerous meetings to nail down the design. Supported on box-construction solid-wood trestle legs, the top is MDF, veneered and lipped with African mahogany. It is 14½ ft. long and 5 ft. wide, and divides in half across its width for shipping. The inlays are of wenge, holly, ebonized wood, mother-of-pearl and marble. Wrigley, a 1981 RIT grad who works in Holyoke, Mass., spent about 500 hours on the table.

Photo above: Allen Bragdon; detail photos: Rick Wrigley