

Apply Now for a Highland Hardware Charge Account

AS A CONVENIENCE to our mail order and in-store tool customers, we have adopted a charge account program administered by Bank One of Eastern Ohio, and we invite you to apply now for a charge account. Each person or business for whom an account is opened (approval requires about 3 to 4 weeks) is issued a Servistar® charge card which is good for mail, phone, and in-store purchases at Highland Hardware.

The initial line of credit is generally set at \$1000. For larger specific purchases a higher credit limit may be requested, subject to approval.

There are no membership fees for a Servistar® card. The minimum monthly payment is 3% of your outstanding balance or \$10.00, whichever is greater. If used as a revolving charge account, the finance charge is 18% annual percentage rate. (However, if you pay your balance in full each month, there is NO finance charge).

Thus after receiving your Servistar® card, a stationary tool can be purchased from us for no money down, with a *minimum* monthly payment of only 3% of the cost of the purchase. Of course, making an initial down payment and/or making larger monthly payments when possible will result in less finance charge.

If you choose to make monthly payments equal to 5% of the cost of the purchase, about 24 months are required to complete payment. Using 3% instead of 5%, about 44 months are required to complete payment.

For in-store purchases only, *instant credit approval* is available. When applying in person in the store, a credit decision is received within 30 minutes of applying. Dozens of customers have already used this method to finance stationary tool purchases. We'll be happy to assist you in completing an instant credit application.

To request a credit application, send us your name and address, or call us at (404) 872-4466. Specify whether you want an application for a *personal* account or *business* account. Also specify if you intend to present the application in person at the store for *instant credit approval*. Applications for personal accounts (though not for instant credit) also appear on the back of the order forms in our 1988 catalog.

Attend IWF 88 August 27-30

CIRCLE THESE DATES on your calendar. You won't want to miss the 1988 International Woodworking Machinery and Supply Fair, the western hemisphere's largest woodworking trade show. This biennial show is held at the Georgia World Congress Center in Atlanta.

More than 700 exhibitors from around the world will fill this mammoth facility with all that's new in tools and machinery for furnituremaking. Highland Hardware makes its fifth consecutive appearance as an exhibitor, and we look forward to your visit at Booth 2401. Show hours are 9 AM to 6 PM, Saturday through Tuesday, August 27-30.

We invite you to receive from us a Special Customer Invitation, which if submitted in advance will enable a complimentary \$10 discount from the \$15 show registration fee, and also help you avoid the long registration lines.

To receive an invitation, stop by the store after June 1, or send a SASE to us marked "IWF 88 Invitation Request".



Zach Etheridge explores the subject of router table design in his article "The Well-Tempered Router Table" which begins on page 12.

Carving Class Starts May 4

TONY DILEO will teach a 6-week class on woodcarving at Highland Hardware on Wednesday evenings from 7:30 to 9:30 beginning May 4. Each participant in the class will select a project and follow it to completion within the 6-week period. The class is geared for Beginner to Intermediate Level carving students. Cost is \$72.00.

Each class will include lecture, demo, and hands-on work. The registration fee includes enough wood to handle a moderate-sized project for each student. (If you select a larger project, additional wood may be purchased from the store). Tools must be supplied by each student. For those with no tools, the instructor will recommend at the first class meeting which tools to buy. Bench space and sharpening equipment will be provided at the class.

The Instructor, Tony Dileo, a graduate of the Atlanta College of Art, is a local sculptor working in wood and stone. He has been employed at Highland Hardware since 1981.

To register, send or bring a check for \$72.00 to Highland Hardware, or register by phone at (404) 872-4466 if paying by Visa or Mastercard. Space is limited, so do not delay.

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Lamello Quality Now Available for Under \$500



New Lamello Standard Biscuit Joiner only \$448 plus \$6.00 shipping

HERE'S GOOD NEWS for biscuit joinery fans: the folks who created biscuit joinery in the first place have just introduced a new machine featuring Lamello quality at a middle-of-the-road price. The Lamello Standard is the best choice yet for those of you who've been wishing for a substantial, high-quality joinery tool without the serious price tag of the superb Lamello Top.

The Standard incorporates most of the excellent features that have made its big brother the finest joiner ever built. Foremost among them is the hinged front fence that has always set Lamello apart; for the great majority of joining operations, there's virtually no way to avoid dead accurate alignment of the blade, and thus perfect surface alignment across a joint. In fact, not just the fence but the entire base casting is exactly the same as that on the Lamello Top. Tough aluminum alloy casting, the ground and polished perfectly flat, and the nose is likewise ground

at precisely 90 degrees to the base. Tolerances are very tight; there's no loose play in the fence, or between motor and base as the blade is plunged into the work. The base has holes through the rear which will help mount the tool for jugged production-type work.

The Standard differs from the Top in powerplant and transmission systems. The motor operates on 500 watts, to the Top's 600. Our tests here at the store showed perfectly satisfactory performance in a squirrely piece of hard maple with no holds barred — the lower power rating may well be felt only in how well the tool can handle a blade overdue for sharpening, for it feels plenty powerful enough for everyday joinery. This may be due in part to the Standard's 10,000 rpm, which lets the smaller motor work at optimum output. There is no slip clutch built into the right-angle gearing, which should lead us to recommend a slightly less aggressive approach with this machine than with the Top, but frankly it's unlikely anybody could feel much difference. And there's no spindle lock built in, so on the rare occasion when it's time to remove the blade, you'll have to use two wrenches instead of one. The switch is recessed into the rear of the Standard's motor housing, which is not as convenient as a thumb switch up front, but it's hardly a major nuisance, either.

In all, our first look at the Lamello Standard has left us with a very positive impression. The tool does sacrifice a few good points from the Top; after all, the price savings had to come from somewhere. But it is undoubtedly built to higher quality standards than any of its competition, and should prove to be both precise and durable enough to meet the demands of practically any small shop. The Lamello Top remains the tool we recommend for production wood-working; it's a tool you can make a living with for many years. But if your shop environment is a little less intense than a factory floor, and your need for quality a little greater than your need for the least expensive tool available, then the Lamello Standard certainly deserves your consideration.

Available beginning late April from Highland Hardware for \$448 plus \$6 shipping.

Change in Lamello Top Starter Package

Our 88 catalog offers on page 6 a package deal on the Lamello Top and several popular accessories. Due to a price increase, effective March 1, 1988, the package was revised to no longer include the set of Lamello Spanner clamps. Remaining as part of the package are the Lamello Top, a Lamello glue dispenser, a replacement carbide cutter for the Lamello Top, and an assortment of 1000 joining plates.

Price for the package remains \$695.00. Bought separately, the Lamello Top remains \$599.00. Biscuits bought separately are \$29.95 per box of 1000. Specify size 0, 10, 20, or assorted. (Shipping charges are extra).

New Owner's Manual for Freud JS100 Biscuit Joiner



TO REPLACE the original operator's manual which accompanied Freud JS100s (one of those abominable 2-page 4-language jobs often found with imported tools) Freud commissioned Edward A. Baldwin to prepare a new version. Though it does not go into extreme depth covering all the possibilities of biscuit joinery, new JS100 owners will find it a clear step-by-step approach to fundamental biscuit joinery. *Included with every new JS-100, it can also be purchased separately by sending \$1.00 to Highland Hardware.*

When Freud introduced the JS100 in 1986, the tremendous productivity of biscuit joinery became so affordable that just about everyone could experience it for themselves. Small shops, custom woodworkers & hobbyists snapped up tens of thousands of JS100s, and demand continues to grow as word spreads about how the tool makes dead accurate joinery the easiest & fastest part of your work.

Though the Freud joiner is clearly not intended to compete with the likes of the Lamello Top for use in heavy-duty commercial situations, it certainly offers a combination of function and affordability. With a thousand JS100s currently at work in our customers' shops, we have seen a very encouraging track record: there've been few problems, & Freud has provided prompt service on the rare occasions when we needed help. With only moderate care and attention the JS100 provides precisely the speed and accuracy we've come to expect of biscuit joinery at its best.

The JS100 uses a fence design somewhat different from the Lamello's, trading some of the Lamello's convenience for a bit more versatility, particularly on mitered work. A fixed vertical nosepiece works with a sliding horizontal fence for vertical-axis positioning. Angled vanes on the back of the horizontal fence allow it to be flipped over and used for 45-degree joints, while shop-built accessory fences will be required for other angles. The fence can be set at any distance up to 2" from the blade. Pre-set cutting depths, 550-watt motor with conveniently located switch, and six-lb. net weight make the JS100 easy to use and get used to. Includes heavy plastic storage case.

The Freud JS-100 is available from Highland Hardware for \$169.95 plus \$6.00 shipping. Biscuits are \$29.95 per 1000 plus shipping. Specify size 0, 10, 20, or assorted.

WOOD NEWS 21 Spring-Summer 1988

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Wood News solicits manuscripts contributed
by our readers. We pay \$50.00 (in tools) per
newsletter page for material selected for use in
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photos. Submit material to Wood News Editor,
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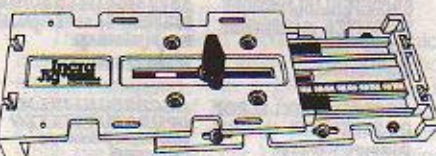
Inkra Jig

The Universal Precision Positioning Jig

©1988 by Hugh Foster

THE INCRA JIG is an incremental positioning device for use with your table saw, drill press, router table, radial arm saw, or other stationary power tool. It can be configured to function as a universal dovetail jig, box joint jig, or as a variable stop block for your table saw, radial arm saw or drill press.

The heart of the Incra jig's design lies in its precision-molded, interlocking sawtooth positioning racks with a tooth-to-tooth spacing of exactly 1/32". Two pairs of racks mesh perfectly at every location along their length, allowing you to position your work precisely where you want it at any multiple of 1/32" over the full 8 inch range.

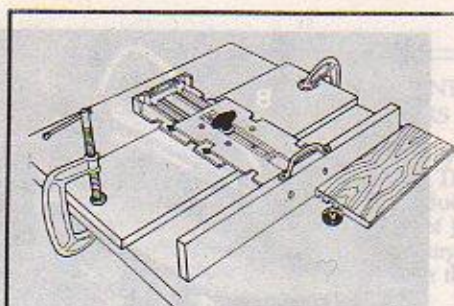


The inventor says that once you've started using your Incra Jig fence, you will soon notice that you are able to complete entire projects without ever having to use a ruler or any other measuring device; instead, he says, you'll just set Incra Jig with absolute confidence that your finished dimensions will come out exactly right. My dial indicator suggests the claims of worst case error being within 0.001 are probably pretty accurate. I'm not sure we need repeatability within 1/1000 of an inch or better in the woodshop – after all, wood moves! – but this jig coupled with a bit of patience will enable the knowledgeable woodworker to make things that were heretofore believed impossible. More importantly, the Incra Jig will put precision woodworking within the means of even a woodworker as average as I.

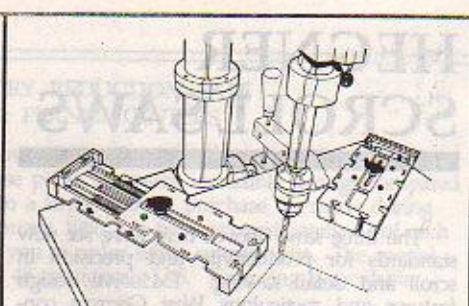
Part of the Incra Jig's charm is its excellent manual. A model for all manual writers to follow, the new revised version of the manual contains much how-to information such as a detailed write-up on making dovetails, a section on making finger joints, and discussions of other specific applications.

While most of the tips are Incra Jig-specific, some of the advice is absolutely inspirational. The author advises patience with the suggestion that the extra few minutes patient work takes usually results in an extra few decades of useful life from the project. What more could you want?

Hugh Foster is a woodworker, English teacher, and writer from Manitowish, Wisconsin.



Router Table Fence



Drill Press x-y Positioner

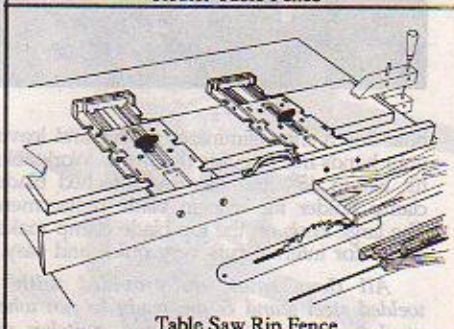
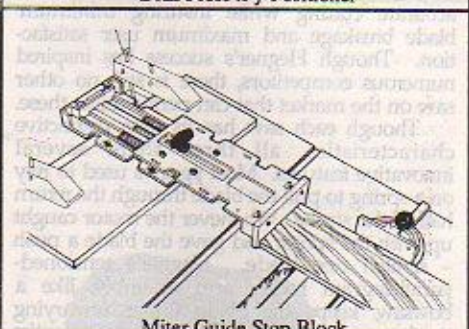


Table Saw Rip Fence



Miter Guide Stop Block

Since many of you won't read the instructions despite my proclaiming their excellence, I will repeat the assembly instructions which are the cornerstone of the tool's successful operation. Install racks loosely; put body halves together fully closed, wiggle to ensure that the racks are meshed perfectly and the unit is fully closed, secure the two halves tightly together, and finally secure each of the eight screws that lock the racks in place, but don't overtighten them. Carefully following the manufacturer's assembly directions will assure accurate operation. A couple of other pointers are important as well: Keep the racks as clean as possible; before changing positions, blow away any dust that might be present. The noise of dragging the racks will probably drive you nuts before the dragging causes physical harm to the racks, but lifting the top won't really take that much extra effort.

The Incra Jig is available from Highland Hardware for \$34.95 plus \$4.00 shipping. MC/Visa/Servistar card users order toll free (800) 241-6748.

One of the inventor's favorite demonstrations of the jig's accuracy is to pluck a single hair from his scalp and use it as a shim to prove that you really can fine tune INCRA Jig by "just a hair." To adjust the size of a cut by just a hair, loosen the racks, insert a hair inside the jig, retighten, and your measurements will now be "off" by just the thickness of the hair – or whatever else you might use as a shim. The pages of the owner's manual are 4/1000", so they might be useful for shimming. Returning to the original "zero" position is as easy as loosening and retightening the racks without the shim – and this whole series of adjustments takes less than a minute, in any event.

A piece of masking tape in the slot for the auxiliary scale is ideal for recording a series of Incra Jig Markers – so the set up can be repeated by pencil marks rather than by numbers. It's easy to replace tape when you want to begin a different series of cuts, or the cuts can be marked in different colors. Of course, it's a good idea to mark the whole series of cuts on the tape before you begin to cut.

The manual contains even more: detailed plans for creating a variable stop block for your table saw or drill press, an adjustable drill press fence, and an x-y positioner for your drill press. It is imperative to build jigs at full extension (i.e., per manual's instructions) – this is the only easy way I can think of to have the jig's measuring start at zero all the time – and starting at zero is the only way to maintain accuracy.

When using the two-Incra-Jig fence on the router table (not pictured here), the router bit should be centered on a line between the jigs, and the Incra jigs should be set 1/32" different from one another. Thus the center of the fence will be offset by 1/64" from either end. So, if the left Incra jig is set to 1" and the right to 1-1/32", the center will be exactly 1-1/64" from the bit. By stairstepping between the two Incra jigs in this manner, you can set the fence to any multiple of 1/64" from the bit.

Compared to the Incra Jig fence, my old router table fence was, at best, primitive. I'll not be returning to it. Nor, after you try it, are you likely to go back to yours either. The jig has made working on the router table so much more pleasant, that the little bit of trial-and-error work it takes to set the depth-of-cut now seems virtually painless.

So, finally, my recommendation about Incra Jig: Treat yourself to some easy precision and buy one. Or better yet, buy two and take advantage of the tandem jiggling possibilities.

HEGNER SCROLL SAWS

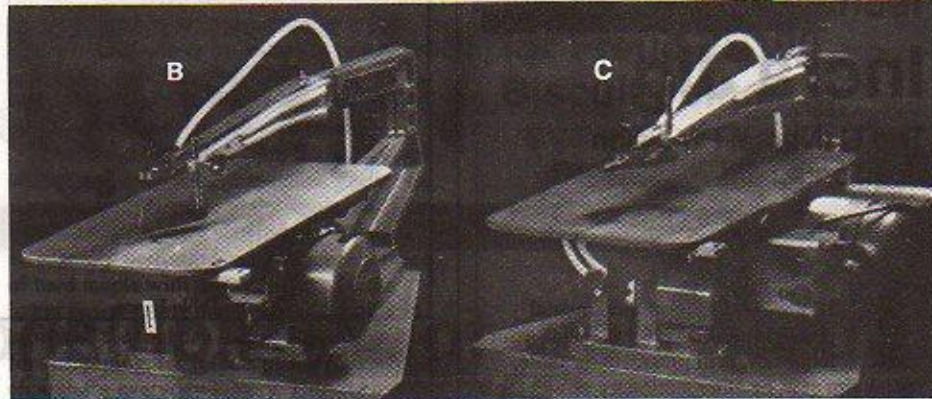
The three saws shown here have set new standards for productivity and precision in scroll and detail sawing. Exclusive design features and meticulous West German construction provide fast, smooth, and extremely accurate cutting while insuring minimum blade breakage and maximum user satisfaction. Though Hegner's success has inspired numerous competitors, there is still no other saw on the market that can perform like these.

Though each saw has its own distinctive characteristics, all three share several innovative features. Most jigsaws used to rely on a spring to pull the blade through the return half of the stroke. Whenever the motor caught up with the spring and gave the blade a push - scratch one blade. Hegner's tensioned-parallelogram rocker arm assembly, like a bowsaw, keeps the blade under unvarying tension and always pulls it through the entire stroke. Constant tension also means a smoother, more uniform cut.

The pivoting blade clamp pioneered by Hegner is another prime contribution to the saws' excellence. When pressure is applied to the tiny blades used in jigsaws, they inevitably bend with that force. In older jigsaws the blade is clamped rigidly to the frame and must flex repeatedly just where it enters the clamp, like a wire being broken the slow way. By contrast, the blade clamps on Hegner saws are free-floating, hardened steel prisms seated in grooves at the ends of the rocker arms. They can rock right along with the blade, distributing the bending load evenly along the entire length of the blade without creating hot spots that lead to early failure.

With the two major causes of blade breakage eliminated, these saws are free to cut faster, use smaller blades, and run them under higher tension than conventional saws. Smaller blades waste less wood, so they cut more efficiently, are capable of tighter turns, and leave a surface so smooth it usually needs no finishing. Very high blade tension also has remarkable results: even when the work is deliberately pushed sideways during a cut, the kerf obstinately remains vertical and clean - in fact, it's hard to force a cut out of true.

Other shared features include a built-in sawdust blower that pumps out a gentle breeze over the work in the immediate area of the blade, keeping your lines clear without blowing dust in your face. A fully adjustable



hold-down shoe eliminates chatter and leaves your hands free to guide the work. Worktables tilt left to 45°, and have an attached blade-clamp holder for ease in blade replacement. The large knob on the top blade clamp makes set-up for internal cuts very quick and easy.

All three saws are provided with a welded steel stand & are ready to run when purchased. Hegner motors and switches are warranted for one year.

The Multimax-2 is the smallest of the three saws, with a 14-1/2" throat and 2" depth of cut (though it now features a 9" x 17" table, 60% larger than before). Its 1.9 amp, 1660 rpm motor provides more than enough power for fast cutting in any material. An optional electronic speed control (150 to 1200 rpm) facilitates very delicate work or sawing in hard metals. The MX-2 weighs 28 lbs.; its steel stand (with bolt-down tabs) weighs 22 lbs. The saw is covered by a two-year parts and labor warranty.

The extraordinary Multimax-3 is a great all-around buy, featuring an exceptional 25" throat depth and 2-3/8" max depth of cut with a stroke rate of 1660 rpm. Two stroke lengths (11/16" or 3/8") economically provide high and low blade speeds to accommodate different materials. Table is cast aluminum. Frame and base are cast iron. Saw alone weighs 66 lbs.; stand is 26 lbs. The MX-3 is covered by a two-year warranty. Shipped freight collect.

The Polymax-3 is Hegner's industrial-duty jigsaw, designed for maximum durability and versatility in a full-time production environment. 2" depth of cut and 19" throat are capacious enough for practically any scrolling needs, while the 3.8 amp motor provides unstoppable power at any of four built-in speeds (1600, 1270, 1100, or 700 strokes per minute) over two stroke lengths (11/16" or 15/16"). Cast iron table and main frame, replaceable blade clamp mounts, and magnetic safety switch are exclusive Polymax features. The PX-3 weighs 85 lbs.; stand is 26 lbs. Saw includes a five-year warranty. The Polymax-3 is shipped by truck freight collect.

HEGNER SCROLL SAWS

A 05.29.01	Multimax-2	Regular	\$995.00
		Sale	\$699.00 plus
		Quantity limited at Sale Price	\$20 shipping
B 05.29.34	Multimax-3		1595.00
C 05.29.02	Polymax-3		1995.00
05.29.03	Magnifying Lamp		127.50
05.29.04	Incand./Fluor. Lamp		119.00
05.29.33	Optional Speed Control		329.00

AMI LETTERING GUIDES

We offer lettering guides for laying out names and signs which can be cut out using your scroll saw. Sets are available for each of the styles illustrated below in 2" heights, except for Cooper Black (bottom right), which is available only in uppercase 1-1/2" letters. Guides are tough .030" polycarbonate.

05.29.61 Uppercase Cooper Black 19.95
05.29.62 Any Other Style, 2" High 49.95
(Specify name of style)



Pebeco Blades, for cutting wood and soft metal, Pack of 12

	Size	Width	Teeth/Inch	
05.29.07	2/0	.015"	30	4.00
05.29.08	1	.026"	25	4.00
05.29.10	3	.032"	20	4.00
05.29.12	5	.039"	16-1/2	4.00
05.29.14	7	.045"	14	4.00
05.29.16	9	.053"	14	4.00
05.29.19	11	.063"	12-1/2	4.00

AMI Premium Double Tooth Blades, for thicker wood & soft metal, Pack of 12

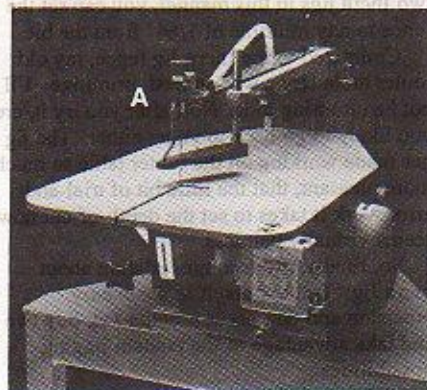
	Size	Width	Teeth/Inch	
05.29.45	5	.038"	16	4.00
05.29.47	7	.045"	13	4.00
05.29.49	9	.053"	11	4.00
05.29.51	11	.057"	10	4.00

Gottfried Blades, for very thick wood, Each

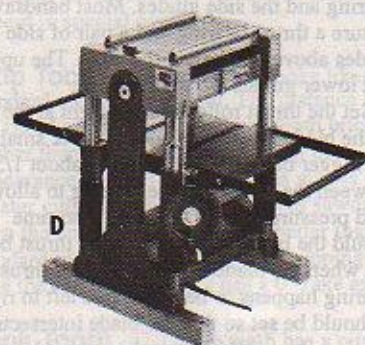
	Size	Teeth/Inch	
05.29.20	2.0mm	10	1.00
05.29.21	2.5mm	9	1.00

Hegner Blade Clamps (with TuffScrew), Pair

05.29.05	Pebeco (.07mm)	12.75
05.29.06	Gottfried (1.0mm)	13.75
05.29.71	Spare TuffScrew, Each	.90
05.29.72	TuffWrench, Each	8.95



MAKITA STATIONARY TOOLS



D MAKITA 2040 THICKNESS PLANER

The 15-5/8" width capacity of this thickness planer makes it a great buy for any shop already equipped with a good jointer. The factory feed rate of 22 feet per minute under load lets you dress a lot of wood in a hurry, while the speed reducer kit available optionally can give you the same incredibly smooth finish as described on the 2030N. Makita's fine 2 hp, 115 volt motor drives the cutterhead at 6500 rpm, delivering plenty of power to remove 1/16" per pass on even wide stock. Max depth of cut on narrower stock is 1/8". As on the 2030N, the 2040's cast-iron bed is equipped with rollers for rough stock, which are easily lowered for finish passes on dressed material. The hard rubber feed rollers cannot mar the surface of even the softest lumber, and are tough enough to last for years of rough work.

The 2040's large width capacity and exceptional 7-3/4" maximum thickness make this an ideal machine for dressing glued-up panels, valuable wide stock, and even heavy timbers. Four-post construction and 254 lb. net weight add sturdiness for lasting durability.

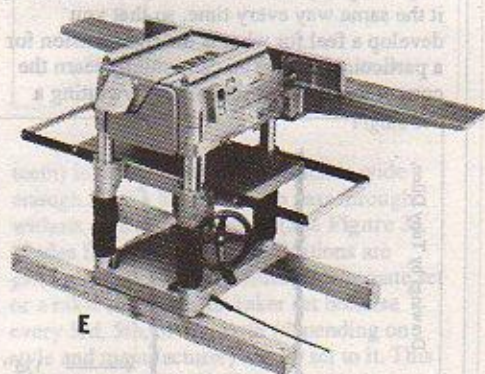
08.10.14 2040 Planer **\$1299.00**
Sale quantities are limited \$1099.00 plus \$40.00 freight

08.10.15 15" HSS Knives, Pair 96.00
08.10.16 15" Carb. Knives, Pair 370.00
08.10.22 Repl. 2040 Brushes 6.00
08.10.25 Repl. 2040 Switch 19.00
08.10.27 Stand for 2040 98.00

FEED RATE Speed Reduction Kit

An improvement in the quality and smoothness of cut of the Makita 2040 planer (and of the now-discontinued 2030 planer-jointer) can be achieved by using Makita's optional feed rate speed reduction kit. It consists of 3 trunnions which replace the ones which are standard equipment on the two machines. Installation is quite simple and requires a screwdriver and external retaining ring pins. Instructions are included.

Feed rate is reduced approximately 45%.
08.10.32 Speed Reduction Kit 44.00



E MAKITA 2030N PLANER-JOINTER

The 2030N is a revised edition of the model 2030 which was popular for many years. It features a redesigned head that blows waste chips out the side of the machine, two feed rates available at the flip of a lever, 4-post planer table support with outrigger support rollers, an expanded jointer fence, and 12-1/2" width capacity in the planer. Because the motor is built in above the cutterhead, its operation is quieter than that of the 2030.

The 2030N is powered by the same efficient and reliable 13-amp motor that has proved itself over many years' use in the 2030. It will handle a 1/16" depth of cut on 12" hardwood, and drives the cutterhead at 7000 rpm for very clean planing. The 2030N offers 40" of support under your stock, which helps to minimize snipe and reduces load on the feed rollers. Nominal feed rate is your choice of 26 or 17 fpm, offering 45 or 69 cuts per inch. (Feed rate under load will be lower, of course, but cuts per inch remain the same.) A built-in electric brake stops the cutterhead in seconds. No-volt safety switch makes accidental starts virtually impossible.

The jointer features solid cast-iron beds which total 59-1/2" in length for impressive ease in handling long and heavy stock. Outfeed bed is permanently fixed for reliable accuracy; infeed bed adjusts smoothly to a maximum 3/16" depth of cut. The two 6-1/8" knives are easily re-installed using a straight-edge registered on the outfeed table. The jointer fence measures 28-3/4" long by 4" high, and conveniently adjusts over 4" of the bed width.

08.10.41 2030N Planer-Jointer **\$1599.00**
Sale quantities are limited \$1299.00 plus \$40.00 freight

08.10.42 HSS 12-1/2" Knives, Pair 74.00
08.10.10 HSS 6" Knives, Pair 23.00
08.10.43 Carbide-Tipped 12-1/2" Knives, Pair 299.00
08.10.12 Carbide-Tipped 6" Knives, Pair 130.00
08.10.34 Repl. 2030N Brushes 6.00
08.10.35 Repl. 2030N Switch 99.00

MAKITA INVENTORY REDUCTION SALE ON PLANERS & PLANER-JOINTERS

We call your attention to the unusually low prices offered here on the 2030N Planer-Jointer and the 2040 Thickness Planer. These prices represent incredible savings compared to true market value, and are possible due to a large quantity purchase we made during Makita's inventory reduction sale. As of January, 1988, we have approximately 40 of each model to sell at the special prices. We urge you to order while supplies last. The special freight terms apply to shipments within the 48 contiguous U.S. Financing is available, subject to credit approval.



F MAKITA 410 DUST COLLECTOR

We are very pleased to offer a high-quality Makita machine which will economically meet the needs of countless small shops where power tools (particularly thickness planers) are in use.

The model 410 dust collector is a compact, portable, and relatively quiet unit capable of handling the requirements of machines as large as a 16" planer. Its 9 amp, 10,000 rpm motor drives a high-efficiency centrifugal fan for a peak air flow of over 300 cfm through a 3" hose, providing high velocity (6253 fpm) and a very large static pressure (20") for minimal clogging under heavy load. The collector comes with large, 8 cu.ft. dust bag with built-in window for monitoring load. It can also be ducted into other collection containers as desired. The unit weighs only 20 lbs., and can easily be moved from one machine to another.

Eight feet of heavy-duty flexible 3" hose is provided. Ready-made dust hoods for current models of Makita planers are available. Dust hoods for other makes of planers and stationary tools in general can easily be fashioned using sheet metal or plywood.

08.10.40 Makita Dust Collector 279.95
08.10.41 Extra 8' Length of Hose 69.00
08.10.42 16' Length of Hose 99.00
08.10.44 Planer Dusthood/2030N 53.00
08.10.45 Jointer Dusthood/2030N 49.00
08.10.46 Planer Dusthood/2040 99.00
08.10.47 Planer Dusthood/2040 125.00

The Bandsaw Balancing Act

Which Blade to Use, and How to Use It

By Brad Packard

FOR THE PAST YEAR, a renewed interest in the bandsaw as a woodworking machine has been evident throughout the woodworking community. A catalyst for this seems to be Jim Cummins' article "Home Shop Bandsaw" in *Fine Woodworking* #63 (March, 1987). From the hundreds of bandsaw owners I've talked with since the article appeared, it seems the article may have created more confusion than it did solutions concerning bandsaw blade choice and operation. In this article I will try to clear up some of this confusion by offering an approach based on practical results as well as theory.

My strategy for achieving good results on a bandsaw includes the following:

1. Understand how the blade functions as part of the overall machine, and how to align it.
2. Use proper blade set-up procedures (tension and tracking).
3. Understand what results are produced by different blades.
4. Use proper technique when sawing.

Bandsaw Alignment

The blade of a bandsaw ties the upper and lower wheels together, becoming part of the overall machine. Inaccuracies in the shape, balance, and alignment of the wheels are transmitted to the blade and have a major effect on its cutting action. Thus the wheels and tires need to be round and balanced, and both wheels need to be aligned in the same plane. (See Mark Duginske's article "Bandsaw Alignment" in *Wood News* #20).

Proper Blade Setup

Proper blade setup can make the difference between good and bad results. By taking the time to tension and track the blade correctly and set the blade guides properly, you eliminate variables that can produce bad results. Here are some specific techniques.

Tension

Tension can make or break your blade's performance. The article in *Fine Woodworking* created a good deal of confusion on this point. Most people don't have a gauge to measure PSI (pounds per square inch). Few of us can correctly identify a blade's musical

pitch either. (However, if one of these methods works for you, by all means use it.)

To find the correct tension, ignore the tension scale on your saw, and (with the saw unplugged) increase the tension on the blade until pushing on the side of the blade with your finger using a moderate amount of force deflects the blade about 1/4" from its normal position (see Figure 1). Do this along an unrestrained stretch of blade. (Back the guides out of the way first if only the front stretch of blade is accessible on your saw). The exact way that you push is not as important as doing it the same way every time, so that you develop a feel for what is the right tension for a particular blade. You can initially learn the correct tension experimentally by cutting a

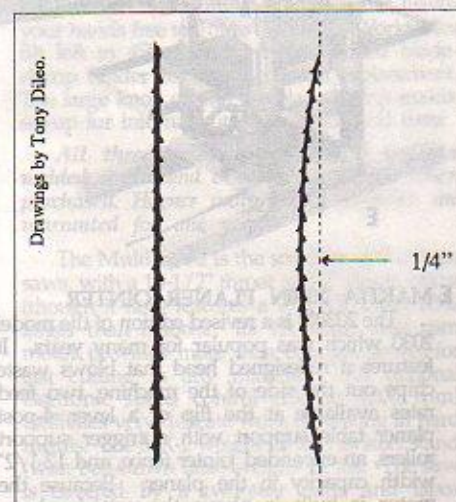


Figure 1.

piece of scrap wood using different blade tensions. A blade that is undertensioned will be extremely sensitive to changes in feed pressure (more on this under Operator Technique) and will have a tendency to bow in thicker wood. (A bow can also be caused by other reasons). Too much tension for one person may not be for another depending on the machine being used and personal work habits. When too much tension is put on the blade, premature blade breakage and poor tracking can occur, but most important, you can *damage* your machine by trying to make it reach a blade tension greater than the machine was designed to operate at. Good results come easier when using blades that serve your specific needs, rather than forcing one blade to do all jobs. (See Blades Available).

Tracking

After tensioning, track the blade to a correct position on your wheel. On a crowned wheel machine (such as Delta, Jet, or Sears), this should be in the middle of the wheel no matter what the blade size. On a flat wheeled machine (such as Inca), smaller blades (3/8" and smaller) are tracked in the middle of the wheel, while blades 1/2" and larger should be tracked with the teeth just hanging off the edge of the wheel. Check the tension again to make sure it hasn't changed (new blades can stretch and the tracking process can also change tension). Always remember that

tracking while rotating the wheel by hand will take care of major tracking adjustment, but finer tracking adjustment may need to be made with the saw running (with the cover on, of course). So when you first turn on the saw, bump the switch on and off, and bring the machine up to speed slowly, allowing you to make small tracking adjustments if necessary.

Blade Guides

Before starting the machine it is necessary to adjust your blade guides properly. The blade guides are of two types, the thrust bearing and the side guides. Most bandsaws feature a thrust bearing and a pair of side guides above and below the table. The upper and lower guides are set the same.

Set the thrust roller bearing right at the back of the blade on small blades (1/4" & smaller). On bigger blades, leave a gap of about 1/32" between the blade and the bearing to allow feed pressure to be absorbed. At no time should the blade bear hard on the thrust bearing when the blade is idling. If your thrust bearing happens to be adjustable left to right, it should be set so that the blade intersects the bearing about 3/16" from the outer edge of the bearing.

The side guides (which can be either roller bearings or mild steel blocks) are meant to prevent blade twisting and should be set as close as possible without touching or binding on the blade when it is idling. The blade will of course touch these guides when wood is being cut. Be sure to position the side guides *behind* the teeth, so that the teeth themselves do not pass directly between the guides during a cut.

An interesting experiment is to set the side guides too far from the blade and notice how increased feed pressure and turning make the blade wander.

A good trick for setting the side guides (if they are both horizontal) is to pinch them against the blade and rotate the wheel about one quarter turn. As the blade moves through the guides, it will move them apart slightly.

Blades Available

It should be noted that all bandsaw blade stock is not created equal. In the United States, most woodcutting bandsaw blade stock ranges in thickness from about .018 to .035 inches. Most of the blades we sell at Highland Hardware are .025-inch-thick Lenox Flex Back brand blades. This thickness (.025") works best on bandsaws with wheels between 11" and 16" in diameter. Thicker blades can have a tendency to fatigue too quickly on smaller wheels. Bandsaws with very small wheels, 7" or 8", should use blades about .020" thick, or thinner if possible. Bandsaws with wheels 18" and larger can use blades between .025 and .035" thick.

Most readily available blades for cutting wood are carbon steel blades. Jim Cummins' article seemed to ignore these blades, and instead favored bimetal blades, which until recently have not been readily available for the wood craftsman. The bimetal blade was

designed to cut metal. While it can be used to cut wood also, the bimetal design has some limitations not mentioned in the *Fine Woodworking* article. (See Box at end).

The regular carbon steel blades come in a variety of widths and tooth styles. In woodworking, three tooth styles account for most use: standard, skip, and hook. (See Figure 2).

Standard Tooth. The standard tooth (sometimes called raker tooth) produces the smoothest cut. It works best for crosscutting. Because it has a tendency to follow the grain, it should not be used for ripping or resawing, except in special cases.

Skip Tooth. The skip tooth looks like the standard tooth after a fight. The distance from the tip of one tooth to the next (tooth pitch) is farther than on the standard, giving the appearance of teeth missing. This allows for greater gullet space which removes sawdust from the cut. This tooth style is better than the standard in thicker woods and for ripping. Like the standard tooth, it has a 0° rake angle.

Hook Tooth. The hook tooth has a pitch similar to the skip tooth, but cuts more aggressively because it has a 10° positive rake angle. When ripping and resawing, this blade has the least tendency to follow the grain. While it sacrifices some smoothness of cut, the hook tooth is my favorite all-around blade.

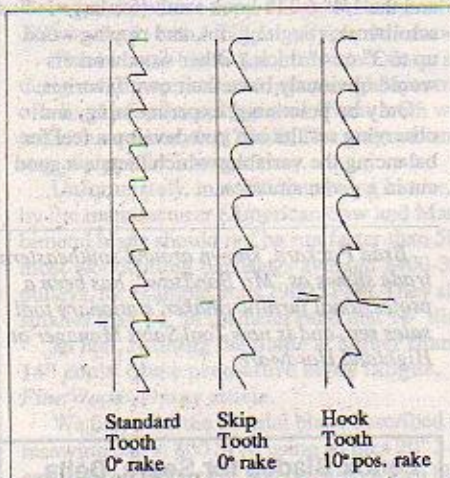


Figure 2.

Blade Pitch and Set

As important as tooth style is how many teeth per inch (TPI) a blade has. The standard or raker tooth is available with between 6 and 24 TPI (depending on blade width) while the skip and hook have between 3 and 6 TPI. As a general rule, the thicker the wood, the less TPI you should use. For example: 4" to 12" thick wood should be cut with a 3 TPI hook tooth for best results (although some people prefer a skip tooth). 1"-thick stock can be cut with a 3 TPI hook tooth as well, but less tearout and a smoother cut is obtained with a 6 TPI hook tooth or 6 to 14 TPI standard tooth.

Teeth are set to one side or the other (left or right if you look straight at the front of the

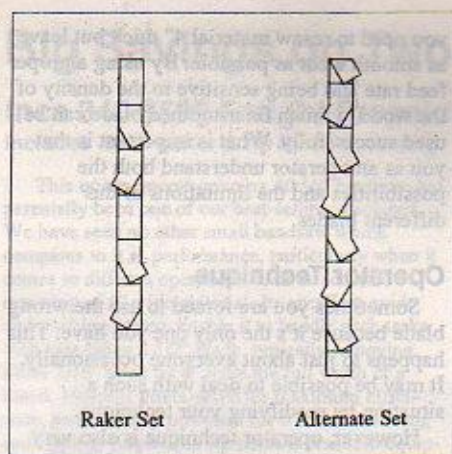


Figure 3.

teeth) in order to cut a kerf which is wide enough for the blade body to pass through without constantly binding. (See Figure 3). Blades for woodcutting applications are generally supplied with either an alternate set or a raker set. I like the raker set because every 3rd, 5th, or 7th tooth (depending on style and manufacturer) has no set to it. This raker tooth acts like a shovel to remove sawdust from the cut. Other sets are also available and can be experimented with for specific applications.

Choosing the Right Blade

There is not one miracle blade that will fulfill your every need on a consistent basis without serious trade-offs, though it is simple to choose the right blade with a little thought. Let's consider three important factors.

1. How tight of a curve is being cut, or is an accurate, straight cut important (e.g. ripping or resawing)?

A lot of woodworking instruction books have charts showing the tightest radius that can be cut with a given size blade. I have found that these differ from book to book and are rarely a reliable indicator of how tight a curve a blade will actually cut. This is because blades with a greater set to the teeth make a wider kerf for the blade to turn in. The best thing to do is to first get an idea of the limits of each blade before getting stuck in the middle of a crucial cut. This can be done by taking a test cut in a piece of scrap stock. First, cut a straight line for about an inch and then start to turn the piece of wood as you feed forward. Increase the tightness of the curve until the back of the blade starts to rub against the opposite side of the kerf. (See Figure 4). At this point, if the curve is tightened further, the blade will start to bind and heat up. On some saws, the motor will start to labor. When this happens, the blade is being forced to cut too tight of a curve. Forcing a blade will not only give an inferior cut, but can also cause premature blade breakage.

You'll find that a wider blade (1/2") will cut a 3" to 4" diameter circle, whereas a 1/8"

blade can cut about a 1/4" diameter circle. The best thing is to experiment so you develop a feel for the approximate curve each size blade will cut. Of course, the use of different techniques such as using relief cuts, or cutting curves in successive passes can overcome the restrictions of a given blade width. The blade-size range for most non-industrial bandsaws is about 1/8" to 3/4". Blades between 1/8" and 1/2" work best, and you should sample them to find out for yourself what their limits are.

When a straight line is being cut, a wider blade usually works best. My choice for a general ripping and resawing blade is a 1/2" x 3 TPI hook tooth blade. This blade is wide enough to give a straight cut even in thick wood. On wood up to 3", 4", or thicker, even a 1/4" blade (with 6 TPI hook or skip) can give a very straight cut if the feed rate is slow and steady. If a lot of straight cutting is required, however, it is better to change to the wider blade for achieving more consistent results.

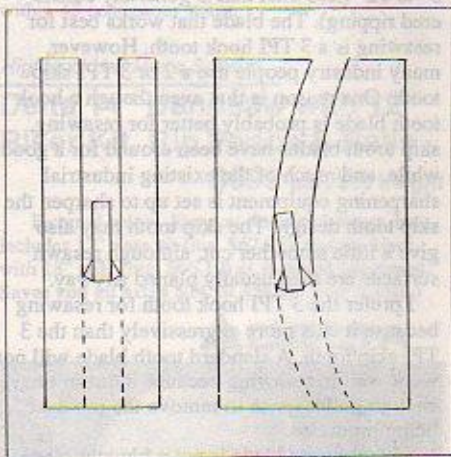


Figure 4.

2. How thick and dense is the wood being cut?

The thickness and density of the wood being cut have a big effect on a blade's performance. As the size of the wood gets thicker, the blade has to remove more sawdust from the cut before it can cut farther. The thickness of material and the type of cut dictate which tooth style and number of TPI are used. Generally, the thicker the wood, the fewer the TPI. A hook tooth or skip tooth pattern should be chosen. Let's look at several situations.

A blade cuts easier when it cuts across the grain. A good experiment is to first cut across the grain, then rotate the workpiece so you are cutting with the grain (ripping). Notice the difference in the feed of the cut. If most of your cutting is cross-grain, you can get away with more TPI (up to say 14 TPI) even in thick wood.

Most of the time when cutting curves (which combines ripping and crosscutting) in stock 3" to 4" thick, it is best to switch to a 6

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The Bandsaw Balancing Act

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TPI hook. On thicker stock, or very dense stock, use a 3 TPI hook, which cuts more efficiently.

Thin woods 1/2" to 1" thick are best cut with blades of more TPI featuring a standard tooth style. I prefer these because they don't feed as fast as the hook or skip. However, if I'm in a hurry and don't need a smooth cut, I'll use a 6 TPI hook on 3/4"-thick wood. Choose the blade that feels most comfortable and gives the results you need.

The area that gives people the most trouble is resawing. This is when you stand the board on its edge and cut through its width—usually 3" to 12" (less than that is generally considered ripping). The blade that works best for resawing is a 3 TPI hook tooth. However, many industry people use a 2 or 3 TPI skip tooth. One reason is that even though a hook tooth blade is probably better for resawing, skip tooth blades have been around for a good while, and much of the existing industrial sharpening equipment is set up to sharpen the skip tooth design. The skip tooth may also give a little smoother cut, although resawn surfaces are then usually planed anyway.

I prefer the 3 TPI hook tooth for resawing because it cuts more aggressively than the 3 TPI skip tooth. A standard tooth blade will not work well in resawing because it doesn't have enough gullet space to remove the sawdust being produced.

My resawing blade is not a bimetal blade but rather a Lenox .025" x 1/2" 3 TPI hook tooth. This is a great all around ripping and resawing blade. The 1/2" width gives better resistance to feed pressure than a 1/4" and can also be tensioned enough to do a good job. A 3/4" would be okay also, but is mostly available in .032" and .035" stock, which doesn't work as well on smaller bandsaws.

When choosing a blade for use in dense wood (e.g., hard maple or oak) that is not very thick, treat it as though it were thicker than it really is, and thus use fewer TPI. Conversely, wood that is not very dense (e.g., redwood or balsa) is less sensitive to the number of TPI being used, and you can get away with using a blade with more TPI.

3. What kind of results are needed in the cut?

Many of the cuts made on a bandsaw are meant to remove excess stock so the piece can be completed using another process. Examples include cutting 1/8" outside the line before using a pattern jig on a shaper, or roughing out carving blocks or chair arms. In such cases, a coarser blade speeds up the work while still leaving a smooth enough cut to suit your needs.

However, there are times when a more finished cut is needed. Suppose for example

you need to resaw material 4" thick but leave as smooth a cut as possible. By using a proper feed rate and being sensitive to the density of the wood, a much finer-toothed blade can be used successfully. What is important is that you as an operator understand both the possibilities and the limitations of the different blades.

Operator Technique

Sometimes you are forced to use the wrong blade because it's the only one you have. This happens to just about everyone occasionally. It may be possible to deal with such a situation by modifying your technique.

However, operator technique is also very important when using the correct blade. Good technique includes executing smooth turns (employing proper relief cuts when necessary), and more importantly, using the proper feed rate. Avoid feeding material into the blade faster than the blade can cut it. When cutting curves, remember to maintain forward movement of the workpiece while turning.

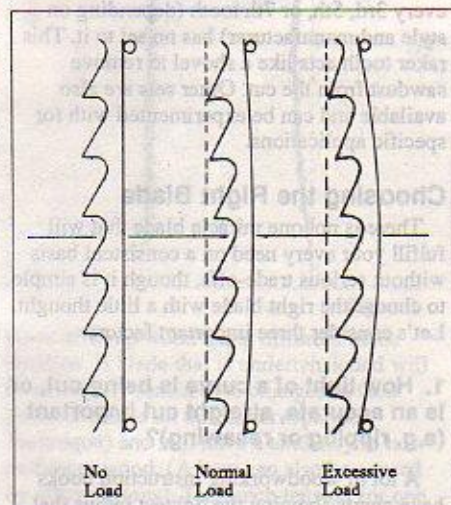


Figure 5.

What happens to a bandsaw blade as it cuts is quite different from what happens to a table saw blade, which is far more rigid. The bandsaw blade flexes in an arc away from the operator when it cuts. The top and bottom of the arc are defined by the upper and lower thrust bearings. (See Figure 5). This arc serves the purpose of absorbing the stress created by the act of sawing, distributing the stress over a greater distance. However, when a blade receives too much feed pressure, the arc becomes more acute, in effect stretching the back of the blade while buckling the front of the blade, resulting in a bowed cut.

In cases where a lot of feed pressure is exerted on the blade (e.g., resawing), set the upper and lower thrust bearings about 1/32" behind the blade, allowing it to arc backwards before contacting the thrust bearings. This produces two arcs: one defined by the upper and lower wheel, and one defined by the upper and lower thrust bearings. The stress of cutting is distributed along a larger arc, permitting greater feed pressure.

One key to getting good results on a bandsaw is to develop a feel for the amount of feed pressure being exerted on the blade. This can only be accomplished by practicing while observing the results of your work. When changing feed rate, concentrate on doing it smoothly. Rapid changes in the feed rate (either faster or slower) can cause the blade to jog to one side or the other.

Summary

So why is this article called "The Bandsaw Balancing Act"? Simply this: In order to have success with your bandsaw, you must correctly balance machine alignment, blade choice, blade setup, and operator technique. For example, after you begin a cut, the blade heats up and stretches out, losing some of its tension. An alert operator will notice this, and either slow his feed rate to compensate, or turn off the machine and increase the tension. Either solution works, but if neither is done, the workpiece can be ruined. Likewise, if the guides have not been properly set and the operator doesn't take the time to adjust them, poor results will follow, even though the proper blade may have been selected.

If stranded on a desert island with only three blades for my bandsaw, I'd choose the 1/2" 3 TPI hook tooth (for resawing and thicker ripping), the 1/8" 14 TPI standard tooth (for tight scrollwork and fine joinery) and the 1/4" 6 TPI hook tooth (for large radius scrollwork, roughing out, and ripping wood up to 3" or 4" thick.) Other woodworkers would obviously have their own favorites.

Only by practicing, experimenting, and observing results can you develop a feel for balancing the variables which dictate a good cut in a given situation.

Brad Packard, known around southeastern trade shows as "Mr. Bandsaw", has been a professional furniture maker, stationary tool sales rep, and is now Tool Sales Manager at Highland Hardware.

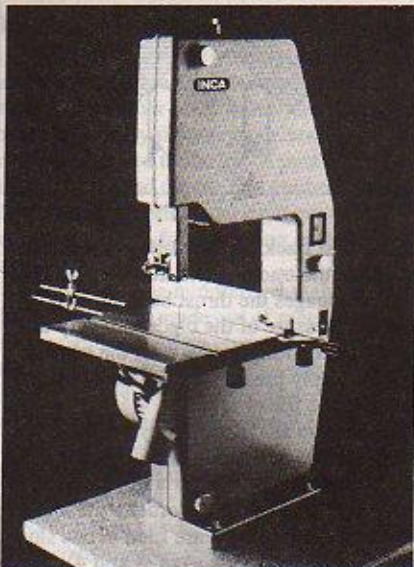
Lenox Blades for Sears, Delta, Shopsmith, & Inca Bandsaws

Using high quality blades is the first step toward improved bandsaw performance. We are pleased to offer what we consider the finest blades on the market for four of the most popular small bandsaws (Sears 12", Delta 14" [and Taiwanese copies], Shopsmith 11", & Inca 10-1/2").

Blades are available in sizes that match Mr. Bandsaw's "desert island selection" mentioned above:

- 1/8" 14 TPI standard
- 1/4" 6 TPI hook
- 1/2" 3 TPI hook

All blades are \$9.95 each plus shipping (except blades to accommodate the Delta saw with riser block kit are \$10.95 each). Deduct 10% discount if ordering 3 or more assorted blades at one time. Specify brand and size. Add shipping charges indicated on page 31.



Big Savings on Two Popular Bandsaws

Inca 340 \$599 Freight Prepaid
includes .6 HP motor & rip fence assembly

This quiet, smooth-running 10 1/2" bandsaw has perennially been one of our best-selling machines. We have seen no other small bandsaw which compares to it in performance, particularly when it comes to difficult operations such as accurate resawing of 6" wide material. Its excellent guide and tracking system enable it to handle such tasks with ease using a 1/2" blade, typically removing slices 1/16" thick by 6" wide the full width of a board. Motor is direct-drive for maximum efficiency, and is amply powerful for 6"-thick resawing and ripping. Adjustable rip fence is standard equipment. Stand is optional. Optional blade guide kit allows use of 1/16" and 1/8" blades for intricate scrollwork. 5-year Inca warranty. Special offer available only while limited sale supply lasts.

We will pay freight charges for this offer of the Inca 340 on orders within the 48 contiguous states.

Delta 14" \$599 plus \$50 freight
includes 3/4 HP motor & enclosed stand

Delta has significantly improved the performance of its 14" bandsaw by recently offering it with a 3/4 HP motor which features an integral resilient mounting arrangement. As a result, motor vibration, which was always something to complain about with earlier versions, is thoroughly dampened where it originates, and is not transmitted to the saw by way of the stand. The result is a much quieter, smoother running Delta machine than ever before. A conventional belt and pulley arrangement links the motor shaft to the lower wheel shaft.

Included is an enclosed stand, which is much more compact than the open stand version offered on Delta's previous bandsaw promotion.

Maximum depth of cut is 6". Optional riser kit (offered below) increases depth of cut to 12" for large resawing capacity. Rip fence and miter guide are also available optionally. Freight offer applies within 48 contiguous states.

Desperately Seeking "The little blade that could" . . .

Many people who read the article "The little blade that could" in *Fine Woodworking* #63 have contacted us seeking to buy the bimetal blade mentioned in the article, and to ask if it was as good as the author said it was. [Jim Cummins' provocative statement was "If you own a Rockwell/Delta bandsaw, or a copy, I suggest that you fit it with a hook-tooth, 1/4-in.-wide bimetal blade, .025 in. thick, with 6 TPI for all your bandsaw work." (our italics)]. Here is what we've learned.

The bimetal blade has been used since around 1970 for cutting metal (for which it was designed). Its teeth are cut into a tough layer of high speed steel that's been welded onto the edge of a band of softer spring steel. These teeth will withstand higher cutting temperatures than the teeth on a carbon steel blade. The main advantage of the bimetal blade is thus that its teeth will stay sharper for a longer time.

Unfortunately, in addition to being harder, the HSS teeth are also more brittle. We were told by the manufacturer (American Saw and Manufacturing Co., maker of Lenox blades) that the bimetal blade should not be run faster than 500-700 surface feet per minute (SFM). However, most woodcutting bandsaws average 1400-3000 SFM (the Delta 14" with factory motor and pulleys, for example, runs 2900 SFM). They also said bimetal blades should not be run on wheels smaller than 14" in diameter (and that 18" diameter or larger wheels were preferred).

In fact, running the blade at higher than recommended SFM or on wheels smaller than 14" could cause premature blade fatigue. Neither of these points was described in the *Fine Woodworking* article.

We first tried the bimetal blade described in the article (1/4" wide, .025" thick, 6 TPI hook) resawing oak at 800 SFM using an Inca 20" 3-speed bandsaw. The feedrate was extremely slow, especially compared to that possible with a blade we would normally choose for the task, a 1/2" 3 TPI carbon steel blade running at 1800 SFM. One reason for the slow feed rate is the low 800 SFM. Another is the tooth configuration. A 6 TPI hook tooth has too many TPI to resaw thick wood efficiently unless the wood is not very dense. In addition, 1/4" is not wide enough to handle the heavy feed pressure inherent in resawing.

Another Lenox .025" bimetal blade which we tried was the 1/2" 4 TPI hook, using a Delta 14" bandsaw slowed down to 1000 SFM. (Without using a jack shaft, it was impractical to slow it down any further). The fewer TPI on this blade allowed it to clear chips better than the 1/4" 6 TPI did, allowing for a more efficient cut in thick wood. However, in very dense wood (e.g., hard maple or cocobolo) the 4 TPI bimetal was too fine, and a 3 TPI carbon blade performed significantly better. (Unfortunately, we've been unable to find a .025" 3 TPI bimetal blade to compare).

If you are hot to use a bimetal blade for cutting wood, first consider the wheel diameter of your machine, and whether it is practical to slow the SFM down to the recommended range. Then weigh the bimetal blade's advantage of staying sharper longer against its extra cost (roughly 2-1/2 times that of carbon blades) and slower feed rate (read that slower production).

We suggest that before going to the trouble of equipping your saw to handle a bimetal blade, try using the appropriate carbon steel blade for your application, and see what your results are. In our experience, we have found no single blade, bimetal or otherwise, which will give superior performance for "all your bandsaw work". —B.P. & C.B.

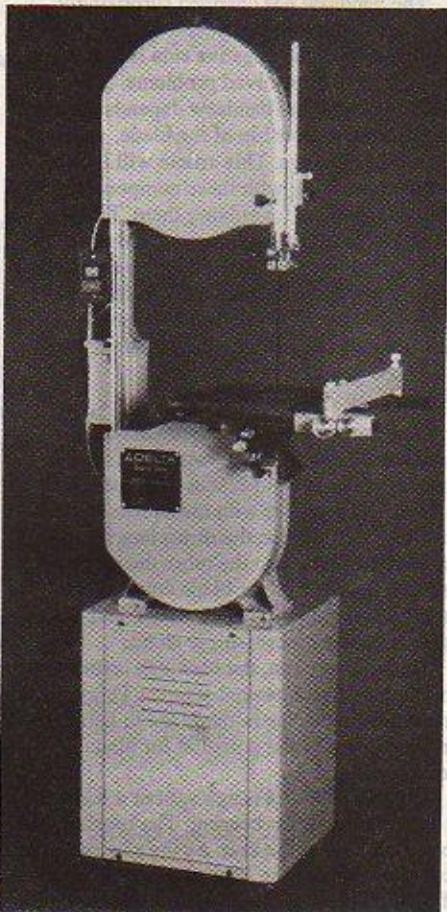
Highland Hardware Special

Delta 14" Bandsaw with 12" Riser Kit, Rip Fence & Rails

\$699 plus \$50 freight

Pictured below. Same as described above, but includes 12" riser kit (reg. \$67.95), and rip fence with 18" rails (reg. \$66.10) as standard equipment. Saves you an extra \$34.10. (See p. 8 for blades.)

DELTA



Two Tips for Fine Tuning Your Bandsaw

The bandsaw is still evolving, as evidenced by the fact that slight problems still exist with some of its major components

©1988 by Mark Duginske

THE BANDSAW was first designed in 1808. It was a great idea, but unfortunately it didn't work. The major problem was in the blade, which was constantly breaking. However, around the middle of the 19th century, steelmakers developed a technique for rolling thin spring steel, and soon after, a French woman made the next breakthrough when she patented the process for brazing bandsaw blades. These two improvements led to the first suitable bandsaw blade.

The bandsaw has changed surprisingly little in the last hundred years. That is both good and bad. The negative side is that there are still some unresolved problems. The performance of the bandsaw depends greatly on the interrelationship of the blade, guides, and thrust bearings. This article will isolate problems existing with these components and offer suggestions for solving them. These problems combine to decrease bandsaw performance and to shorten blade and bearing life. By using the techniques, you should be able to greatly improve your bandsaw's performance and also increase blade life.

Bandsaw Blades

One problem lies in the way in which bandsaw blades are manufactured. The corners of the back of blades are produced square. The problem with the square back is that it is very hard on the thrust bearing. The problem grows worse the more the blade is used, as the back of the blade contacts the thrust bearing, the flat back wears, and the corners become increasingly sharp.

Under heavy use, the back can actually form a burr like a cabinet scraper. This type of "cold forming" causes the blade to become brittle, adding to the potential for blade breakage.

If the blade has a rough spot or a bad weld, it can scar the thrust bearing. The bearing will rotate but stop at the scar. As the saw runs, the scar becomes deeper. Figure 1 is an example of a thrust bearing that has been scarred by the

blade. Eventually the bearing stops rotating and the blade runs in the scar. The metal-to-metal contact between the blade and the bearing heats up the blade.

Heat destroys blades. The blade will either suffer metal fatigue and break, or it will lose its ability to stay sharp. Either way the blade is destroyed by the heat.

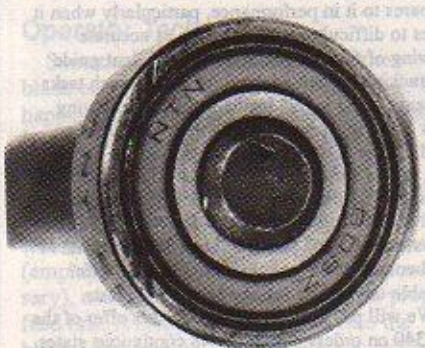


Figure 1

The thrust bearing should be observed often during the sawing process to make sure that BOTH bearings (above and below the table) are rotating. It is not unusual for a bandsaw owner to feel that he is breaking a lot of blades and then realize that one of the bearings is damaged or frozen. The thrust bearing below the table, concealed from sight, is often the culprit.

Both bearings should be smooth and show no signs of scarring. If a bearing appears to be damaged, it should either be replaced or reversed. Some bearings can easily be pressed off the shaft and then pressed back on in a reversed position, assuming the bearing itself is still functional. It's also a good idea to keep one or two spare thrust bearings on hand.

The solution to the problem is a simple one. The answer is to round the back of the blade. This was done by some manufacturers years ago.

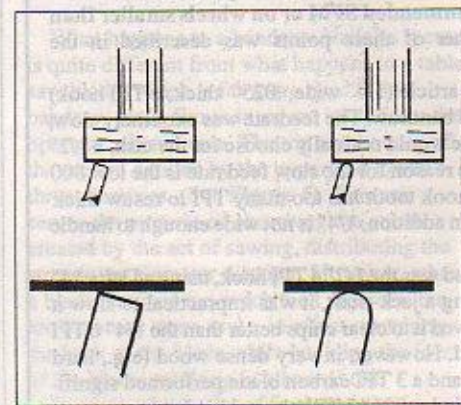


Figure 2

The round back cannot dig into the thrust bearing as a sharp square corner does. This is especially true if the blade gets twisted, which often happens when making sharp curves. (See Figure 2). To round the back of the blade, use either a file or a diamond hone. I like the diamond hone for 1/8" and 1/4" blades and the file for larger blades.

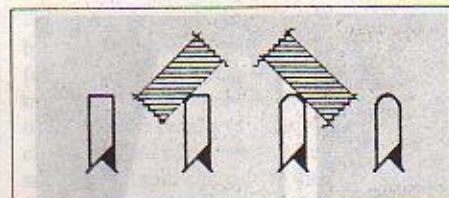


Figure 3

After first tracking the blade in the usual way, adjust the tracking (tilt the top wheel) so the blade engages the thrust bearing. This backward pressure of the blade will help to keep it from coming forward off the wheels when you apply pressure to the back of the blade with the file or hone.

The corners are filed first by gently moving the file or diamond hone back and forth. You should do this for a minute or two on each corner. Then slowly rotate the tool so the back and the corners are filed in one slow circular movement. (Figures 3 and 4).

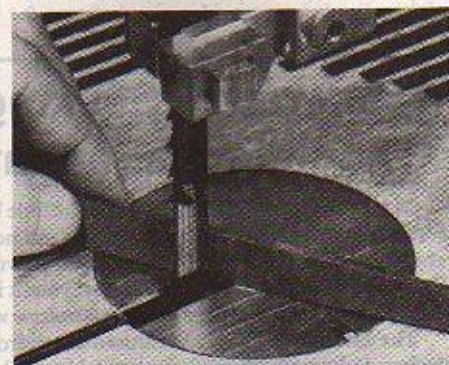


Figure 4

Switch off and unplug the saw and feel the back of the blade. You should feel no sharp corners. If you are going to cut a lot of tight curves, it might be worthwhile to round the corners even more. After you are done rounding the corners, remember to angle the top wheel back to normal again to retrack the blade and take pressure off the thrust bearings.

After filing, the saw will run quieter, and the blade will be less likely to damage the thrust bearings. There will also be another benefit. The blade will cut smoother on curves, especially tight curves where the back of the blade is in close contact with the fresh kerf. The cut will be smoother because the smooth back of the blade will not get caught on each imperfection in the cut. The front of the blade will stay more stable because it will not be jostled as much as it is with a square back - any rough movement at the back of the blade is transferred to the front. See Figure 5.

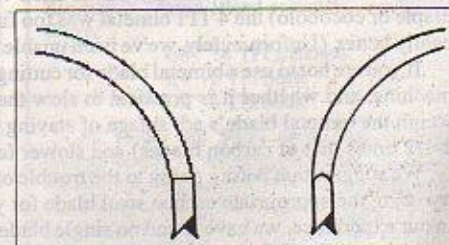


Figure 5

Bandsaw Guides

Bandsaws are usually equipped with two sets of guides. One set is located above the table and the other set is below the table. The top set is held by the top guide assembly which is attached to the guide post and is adjustable up and down. The guides hold the blade securely during a straight cut and prevent the blade from twisting or deflecting during a curved cut.

For the last one hundred years the guide blocks have been made out of metal. Perhaps this was an appropriate choice of materials a hundred years ago when the bandsaws were running at very slow speeds. However, as bandsaws evolved, the improved blades and machines allowed much higher speeds. The average wood cutting bandsaw today now runs at about 2800 feet per minute.

At this high speed, metal is no longer the appropriate material for bandsaw guides. Metal guides steering the metal blade generate a tremendous amount of friction.

This friction creates heat which shortens blade life through either premature blade breakage or loss of tooth hardness. This is especially true with small blades making tight curves. The narrow blades don't have the mass to absorb and dissipate heat well. This will also result in burn marks on the work-piece.

Simply put, metal guide blocks for bandsaws are one of the "least smart" ideas in woodworking today. Aside from creating friction and shortening blade life, they are also very noisy. Also, if they are not set perfectly, metal guides can accidentally touch the teeth of a blade, destroying the set and ruining the blade.

Because of friction, the guides cannot be set sufficiently close to the blade to hold it securely for very accurate work. One alternative for holding small blades adequately for intricate work has been to replace the metal guides with a slotted roller bearing, or a pair of roller bearings on either side of the blade. However, these are expensive and not practical for every saw.

The easy solution to the metal guide block problem is very simple. Replace them with something besides metal.

Anything is better than metal. A lot of the old timers in Wisconsin use green sugar maple. Some European manufacturers still use hardwood. Tropical hardwood has been tried but doesn't seem to be the answer. They initially leave an oil film that coats the blade, but rather than continuing to lubricate the blade, the film can dry, creating a crust on the blade which can actually cause a heat buildup. For this reason hard tropical or exotic woods are not the best choice.

In the past year two manufacturers, one in Kentucky and one in Idaho, have begun making nonmetallic replacement guide blocks for bandsaws.

The manufacturer in Idaho uses a black plastic that melts when a match is held to it.

The product made in Kentucky, which has been dubbed "Cool Blocks," is made from a specially formulated phenolic laminate material that doesn't melt. Phenolic is a plastic with layers of linen cloth compressed in it. It was developed during the thirties as an insulation material in the electronics industry. It is strong, nonconductive, and it dissipates heat. Cool Blocks have three synthetic dry lubricants that are designed to lubricate the blade but not make it oily.

After experimenting for the past six months with various materials for replacing metal guides, including different types of wood, plastic, and miscellaneous secret potions, it appears to me that the clear winner is Cool Blocks.

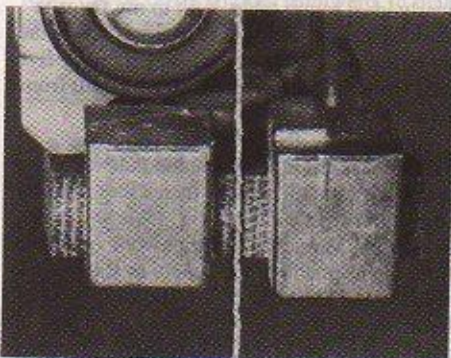


Figure 6

There are a lot of gimmicks these days; things that are dumb ideas, poor values, or things you simply don't need. Cool Blocks are a pleasant surprise. They really do work and they work well. Usually things like this set off the buzzer on my gimmick detector, but not this time.

After replacing the standard metal guides with Cool Blocks, my bandsaw ran smoother and quieter. The blades seem to last longer and stay sharp longer, especially small blades. They can be set right up to the blade making the saw terrifically accurate (Figure 6). The super-close fit gives the operator great control which is quite unusual for a bandsaw. With a close fit, the blocks wear a bit faster but they are easily resurfaced with a file. The \$10 price tag for the Cool Blocks is cheaper than standard replacement metal guides, which vary in cost from \$12 to \$24.

A friend of mine who does a tremendous amount of bandsaw work with the 1/8" blade says that with Cool Blocks, his small blades last two to three times as long. Now the blades often get too dull to use which is a contrast to his old problem of routinely breaking blades while they were still fairly sharp. With the use of Cool Blocks, the problem of premature breakage has been greatly reduced.

We used a sound meter to test the claim that the Cool Blocks are quieter. This produced some very interesting results.

Cool Blocks were quieter than metal guides, especially when the guides were set fairly close, such as .003", which is the thickness of a piece of writing paper. At this distance, the Cool Blocks make roughly half

the noise. On a cheaper bandsaw they were quieter yet. This is perhaps because the less accurate saws have wheels that are less round, leading to more contact between the blade and the guides. What is most surprising is that the saw becomes quieter the longer it runs. Cool Blocks somehow polish the blade making it more slippery and quieter. After it has run for a while, say an hour, you can switch the saw off and feel that the blade body is smoother.

Ironically, even after we reinstalled the metal guide blocks (for test purposes) after using the Cool Blocks, the saw continued to run quietly for a while, though as time passed the blade got progressively louder. This seems to indicate that Cool Blocks are not just passive, but actually have a positive effect on the surface of the blade itself.

It appears that Cool Blocks will soon become standard equipment on one of the major bandsaw brands now sold in the U.S. I wouldn't be surprised if in the next couple of years they became standard equipment on all bandsaws. This would go a long way towards updating the bandsaw and bringing it into the twentieth century.

The bandsaw is a wonderful tool, especially if it is well tuned. The techniques described in this article are inexpensive and take only a minute or two, but I can guarantee they will help lead to better performance and longer blade life.

Mark Duginske is a woodworker from Wausau, Wisconsin.

Cool Blocks are now made in 6 sizes to fit the following saws:

- 14" Delta
- 14" Taiwanese
- 12" Sears
- Old Sears (round 1/4" guides)
- 11" Shopsmith
- 10-1/2" Inca

Order Cool Blocks from Highland Hardware for \$9.95 plus \$3 shipping. Be sure to specify bandsaw brand.
(If not satisfied with your new Cool Blocks, return them for a \$9.95 refund.)

The fine Diamond Hone mentioned for filing the backs of 1/8" & 1/4" blades can be ordered for \$4.95 plus \$3 shipping.

Highland Hardware
1045 N. Highland Ave, NE
Atlanta, GA 30306

Toll Free Orderline (800) 241-6748

The Well-Tempered Router Table

by Zach Etheridge

FUNNY THING about router tables – everybody knows about them, at least a little bit, and anybody who's ever used one knows they're very useful if not absolutely indispensable – and yet there's not a single one I'd consider worth having that I've seen for sale anywhere. Likewise, it's difficult even to find competent plans floating around out there in the wide world. Fortunately, however, router tables are fundamentally pretty simple, and can easily be built well enough to suit any needs you might encounter.

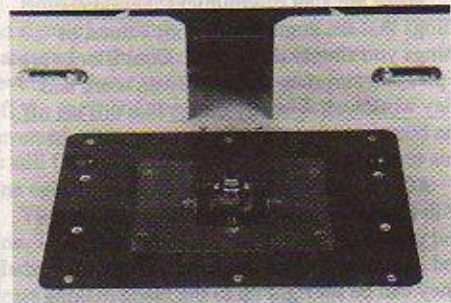
In fact, you probably already have a router table in your shop, though you may never yet have built or bought one. The key word is *table*, "a piece of furniture consisting of a smooth flat slab fixed on legs" (or so my ancient Webster's claims). No, I don't think you have the dining table in the basement, but you likely do have a workbench or some other surface on which you sometimes get things done. If you can arrange a successful introduction of your router to your table, you'll have built a router table, just like that.

The design and construction of your router table should be based sensibly on what you want the thing to do. You'll want the surface to be relatively flat, and smooth enough to let you slide pieces of wood across it without resistance. You will surely want as large a surface as can reasonably fit in your shop, which is a powerful incentive to use the existing surface of your workbench. You want the table standing at a working height as comfortable as possible for handling stock either flat or on edge (this criterion is most miserably *not* met by any table system that purports to stand atop your workbench).

And finally we come to the most often ignored design consideration of all: mounting the router. You will want the system to operate efficiently; it should be easy to mount or dismount the router, which is after all also a hand-held tool, and it should be easy to do normal routerly things such as changing depth of cut, installing bits, switching on and off, and so on. The mounting method most often used consists of bolting the router to the underside of the table surface, perhaps after routing out a shallow mortise to minimize the depth of cut lost to table thickness. This method is not your best choice, for it provides exactly the opposite of each of the requirements listed above. Wouldn't it be nice if you could somehow get the router out from under the table to change settings or bits, and then get it underneath again without wasting a lot of time and energy? It turns out there is a way to do exactly that.

In the usual long-winded and unlikely way of such things, I invented an excellent mounting system years ago, becoming at least the ten-thousandth person to have had the idea. I devised a large sub-base for my router, bigger than the width and depth of the router including handles. I then cut a hole in my old plywood-topped workbench, just the size of the oversize sub-base. I installed a ledge for the base to rest on, so that when I flipped my router upside down and dropped it in the hole, the sub-base lay flush with the surface of the bench. When I needed access to the router, all I had to do was grab it by the throat, lift it out of the table, and do the work right side up the way it was meant to be done. Thus with the greatest of ease and economy I acquired a nearly ideal router table, built to my favorite working height, taking up no new space in the shop, and measuring a whopping three by five feet. Only the fence remained to be built from scratch.

Incidentally, the hole for the drop-in module was cut in the benchtop halfway along the bench's length but less than a foot from the edge, offering a choice of two table widths to work with. Moulding and trim work gets done from the near side of the bench, so the fence is reached and the stock controlled with ease. Really large items can be worked from the other side of the bench, where more than two feet of support surface in front of the bit make handling easier.



My first drop-in module was actually a lot more sophisticated than it needed to be – but it was more fun, too. It was also one of the most efficient table-mounting systems anybody ever heard of. Eliminating the minor hassle of removing and replacing your standard sub-base, the module attaches to your router in seconds, costs no lost depth of cut at all, and impresses the heck out of your woodworking buddies besides. This is the system we first described in *Wood News* several years ago, the design for which we've been supplying to purchasers of Makita plunge routers ever since. If you want the ultimate in drop-in systems, you'll get the idea free when you buy a router from us, or – if your router has two parallel holes that pass through the base, are at least 1/4" in diameter, and for which there are set screws provided in the router base – you may purchase the plans separately for \$5.00 including postage.

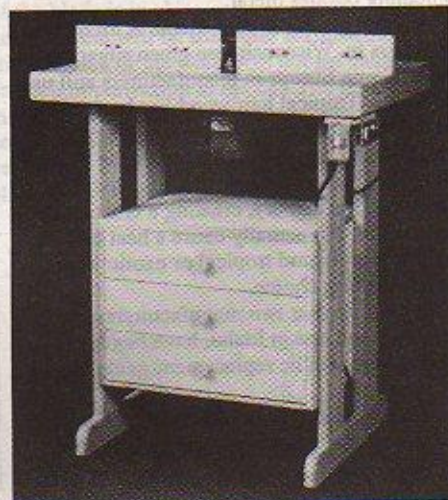
For routers lacking Makita's parallel guide-set holes through the base casting, or for any router whose owner prefers simplicity to gizmophilia (uncontrollable love of gizmos,

not according to Webster's), the oversize drop-in sub-base remains the most efficient general-purpose method for table mounting. Without engaging in theatrics, the drop-in sub-base can simply replace the manufacturer's bakelite or phenolic sub-base with a much larger version of the same. I used to feel stymied by the difficulty of finding a suitable material for the sub-base, as any such stuff must meet some fairly exacting standards, but – well, read on...

The ideal material for the drop-in base must be stiff, to avoid sagging or vibrating;



thin, so as not to cost too much depth of cut; tough enough not to wear out under regular use; and slick enough not to induce drag or mar your stock as you slide it along. It must be obtainable by the humble likes of you and me, and it must be a material that we can manipulate without building our own machine shop. Phenolic resin board meets all these specifications easily, and by coincidence we just happen to stock 9" by 12" pieces of 1/4" thick phenolic here at the store. The stuff isn't cheap, at \$10.99 per piece (plus \$3 shipping), but it really is just about the ideal jiggling material. I've used it in sub-bases and in several other router jigs, and have found that it can be sawed, routed, drilled and sanded with normal woodworking tools, and can even be given a slick finished edge with a sharp hand plane. One thing you can't do easily with phenolic is join pieces of it with wood screws. The material has virtually no compressibility, & most wood screws will break off even in generously piloted holes. Sheet-metal screws are a viable alternative if you're careful about pre-drilling, and epoxy cement does a fine job of permanent assembly.



All of the foregoing may be fine for some folks, but the drop-in system does presuppose a surface into which it can be dropped. But what if you don't want to cut a hole in your \$1000 workbench, or if you don't have a workbench at all? Building a router table is a straightforward woodworking project, and a popular one too, judging from demand here at the store. The plans most often asked for are those published by *Woodsmith* magazine; originally appearing in issue #20 in early 1982, the plans have been supplemented and published in a six-page *Woodsmith* booklet available from Highland Hardware for \$3.95 plus \$3 postage and handling (specify *Woodsmith* Woodworking Plan Booklet #12). The original design was for a legless table surface that could be clamped to the workbench, providing a fairly large work surface (easily scaled up if you have room) at a convenient height, and offering easy out-of-the-way storage. The plan booklet also gives details on a leg-stand system with built-in cabinet, which bears close resemblance to the table shown at lower left. Though the *Woodsmith* plans don't mention a drop-in system, it will not be difficult to modify their table design to accommodate this more efficient mounting method.

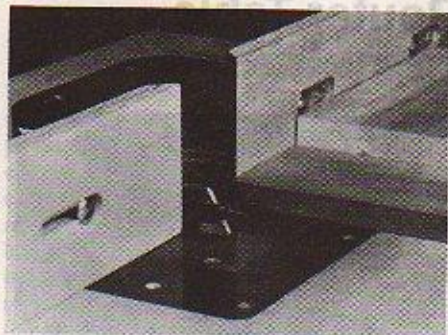


The bit opening cover has been removed for this "exploded view" shown above.

Once you've established your smooth flat slab fixed on legs, you'll want to equip it with several essential accessories, starting with the fence. Most of the router-table designs and discussions I've seen tend to ignore the fence or treat it cavalierly at best. And in fact a pretty crude fence will get the job done most of the time, sort of, unless the job involves something other than a simple edge treatment on straight 4/4 stock. The fence does double duty on the router table: while it guides your

work, it also serves as your major safety device, covering all of the bit not actually involved in making a cut. The simplest kind of fence is a straight piece of wood about the size of a 2 x 4, notched at its mid-point so it can rest directly over whatever bit you're using, leaving a reasonably small opening around the sides and top of the bit. A safer and more versatile design can easily be borrowed from the nearest shaper, which will demonstrate such features as laterally adjustable fence faces on either side of the cutter opening, to allow the operator to custom-fit the opening to a wide variety of cutter sizes. The fence faces are several inches high, and stout enough to let you run stock on edge when needed. And at least the left side of the fence can be offset slightly frontward, to make up for stock width lost to a full edge-relief cut.

(continued on next page)



The thick block behind the workpiece serves as a miter guide and eliminates tearout as well.

MAKITA 3612 Plunge Routers

The 3612 routers are among the most versatile routers ever made, and are also among the most powerful. Building on experience gained over in over a decade of production, Makita has equipped these machines with superlative features that give them more ease in handling, more adjustability, more power and precision than ever before.

There are two models in the 3612 series: the old favorite rectangular-base model, designated 3612B, and the round-base edition of the same machine, designated 3612BR. The base configuration is the only difference between the two; powerplant and fittings are identical. The rectangular base measures 6-5/8" by 5-1/2", while the round base is 6-1/4" in diameter; this gives the rectangular base about 13% more surface area than the round base and makes it a bit easier to control during hand-held work. The rectangular base is also more easily accommodated in many jig designs, especially Tage Frid's mortising jig, described in *Fine Woodworking on Joinery*, p. 45.

At 14 amps, the 3612 routers' 23,000 rpm motor generates 3 HP. That's more power than you'll find in many shapers, and in fact these routers can handle many of the cutting and shaping jobs usually reserved for stationary tools. This enormous power insures that work gets done as efficiently as possible; greater depth of cut & less rpm loss under load mean fewer passes and a cleaner finish with any kind of bit. Indeed, these routers have spawned a whole new generation of very large bits designed to take full advantage of their 1/2" collets and high power.

The plunging capability of the 3612 routers, with 2-1/2" of total vertical travel, is an outstandingly useful feature. It allows vertical entry into the work, as needed for routing mortises or for stopped grooves or edge treatments. It lets the user pre-set final and intermediate cutting depths, reaching any setting almost instantly by rotating a three-stage turret on the router base and plunging onto a stop. The plunge feature also offers greatly increased safety in normal operation. Most common bits will withdraw above the base when the motor housing is fully raised, allowing the machine to be set down securely on its base before the bit stops rotating after a cut.

Micro-adjustable depth of cut is another noteworthy Makita innovation. The plunge stop rod attached to the motor housing is threaded through a spring-loaded half-nut; press the release button to instantly move the stop rod close to the desired setting, then rotate the rod up or down for extremely precise setting of final depth. The stop rod does not interfere with the motor housing's upward travel, so bits can still be retracted after depth of cut is set.

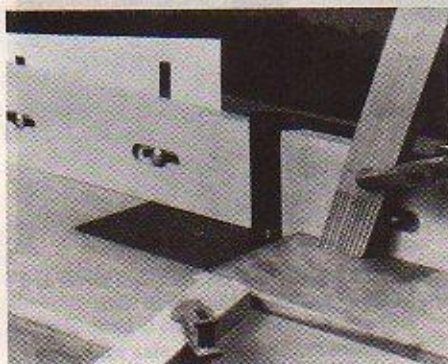
Specifications common to both models are as follows: universal 14-amp motor, 23,000 rpm, rated for commercial use. Collet size is 1/2", with 1/4" adapter sleeve provided. Built-in spindle lock allows easy one-wrench bit change. Chip deflector shield is standard equipment. Brushes are easily accessible. Toggle switch and plunge lock lever are reached from right handle without removing the hand. Total weight is about 12-3/4 lbs. for the 3612BR, 13 lbs. for the 3612B. Provided with one year parts & labor warranty. Add \$6.00 for UPS shipping.

MAKITA 3612B Rectangular-Base Plunge Router	\$199.95
MAKITA 3612BR Round-Base Plunge Router	\$199.95
Set of Guides (includes Guide Holder, Straight Guide & Roller Guide)	\$43.00



Router Table

(continued from previous page)



(Shaper fences can be aligned offset at left or right, but since you can't run your router backwards, you will almost always feed your work from right to left, and only the left side of your fence need offer any re-alignment.) The re-alignment mechanism can be as low-tech and as accurate as dropping a shim behind the fence face and re-tightening its locking screws, as shown above left.

If you've gone to the trouble of building a fence that safely surrounds and covers the router bit, you've already done most of the work for hooking a vacuum system to the table. The hookup can be as elegant as a hollow box-beam fence with built-in vac port,



or as simple as a hole at the rear of the bit enclosure which accepts the business end of your shop vac's crevice tool. It will certainly be worth the effort to connect some kind of dust collection system. If you think the hand-held router makes a mess, wait till you can see it all happen right before your eyes! And while we're on the subject of mess: while cleaning up, be careful not to sweep junk from the table surface through the bit opening, where it can fall into the router motor. The problem is least acute during operation, when the router's cooling fan exhaust protects it against this hazard pretty well. However, I suspect that many bearing failures attributed to using the router upside down are actually due to pouring waste into the defenseless machine while it's not running.

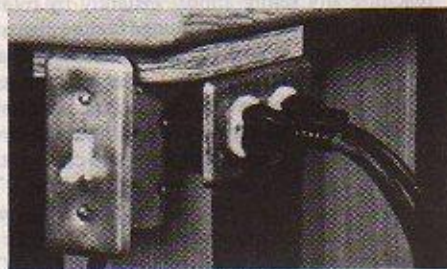
Now that you've put the fence together, there's another safety device you'll need for those occasions when you're not using the fence after all, such as when using a ball-bearing piloted bit to do an edge treatment on an irregular shape. Here you need to cover the

bit; though you may not make it as hard to get to as when the fence is set up correctly, at least you can make it impossible to simply reach down and injure yourself. The free-form guard consists of a block of wood, about 2 x 4 or 5 inches and slightly thicker than the stock you're working on, which can be firmly attached to the table just behind the bit. Atop this block fasten a stiff plexiglas or plywood awning which extends forward to completely cover the bit.

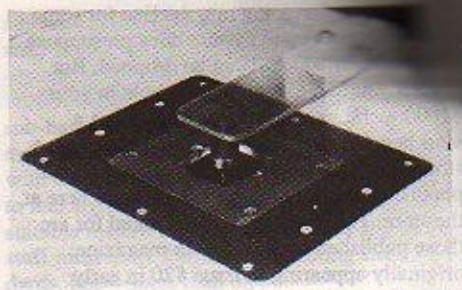
Another fence accessory that shouldn't be done without is the feather board, which is a shop-made version of a shaper's spring-loaded pressure pads used for controlling stock as it's fed past the bit. With one or two feather boards clamped to the table to hold the stock securely against the fence, and another one or two feather boards clamped to the fence to hold the stock down firmly on the table, even the longest, most awkward or oddly shaped pieces can be handled safely and accurately. All you have to provide is the oomph to move the work along; your wits are left free to concentrate on feeding the stock smoothly and keeping your hands out of harm's way.

A mitre guide can be a handy addition to your collection of table jigs. If you already own a guide, it's no problem to rout a groove along the table surface to fit the guide bar. It's also very easy to fake up a functional mitre guide using a piece of scrap with at least one corner cut accurately square. One edge of the square slides along the fence, while the other pushes the stock along in a satisfactorily perpendicular fashion.

Once you've got the router mounted and outfitted with accessories, you're almost ready to go to work, but there's one more thing to take care of first. Any table-mounted router needs a switched power source; it's not at all practical or safe to fumble around under the table looking for the switch built into the router. It will be handy to have two outlets controlled by the same switch, so you can set up your shop vac or dust collector to run whenever the router does. Switched power means you'll have the router switch locked on or taped down — please remember to turn it OFF as the first part of returning to hand-held mode.



After spending your time and creativity on the construction of a router table, and after discovering how immensely useful the thing can be, there will come a moment when it will be appropriate to consider the table's limitations. Though the table-mounted router may be exactly the right tool for a thousand different jobs, there are still plenty of



operations where the hand-held router remains the tool of choice, even in some situations where you *could* do the job on the table. I will encourage you to remember that the table-mounted router, like every other stationary tool, has permanently built-in hazards along with its advantages. The bit, emerging through the table surface and accessible to the workpiece, is also accessible to your hands. As with other rotating cutting tools, the possibility of kickback exists — and you'd better believe it's no more fun with a router than it is with a tablesaw. Even with a mounting system as efficient as the drop-in sub-base, does it make sense to table-mount the router for a one-shot job that could be done with the work simply clamped to your bench? Is it safer to run that short piece on the table, or to knock together a simple holding fixture and do the work hand-held? Like any other woodworking method or machine, the router table is best used with good judgement, with an open mind about its qualification for the job, and with constant care for yourself as well as for the work.

All right, now rush down to the shop and get busy. While you're getting ready to chop a hole in your workbench or whip out a brand-new custom table, consider this ancient wisdom about jigs (which is what the router table is, if a little overgrown): a jig is supposed to do the hard part of your work for you. Think carefully into a jig when making it, and it will think carefully for you ever afterward. Let the jig be less than right, and your work will come out wrong for evermore. If you build a router table, build it stout and tight. When you cut a hole in a table surface for your drop-in sub-base, make sure you get a tight fit, and make sure the sub-base lies dead flush with the table surface. When you make a fence, make it straight and square, and your work can be as straight and square as you please. Do it right, and just like Seymour Keats, a router table man from way back, said about it: a jig of beauty is a joy forever.

Zach Eberidge is Product Engineer at Highland Hardware.

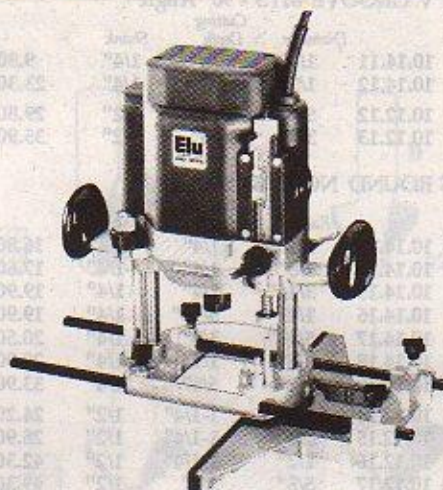
Elu Electronic Variable-Speed Plunge Routers

THESE TWO NEW Swiss machines represent the current state of the art in router technology, and they offer the user an extraordinary experience in versatility and ease of operation. That both models are plunge routers should come as no surprise; the third dimension of movement provided by the plunge-type design adds a tremendous range of function to the tool. And these two Elu routers also sport electronic variable speed control with a soft-start feature that has to be felt to be believed.

An outstanding feature of the 1 HP router is the optional base assembly with large right-angle fence. This combination provides a world of versatility in either hand-held or stationary mode, with convenient, highly precise adjustments at your fingertips.

Each model is backed up by Black & Decker's one-year free maintenance program in addition to the normal one-year parts & labor warranty; during your first year of ownership, even routine maintenance is on the house, so you can take your router in for cleaning, inspection, or any necessary repair at no cost whatsoever.

Straight edge guide with rods & non-marring fence is provided as standard equipment with both models.



Model 3338 2 1/4 HP Router

The Elu model 3338 2-1/4 HP router seems to have just about every feature you could want built into one machine. The 3338 offers 2-3/4" of smooth, snug-fitting plunge capability; magnifier-equipped plunge stop rod with micro-adjustable tip; 1/2" precision-made collet with unusual 1-3/8" depth for maximum security and durability; self-locking plunge lock lever; three-stage plunge stop turret, and of course its soft-start

constant-speed rpm selection dial which lets you choose any operating speed between 8,000 and 20,000 rpm, then maintains that speed by supplying more power as needed to prevent rpm loss. You can run a flush-trim bit at high speed for clean cutting on laminates, or slow the router down for safe, vibration-free use of huge panel-raising and other moulding bits. And of course you have all the standard plunge-router features at your fingertips: clean, precise mortising; excellent visibility during any operation; heavy return springs that lift the motor housing, safely withdrawing most bits above base level upon completion of a cut.

Specifications: Collet capacity 1/2" (1/4" and 3/8" collets available optionally), 8,000-20,000 rpm, 10-12 amps, max plunge 2-3/4", weight 11-1/2 lbs.

Elu 3338 2-1/4 HP Router	\$449.00
40902 1/4" Collet	\$29.95
40904 3/8" Collet	\$29.95
40960 Base Plate Extension	\$26.95



Model 3304 1HP Router

Elu's model 3304 brings the same sophistication to a light, easy-to-handle 1 HP utility router. This router comes equipped with a 1/4" collet, 1-11/16" maximum plunge, plunge-lock screw incorporated into the right handle, and variable speed from 8,000 to 24,000 rpm. It's also the quietest router we've heard at any speed - how they do it remains a mystery, but the 3304 certainly sets some kind of record for noise reduction.

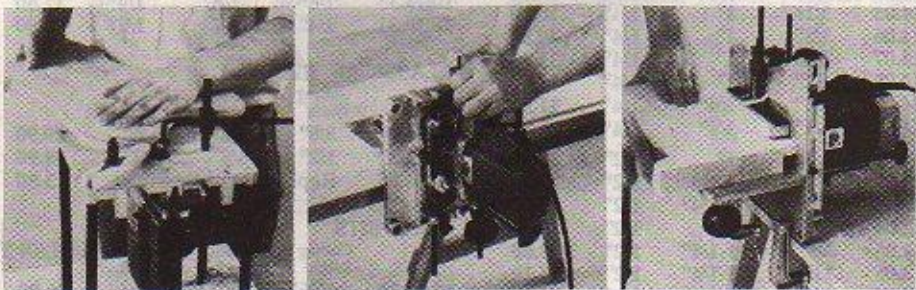
Multi-Purpose Table for 3304

A highly versatile optional accessory package for the 3304 is Elu's unique multi-purpose utility table. This table uses a quick-mount system for installing the router, and provides a 9-5/8" by 8-1/4" work surface with a 5-1/4" high fence; in addition to normal router-table function, the unit can also serve as a right-angle trimmer base, with the fence providing a large stable surface base which orients the router securely for stationary or hand-held work. The system is provided with an adjustable spring-loaded hold-down pad, and a micro-adjuster for setting bit position under the fence.

Specifications: 1/4" collet capacity, 8,000-24,000 rpm, 5-6.5 amps, max plunge 1-11/16", weight 6-1/4 lbs.

Elu Model 3304 1 HP Router	\$249.95
40900 Accessory Package	\$149.95
40907 Trammel Bar for 3304 <small>(included as part of 40900 pkg.)</small>	\$9.00

Elu Routers and accessories are in stock at Highland Hardware.



CARBIDE TIPPED ROUTER BITS

In this, our largest selection ever, we offer a comprehensive line of high-quality carbide-tipped router bits for amateur and professional alike. These are not the cheapest bits on the market; instead they are among the best available, offered at very competitive prices and backed up by experienced and reputable manufacturers. These bits are tipped with machine-brazed C-2 carbide for the best combination of toughness and edge-holding ability; they are sharpened with 400-grit diamond abrasive to a very sharp edge for clean cutting with minimized tear-out. Your local saw-sharpening service should be able to handle re-sharpening of any of these bits, and you can maintain edges between grindings with one of our fine diamond abrasive paddles (see p. 11).

You'll note that throughout the listings there are new, special-purpose, and oversize bits, many designed for use with the new generation of very powerful 1/2" routers now dominating a large share of the market. Whenever possible, we offer a choice of 1/4" or 1/2" shank, usually at very little difference in price. If you own a large router, 1/2"-shank bits will give you a great bonus in stability and safety under heavy use. Some of these bits are for large routers only: the 1-3/4" straight bit for fast surface wasting; the 1-1/2" rounding-over bit (you can actually make 3" columns with a router!); and the panel-raising bits which do work formerly reserved for stationary shapers. The HSS spiral end mills (not carbide) are most effective when used in a plunge router. Most of the bits, however, from the 1/16" straight bit to the point-cutting (quirk bead) round-over bit to the 3/4" overhead flush trim, are suitable for use with any router.

Router bits can easily represent a greater investment than you have in your router. We're persuaded that it makes sense to invest in bits you can rely on for precision and durability, and we offer these high-quality bits with confidence that they will meet your most exacting standards.

A STRAIGHT BITS

	Cutter Diameter	Cutting Length	Shank Diameter	
10.14.01	1/16"	1/4"	1/4"	9.90
10.14.02	1/8"	1/4"	1/4"	9.90
10.14.03	3/16"	7/16"	1/4"	9.90
10.14.04	1/4"	1"	1/4"	9.90
10.14.05	5/16"	1"	1/4"	10.80
10.14.06	3/8"	1"	1/4"	10.80
10.14.07	7/16"	1"	1/4"	11.90
10.14.08	1/2"	1"	1/4"	11.90
10.14.09	5/8"	3/4"	1/4"	11.90
10.14.10	3/4"	3/4"	1/4"	13.30
10.12.01	3/8"	1"	1/2"	11.20
10.12.02	7/16"	1-1/4"	1/2"	11.90
10.12.03	1/2"	1-1/4"	1/2"	11.90
10.12.04	1/2"	2"	1/2"	15.90
10.12.05	5/8"	1-1/4"	1/2"	13.80
10.12.06	11/16"	1-1/4"	1/2"	15.30
10.12.07	3/4"	1-1/4"	1/2"	14.90
10.12.08	7/8"	1-1/4"	1/2"	17.70
10.12.09	1"	1-1/4"	1/2"	18.90
10.12.10	1-1/2"	1-1/4"	1/2"	25.90
10.12.11	1-3/4"	1-1/4"	1/2"	41.90

B V GROOVE BITS - 90° Angle

	Diameter	Cutting Depth	Shank	
10.14.11	1/4"	3/8"	1/4"	9.80
10.14.12	1/2"	1/2"	1/4"	23.30
10.12.12	5/8"	1/2"	1/2"	29.80
10.12.13	3/4"	5/8"	1/2"	35.90

C ROUND NOSE BITS

	Radius	Cutting Depth	Shank	
10.14.13	1/16"	1/4"	1/4"	16.80
10.14.14	1/8"	1/4"	1/4"	17.60
10.14.15	3/16"	1/4"	1/4"	19.90
10.14.16	1/4"	5/16"	1/4"	19.90
10.14.17	5/16"	3/8"	1/4"	20.50
10.14.18	3/8"	1/2"	1/4"	20.90
10.14.19	1/2"	5/8"	1/4"	33.90
10.12.14	1/4"	1-1/4"	1/2"	24.20
10.12.15	3/8"	1-1/4"	1/2"	28.90
10.12.16	1/2"	1-1/4"	1/2"	42.30
10.12.17	5/8"	3/4"	1/2"	49.30

D COVE BITS

	Radius	Cutting Depth	Shank	
10.14.20	3/16"	9/16"	1/4"	24.90
10.14.21	1/4"	9/16"	1/4"	24.90
10.14.22	3/8"	9/16"	1/4"	24.90
10.14.23	1/2"	3/4"	1/4"	27.90
10.12.18	3/8"	9/16"	1/2"	26.80
10.12.19	1/2"	3/4"	1/2"	29.80
10.14.84		Replacement Bearing		3.80

E DOVETAIL BITS

	Bottom Diameter	Angle	Max. Depth	Shank	
10.14.24	3/8"	9°	3/8"	1/4"	13.90
10.14.25	1/2"	14°	1/2"	1/4"	13.90
10.12.20	3/8"	9°	3/8"	1/2"	14.90
10.12.21	1/2"	14°	1/2"	1/2"	15.90
10.12.22	3/4"	14°	5/8"	1/2"	49.50

F ROUNDING OVER BITS

	Radius	Depth	Shank	
10.14.26	1/16"	1/2"	1/4"	21.90
10.14.27	1/8"	1/2"	1/4"	21.90
10.14.28	3/16"	1/2"	1/4"	21.90
10.14.29	1/4"	1/2"	1/4"	21.90
10.14.30	5/16"	1/2"	1/4"	23.30
10.14.31	3/8"	5/8"	1/4"	23.30
10.14.32	1/2"	3/4"	1/4"	26.50
10.12.23	1/4"	1/2"	1/2"	22.50
10.12.24	5/16"	1/2"	1/2"	24.50
10.12.25	3/8"	5/8"	1/2"	24.50
10.12.26	1/2"	3/4"	1/2"	28.50
10.12.27	3/4"	1"	1/2"	42.50
10.12.28	1"	1-1/4"	1/2"	90.00
10.12.29	1-1/4"	1-1/2"	1/2"	120.00
10.12.30	1-1/2"	1-7/8"	1/2"	128.00
10.14.86		Replacement Bearing		3.80

G POINT CUTTING ROUND OVER BITS

	Radius	Point Width	Shank	
10.14.33	1/8"	1/8"	1/4"	17.60
10.12.31	1/4"	1/4"	1/2"	35.90

H CLASSICAL BITS

	Cutting Width	Cutting Depth	Shank	
10.14.34	3/8"	1/2"	1/4"	29.90
10.12.32	1/2"	5/8"	1/2"	39.90
10.14.86		Replacement Bearing		3.80

I OGEE BITS

	Cutting Width	Cutting Depth	Shank	
10.14.35	5/16"	1/2"	1/4"	36.90
10.14.36	7/16"	11/16"	1/4"	39.90
10.12.33	5/16"	1/2"	1/2"	36.90
10.12.34	7/16"	11/16"	1/2"	39.90
10.14.86		Replacement Bearing		3.80

J ROMAN OGEE BITS

	Cutting Width	Cutting Depth	Shank	
10.14.37	5/16"	5/8"	1/4"	29.90
10.14.38	1/2"	7/8"	1/4"	30.90
10.12.35	5/16"	5/8"	1/2"	29.90
10.12.36	1/2"	7/8"	1/2"	30.90
10.14.84		Replacement Bearing		3.80

K RABBETTING BITS

	Width of Rabbet	Diameter	Cutting Depth	Shank	
10.14.39	1/4"	1"	9/16"	1/4"	26.50
10.14.40	3/8"	1-1/4"	1/2"	1/4"	22.60
10.12.37	3/8"	1-1/4"	1/2"	1/2"	22.60
10.14.86		Replacement Bearing			3.80

L MORISING BITS

	Diameter	Overall Length	Shank	
10.14.41	1/2"	1-3/4"	1/4"	10.80
10.14.42	5/8"	1-3/4"	1/4"	12.30
10.14.43	3/4"	2"	1/4"	13.80
10.12.38	1-1/4"	2-1/8"	1/2"	21.60

M FLUSH TRIM BITS

	Diameter	Cutting Length	Shank Diameter	
10.14.44	1/2"	1"	1/4"	12.50
10.12.39	1/2"	1"	1/2"	14.50
10.14.86		Replacement Bearing		3.80

N BEVEL TRIM BITS

	Angle	Cutting Depth	Shank Diameter	
10.14.45	7°	1/4"	1/4"	17.90
10.14.46	15°	1/4"	1/4"	14.20
10.12.40	15°	1/4"	1/2"	19.90

TWO-WING SLOT CUTTERS

	Thickness	Slot Depth	
10.14.47	1/16"	1/2"	9.90
10.14.48	1/8"	1/2"	10.90
10.14.49	5/32"	1/2"	10.90
10.14.50	1/4"	1/2"	10.90

P 1/4" ARBOR & BEARING

10.12.41	1/2" Arbor & Bearing	5.50
10.14.88	Replacement Bearing	3.80

Q CHAMFER BITS - 45° ANGLE

	Cutting Depth	Carbide Length	Shank Diameter	
10.14.52	1/2"	5/8"	1/4"	22.50
10.12.42	1/2"	5/8"	1/2"	22.50
10.14.84		Replacement Bearing		3.80
10.14.53	5/8"	7/8"	1/4"	27.50
10.12.43	5/8"	7/8"	1/2"	33.70
10.14.86		Replacement Bearing		3.80

R BEADING BITS

	Radius	Depth	Shank	
10.14.54	1/16"	1/2"	1/4"	21.80
10.14.55	1/8"	1/2"	1/4"	21.80
10.14.56	3/16"	1/2"	1/4"	21.80
10.14.57	1/4"	1/2"	1/4"	21.80
10.14.58	5/16"	1/2"	1/4"	23.30
10.14.59	3/8"	5/8"	1/4"	23.30
10.12.44	1/4"	1/2"	1/2"	22.50
10.12.45	3/8"	5/8"	1/2"	24.60
10.12.46	1/2"	3/4"	1/2"	28.50
10.14.82		Replacement Bearing		3.80

S LOCK MITER BIT

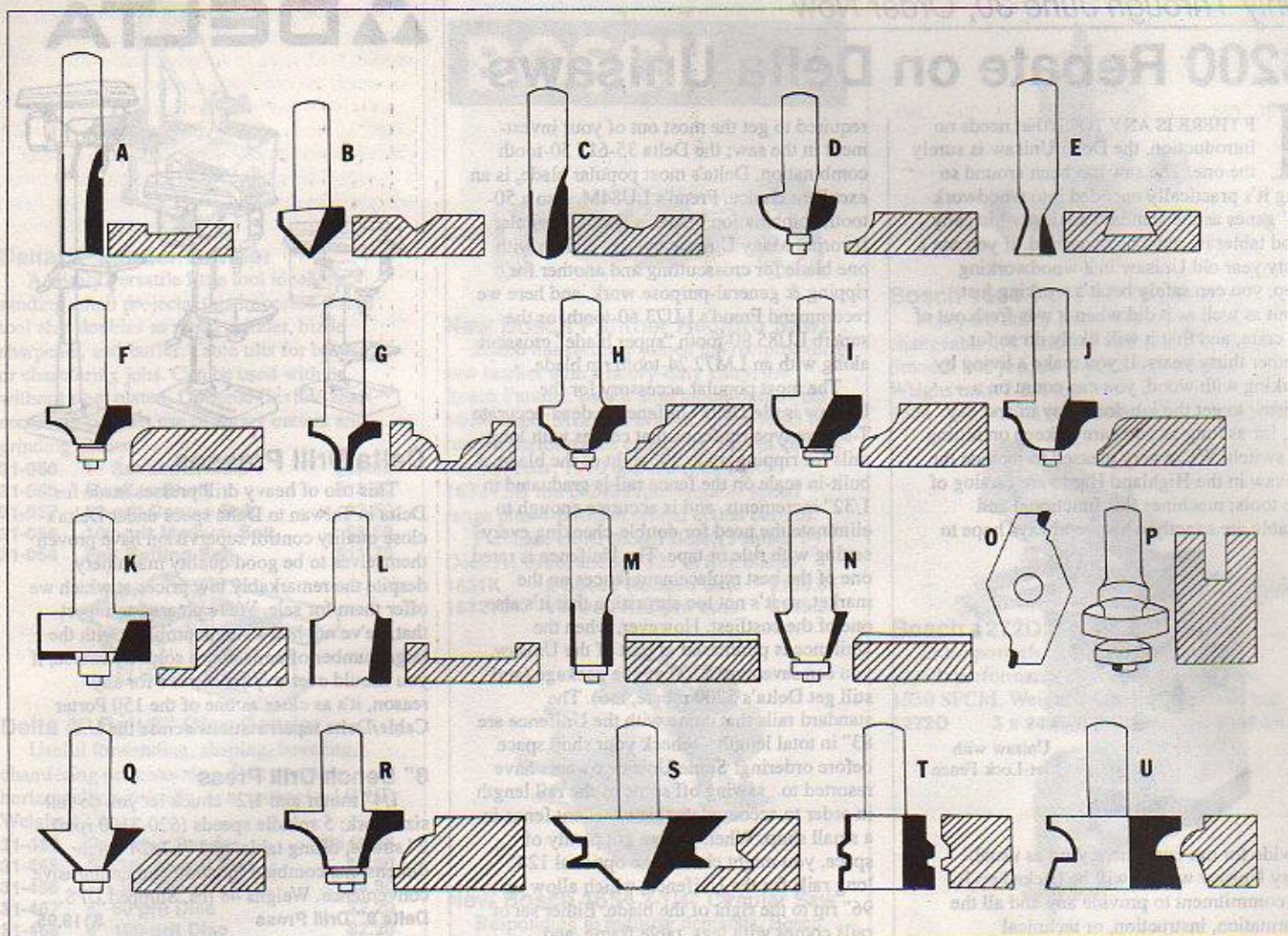
	Diameter	Stock Thickness	Shank	
10.12.47	2-3/4"	1/2" to 1-1/8"	1/2"	89.95

T REVERSIBLE GLUE JOINT BIT

	Diameter	Stock Thickness	Shank	
10.12.48	1-1/2"	1/2" to 1-1/4"	1/2"	49.95

U CABINET DOOR LIP BIT

	Diameter	Stock Thickness	Shank	
10.12.49	2"	1/2" to 1-1/4"	1/2"	69.95



RAISED PANEL ROUTER BITS

These large 1/2"-shank carbide-tipped router bits are useful for all panel raising.

	Diameter	Cutting Width	Stock Thickness	
Standard	1-5/8"	9/16"	1/2"-5/8"	
Ogee Fillet	2-5/8"	1-1/16"	3/4"	
Provincial	3-3/8"	1-7/16"	5/8"	
V10.12.50	Standard Raised Panel			42.50
W10.12.51	Ogee Fillet Raised Panel			69.90
X10.12.52	Provincial Raised Panel			92.40
10.14.86	Replacement Bearing			3.80

6-PIECE 1/2" SHANK CARBIDE ROUTER BIT SET

This assortment (not pictured) of six popular, premium-quality bits was selected to meet the needs of someone who has recently purchased a large plunge router or other router with 1/2" collet capacity. It includes 3/8" and 1/2" straight bits, 3/8" radius round-over bit, 1-1/4" diameter rabbeting bit, 5/32" radius Roman ogee bit, and 1/2" dia. flush trim bit. Sold individually, the bits would cost \$115.30.

10.12.97 6-Pc. Set of 1/2"-shank Bits 99.95

Z OVERHEAD-PILOT FLUSH TRIM BITS

Like conventional flush trimmers, these overhead bits are ideal for final template-guided shaping of roughed-out stock, pattern duplication, edge truing, and so on. In many situations, however, the bearing on the bottom of the conventional bit gets in the way, and that's where these overhead-pilot bits really shine. Note that the maximum depth of cut will be considerably greater than the bits' cutting length, for as soon as part of the workpiece has been trimmed the template can be removed and the work itself used as a guide.

The 1/2" and 3/4" bits have 1/4" shanks for use in any router. The 1" bit has a 3/8" shank, and the huge 1-1/8" bit has a 1/2" shank. Please note that the maximum cutting depth listed below may vary slightly depending on the design of your router.

Overhead-Pilot Flush Trim Bits

	Diameter	Cutting Length	Maximum Depth	
10.14.61	1/2"	11/16"	1-1/4"	19.95
10.14.62	3/4"	3/4"	1-1/2"	21.95
10.14.63	1"	1"	2"	23.95
10.12.60	1-1/8"	2-9/16"	4"	119.95

Y RAIL AND STILE BIT

This remarkable carbide bit reconfigures to cut both a rail and matching stile in 3/4" to 7/8" thick stock. 1-3/4" diameter. 3/8" cutting width. 1/2" shank.

10.12.53	Rail and Stile Bit	78.40
10.14.89	Replacement Bearing	9.00



Only Through June 30, Order Now

\$200 Rebate on Delta Unisaws

IF THERE IS ANY TOOL that needs no introduction, the Delta Unisaw is surely the one. The saw has been around so long it's practically encoded into woodworkers' genes as the standard against which any good tablesaw must be measured. If you see a thirty year old Unisaw in a woodworking shop, you can safely bet it's working just about as well as it did when it was fresh out of the crate, and that it will likely do so for another thirty years. If you make a living by working with wood, you can count on a Unisaw to get the job done, day in and day out, for as long as you care to keep on hitting the switch. We're very pleased to include the Unisaw in the Highland Hardware catalog of fine tools; machines this functional and reliable are exactly what we always hope to



Unisaw with Jet-Lock Fence

provide for our customers. And as usual, every Unisaw we sell will be backed up by our commitment to provide any and all the information, instruction, or technical assistance that you might require at any time before or after the purchase. You can buy a Unisaw in a thousand places, and some will surely save you money up front. We figure our customers choose to buy from Highland Hardware because we're determined to validate your choice for years to come.

We're offering two editions of the Unisaw, each with Delta's durable 3HP, 230-volt single-phase motor. The standard Unisaw comes equipped with two surface-lapped cast iron extension wings, providing a table surface 36" wide by 27" deep. The Jet-Lock fence with built-in micro-set allows ripping up to 25" right of the blade, 15-1/2" left of the blade. The T-slot mitre gauge is equipped with adjustable positive stops at 90 and 45 degrees. The assembled saw weighs over 400 lbs.; stability is not going to be a concern.

A high-quality carbide saw blade will be

required to get the most out of your investment in the saw; the Delta 35-617 50-tooth combination, Delta's most popular blade, is an excellent choice. Freud's LU84M, also a 50-tooth combination blade, is another popular favorite. Many Unisaw owners end up with one blade for crosscutting and another for ripping & general-purpose work, and here we recommend Freud's LU73 60-tooth, or the superb LU85 80-tooth "super blade" crosscut along with an LM72 24-tooth rip blade.

The most popular accessory for the Unisaw is the Delta Unifence, a dead-accurate T-square type rip fence that comes with long rails for ripping up to 50" right of the blade. A built-in scale on the fence rail is graduated in 1/32" increments, and is accurate enough to eliminate the need for double-checking every setting with rule or tape. The Unifence is rated one of the best replacement fences on the market, so it's not too surprising that it's also one of the costliest. However, when the Unifence is purchased as part of the Unisaw, you can save over \$200 on the package (and still get Delta's \$200 rebate, too). The standard rails that come with the Unifence are 83" in total length — check your shop space before ordering! Some Unisaw owners have resorted to sawing off some of the rail length in order to accommodate this excellent fence in a small shop. When you've got plenty of space, you might choose the optional 128" long rails for the Unifence, which allow up to 96" rip to the right of the blade. Either set of rails comes with legs, table frame, and mounting hardware. Note that the Unisaw with Unifence comes with only one cast extension table, to be fitted left of the blade; the right extension is replaced by a 48"-wide shop-built table surface that provides a total working area 8'4" wide by 27" deep. If you've been dreaming of upgrading to a professional-quality tablesaw, then aim your dreams toward a Delta Unisaw with Unifence. It's not only a great machine; it's the most competitively priced package you can buy.

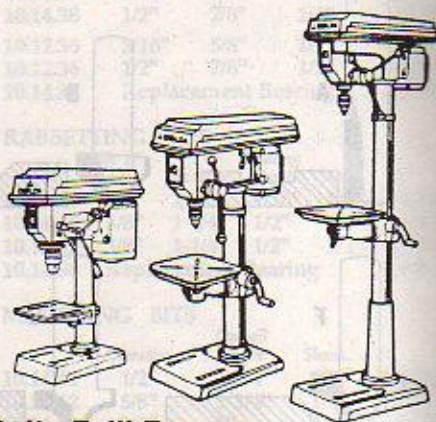
	Our Price	After Rebate
3 HP Unisaw	\$1548*	\$1348*
3 HP Unisaw with Unifence	\$1748*	\$1548*
Delta Unifence Bought Separately		\$399.00
Delta 35-617 50T Comb. Blade		\$39.95
Freud LU84M 50T Comb. Blade		\$49.95
Freud LU73M 60T Gen. Purp. Blade		\$43.25
Freud LU85M 80T Crosscut Blade		\$79.95
Freud LM72M 24T Rip Blade		\$48.25

*Discounted Truck Freight Extra



Unisaw with Unifence

DELTA



Delta Drill Presses

This trio of heavy drill presses made for Delta in Taiwan to Delta specs under Delta's close quality control supervision have proven themselves to be good quality machinery, despite the remarkably low prices at which we offer them for sale. We're pleased to report that we've not had a single problem with the large number of units we've sold. Of course, if you should ever require service for any reason, it's as close as one of the 150 Porter Cable/Delta repair stations across the U.S.

8" Bench Drill Press

1/4" motor and 1/2" chuck let you do full-size work; 5 spindle speeds (620-3100 rpm), 2" stroke, tilting table, and 7x7x24" high dimensions combine function and unobtrusive convenience. Weighs 48 lbs. Shipped UPS.

Delta 8" Drill Press \$119.95

14" Bench Drill Press

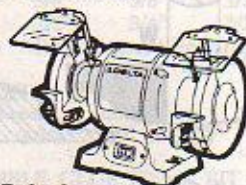
Heavy construction (145 lbs.), 1/2" chuck, 1/2 HP motor, adjustable depth lock with 3.3" stroke, 5 spindle speeds (460 to 2500 rpm) and compact dimensions make this an attractive choice. Shipped freight collect.

Delta 14" Drill Press \$229.95

16-1/2" Floor Model Drill Press

This heavy-duty model is our most popular. 5/8" chuck, 3.3" stroke, adjustable locking depth stop, 3/4 HP 115/230V motor, 12 spindle speeds from 250 to 3000 rpm, and 190-lb. mass make this a best buy. The flanged and slotted 12x12" table tilts 90 degrees in either direction, and can swivel out of the way for drilling large objects. Shipped by truck freight collect.

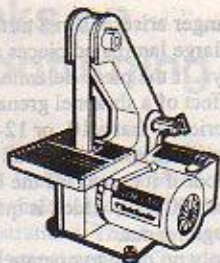
Delta 16-1/2" Drill Press \$299.95



Delta 6" Grinder

Includes 1/4 HP motor, medium and coarse grinding wheels, tool rests, & eye shields.

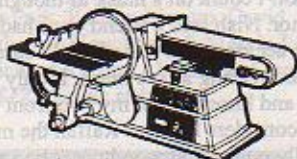
Delta 23-680 6" Grinder \$59.95



Delta 1" Sander/Grinder

A highly versatile little tool ideal for sanding small projects, this imported Delta tool also doubles as metal grinder, blade sharpener, and buffer. Table tilts for beveling or chamfering jobs. Can be used with or without steel platen. Optional flexible shaft accessory permits use of rotary cutters and grinding points.

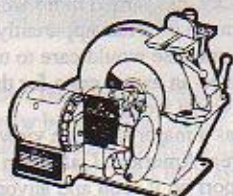
31-050	1" Sander/Grinder	\$69.95
31-055	Flexible Shaft	\$18.50
31-057	60-grit Coarse Belt	\$3.50
31-056	100-grit Medium Belt	\$3.50
31-054	Felt Buffing Belt	\$11.75



Delta 4" Belt/6" Disc Sander

Useful for sanding, shaping, beveling, chamfering or contouring. Belt operates horizontally, vertically, or at an angle. 1/3 HP. Weighs 42 lbs.

31-460	Belt/Disc Sander	\$149.95
31-465	4"x36" 60-grit Belt	\$3.90
31-466	4"x36" 100-grit Belt	\$3.90
31-467	6" 60 grit Disc	\$2.20
31-468	6" 100-grit Disc	\$2.20



Delta Universal Wet/Dry Grinder

Slow speed (70 rpm) 2"x10" 220-grit wet wheel runs partly submerged in a water bath for sharpening chisels and plane irons without overheating the edge. Auxiliary 1/2"x5" 3450 rpm dry wheel is good for knives, scissors, scrapers, etc. 1/5 HP.

23-700	Delta Wet/Dry Grinder	\$139.95
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Delta Light-Duty Shaper

Exceptionally low price on this 1 HP 1/2" spindle shaper with stand. Cast iron table is 15-1/2"x18". Optional adapter allows use of 1/4"-shank router bits. Shipped freight collect.

43-122	1 HP Shaper	\$429.00
43-185	1/4" Router Bit Adapter	\$89.95

BOSCH



New Bosch Panther Recipro Saws

Bosch has recently joined the reciprocating saw market with a heavy-duty entry, the Bosch Panther. Its 8.4 amp motor outpowers Milwaukee, Makita, Porter-Cable & AEG for rugged performance capability. Model 1631K has 2 speeds: 1900 & 2400 rpm. Model 1632VSK has 0-2400 rpm variable speed range plus 4-position orbital action control.

Purchase either model Bosch Panther by Dec. 31, 1988, and get \$25 in free blades. 1631K 2-Speed Recipro Saw \$139.95 1632VSK VS Orb. Recipro Saw \$149.95



New Bosch 1654 7-1/4" Circular Saw

Responding to industry demands, Bosch has introduced this spring its new pivoting shoe builders saw, which features a rugged 13 amp motor, yet weighs only 10.9 lbs. Max depth of cut is 2-7/16" at 90 degrees, 2" at 45 degrees. Has spindle lock for easy blade change and external brushes for easy maintenance. Includes carbide blade.

1654	7-1/4" Builders Saw	\$99.95
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New Bosch 1611 3 HP Plunge Router

A leader among router manufacturers, Bosch offers this new entry in the plunge router market. Large handles for solid control. Heavy 14 amp, 3 HP motor runs 22,000 rpm. Maximum plunge depth 3". 3-position adjustable depth stop. Shaft lock for easy bit change. 1/2" collet is standard.

1611	3 HP Plunge Router	\$249.95
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Bosch 1604 1-3/4 HP Router

A superb utility router featuring interchangeable 1/4" and 1/2" collets. 25,000 rpm. Smooth and precise depth of cut control. Weighs only 7-3/4 lb.

1604	1-3/4 HP Router	\$129.95
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Bosch 1272D 3 x 24 Belt Sander

Extra-powerful 10.5 amp motor gives superb performance in rugged applications. 1550 SFCM. Weighs 14 lb. Includes dust bag.

1272D	3 x 24 Belt Sander	\$189.95
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Bosch 1581VS Jigsaw

Use this saw one time, and you'll know why it is universally acknowledged as the finest there is. Steady, precise control is virtually effortless - in fact, it's hard to believe that reciprocating action can be engineered to be so smooth. Includes 4 orbital-action settings and a speed range from 500 to 3100 strokes per minute. 4.8 amp industrial-duty motor. Blower keeps cut line free of sawdust. Weighs 5.5 lbs.

1581VS	Orbital Jigsaw	\$139.00
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Bosch Jigsaw Blades, Pack of 5

(See chart below for specs)

05.16.11	T144D	5.00
05.16.12	T244D	6.45
05.16.13	T101B	5.50
05.16.14	T119BO	5.50
05.16.15	T101BR	5.50
05.16.16	T127DF	8.70
05.16.17	144DF	9.55

Bosch Blade Specifications

Blade	Length	tpi	Application
T144D	4"	6	Fast rough cut
T244D	4"	6	Fast rough scroll cut
T101B	4"	10	Very clean cutting
T119BO	3"	12	Tight scroll cutting
T101BR	4"	10	Laminates
T127DF*	4"	8	Metals up to 1/4" thick
T144DF*	4"	6	Nail-resistant rough-in

* Bi-metal blades with HSS edge.



Dale Nish Lectures in Atlanta

by Jack Warner
©1988 The Atlanta Journal and Constitution

IF DALE NISH had not become the foremost teacher of woodturning in this country, he could have found steady work as a comedian.

Even if you are an accomplished turner beyond the need of basic instruction, a seminar with Nish is worth the price of admission as entertainment.

A perfect image of the dour Scot, he rarely laughs aloud, managing a wry grin at most.

But sardonic wit, japes and anecdotes about himself and his best friends, who are the rest of the world's great turners, merge into a steady stream of comment as he works.

In terms of technique, Nish is entirely orthodox. He employs no odd tools or methods.

In the two-day seminar I attended recently at Highland Hardware in Atlanta, he confined himself entirely to a Superflute gouge, a 3/8-inch gouge, a 1/2-inch shallow gouge, a heavy round-nosed scraper, a skew chisel and a parting tool, for both facework and spindle turning.

He works quickly and economically, concerning himself with simple, graceful bowl shapes and not emphasizing thinness of wall.

Remember, speed kills

Nish had much to say about safety at the lathe, but it could all be boiled down to two words: speed kills.

"I often am called to act as an expert witness in lawsuits" involving injuries received at the lathe, he said. "I've never seen one yet that didn't involve high speeds," speeds much higher than are necessary.

It is an unfortunate thing that all commercial lathes with which I am familiar are made to turn much faster than most turners would ever need — 2,500 rpm and higher — while none has speeds as slow as we would want. About 375 rpm is the slowest I've seen; 100 would be nice.

Speeds above about 1,200 rpm are pretty much in the province of spindle turning.

I don't think a bowl turner really needs to run his lathe any faster than that, although certainly some very well-known turners do.

What is important is not really the speed of the lathe, but the speed of the perimeter of the workpiece.

I am not mathematician enough to provide an answer, but you can imagine that if your lathe is turning at 800 rpm, and a piece 12 inches wide is mounted on the spindle, then the perimeter speed is much greater than the spindle speed. (Editor's note: a bowl's perimeter speed at 800 rpm is about 30 mph. At 2500 rpm, it would be about 90 mph).

Particular danger arises when a turner attempts to work large laminated pieces at high speeds, Nish says. If the piece delaminates, it has much the effect of a shrapnel grenade.

It is my experience that a 10- or 12-pound chunk of wood will do nothing but fall directly to the floor if it comes off the lathe at a speed of 400 to 500 rpm, which is quite adequate for roughing out.

There is simply no need to operate the lathe at speeds high enough to pose an obvious safety risk.

The lurking danger, of course, is the delamination problem. Even a piece of solid wood, if it is faulty internally, can break into small pieces in an instant.

Wear a Protective Mask

A lathe speed that might not be nearly enough to throw the whole piece of wood could well be enough to hurl parts of it with destructive force. That's why it is wise to wear a protective mask.

But don't count on a mask as though it were armor. Nish said a friend once had a fearsome accident and remarked, "I sure am glad I was wearing a face mask. It only broke my nose and knocked out my two front teeth."

Nish considers Richard Raffan the most technically competent woodturner he knows, and I can't imagine there are any turners of note anywhere in the world he doesn't know. But he says Rude Osolnik is the best turner he knows.

I am not quite sure of the difference, but I expect it may have to do with Osolnik's view, as Nish put it, that "there is no such thing as scrap wood."

Nish contends the venerable turner of Berea, Kentucky, has turned more wood than anyone, and much of it has apparently been wood that no one else would care to turn; he actually received an award once for the best utilization of waste wood.

Osolnik has a major show on view right now at the Great American Gallery in Atlanta; I expect to report on it soon and anyone interested in the art of the woodturner should not miss it.

Also to be seen at the gallery is a new collection of Nish's wormy ash pieces.

These items — most of them formal vase shapes — are quite remarkable and show Nish's approach to turning at its best.

The forms are excellently judged; the worm-eaten wood is sandblasted and left unfinished, which grays the surface and gives the pieces the look of something antediluvian, formed by eons of erosion rather than turning.

Actually, Nish says, the sandblasting came about as a practical matter — the worms that invade any fallen ash in Utah pack their tunnels with their leavings, which harden like cement.

Sandblasting, he says, was the only practical way to clean them up.

Jack Warner is a woodturner, potter, and writer for The Atlanta Journal and Constitution. Reprinted with their permission.

Books on Woodturning

Creative Woodturning by Dale Nish.

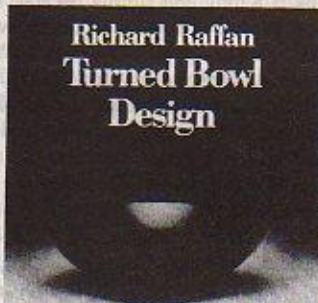
Nish's first book is a practical handbook of turning techniques, clearly presented with large illustrations. This has been one of America's most popular "how-to" turning books ever published. **\$12.95 plus shipping.**

Artistic Woodturning by Dale Nish.

His second book presents his own approach to achieving variety in wood turning, as regards to both design and technique, and is ideal for advancing woodturners. **\$12.95 plus shipping.**

Master Woodturners. by Dale Nish.

In what Nish considers the best of his three books, he explores in illustrated detail the step-by-step methods and work of nine of the world's leading master woodturners, including Rude Osolnik, Ed Moulthrop, David Ellsworth, Ray Key, Mark & Melvin Lindquist, Richard Raffan, Al Stirt, and Jack Straka. **\$17.95 plus shipping.**



Richard Raffan
Turned Bowl
Design

Turned Bowl Design by Richard Raffan.

In this new book Raffan shows readers how to create bowl design that will "continue to delight the eye and hand long after the wood's color and grain have faded." Chapters deal with the wood itself, essentials of good design: the external profile of the bowl, the internal form, balance, scale and weight, cutting sides, decorating surfaces, and more. 176 pages, softcover. **\$16.95 plus shipping.**

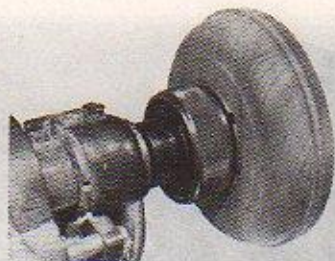
Turning Wood with Richard Raffan.

A "how-to" book published by the Taunton Press featuring one of the world's leading turners. In-depth text is augmented by hundreds of captioned photos. **\$17.95 plus shipping.**

VIDEOTAPE:

Turning Wood with Richard Raffan

This video is a companion to Raffan's book by the same name. Captures the book's more dynamic details, allowing you an up-close perspective on basic techniques as well as 6 complete projects. 2 hours. VHS Format. **\$39.95 plus shipping.**



6-in-1 Chuck Close-Out

The forerunner to Sorby's renowned Precision Combination Chuck, the 6-in-1 Chuck is still being manufactured, though we have discontinued it here at the store.

We have limited remaining stock to fit the following lathes:

Myford ML8	1" x 12 TPI
Myford ML8 (outboard)	1" x 12 TPI (LH)
Rockwell/Delta 11" & 12"	1" x 8 TPI
Rockwell/Delta (outboard)	1" x 8 TPI (LH)
Rockwell Homecraft	3/4" x 10 TPI
Shopsmith	5/8" Plain
Hegner	33mm x 3.5

The 6-in-1 Chuck combines the four traditional chucking methods - face plate, screw chuck, ring chuck, internal screw chuck, plus the split ring chuck for holding long slender work, and the revolutionary expanding dovetail chuck which allows bowls, platters, etc. to be turned without requiring screw holes.

The chuck is supplied with 3-3/4" diameter collets, split ring, wrenches, & woodscrew. It uses the same face plate rings and expanding collets as the Precision Combination Chuck described on page 17 of our catalog.

While our limited supplies last, the 6-in-1 Chuck is offered for \$69.95 plus \$5.00 shipping. When ordering, specify lathe model. If we are sold out of your size, your money will be promptly refunded.



New 3-Jaw Chuck Accessory for Precision Combination Chuck

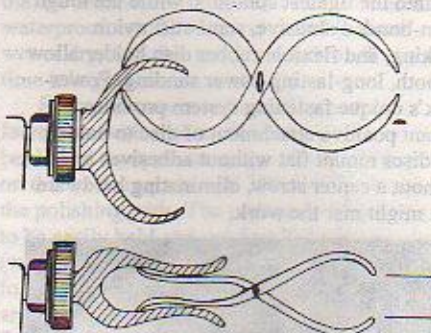
Expressing an awareness of the need to provide users of the Precision Combination Chuck the facility to hold smaller diameter work, Sorby has now begun producing a new accessory based on the popular 3-jaw chuck, but at a very realistic price. The simple arrangement of 3 jaws clamps work between 1/8" and 7/8" diameter. The jaws grip onto spigots up to 1" long. Easily assembled and dismantled in seconds. Fits directly in chuck body. Requires no additional items to use besides the Precision Combination Chuck.

Available from Highland Hardware for \$39.95 plus \$4.00 shipping.

Double Ended Calipers

Another set of new products from Sorby are their chrome plated double ended calipers for bowl turners. Model 977 (top) is the essential tool for indicating wall thickness of bowls by transferring the measurement from one end of the caliper to the other. Model 976 (bottom) serves as both inside caliper and outside caliper, and also transfers the measurement to the other end of the caliper in positions where the caliper setting would otherwise have to be altered for the caliper to be removed.

Model 977 7" Double Ended Calipers are available for \$17.50. Model 976 6" Double Ended Inside/Outside Calipers are \$14.50.



Special Package Deal on Hot Stuff Adhesives



Hot Stuff is a "super-glue"-like adhesive which is very useful when turning bowls with punky areas that want to fall apart, or at the intersection of bark and sapwood, where delamination wants to occur. This cyanoacrylate liquid sets up hard in less than a minute (almost instantly if a special

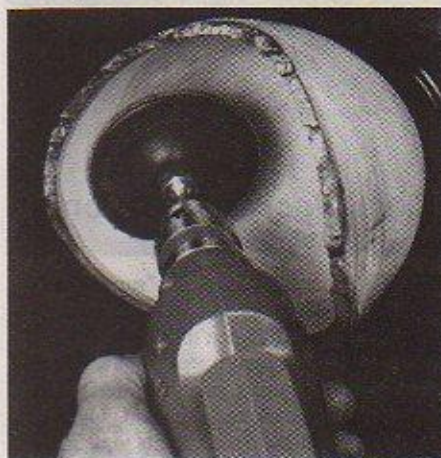
accelerator is sprayed on) and effectively reinforces the bowl material. For filling small holes or pits, there is a thicker gap-filling version of Hot Stuff which will remain on a surface long enough for sawdust to be added to make a wood filler.

There are 3 kinds: Original Hot Stuff, the regular adhesive which is about as runny as water; Super T Hot Stuff, which is a little thicker but will still penetrate readily into small crevices, and Special T Hot Stuff, which is fairly viscous and makes a good medium for filling modest pits or cracks. The Hot Shot Accelerator comes in a pump spray bottle for easy application. We highly recommend getting Hot Stuff Solvent; the adhesive, like all the "super glues", can bond flesh almost instantly.

Our package deal includes one each of the Original Hot Stuff, Super T gap filling Hot Stuff, Special T ultra-gap filling Hot Stuff, Hot Shot Accelerator, and Hot Stuff Solvent. Purchased separately, they would cost \$40.30. **Available for a limited time for just \$29.95 plus \$3.00 shipping, a savings of 25%.**

Power-Lock Sanding Systems

EVERY TIME we host a woodturning class here at the store, the professional turners doing the teaching frustrate the students terribly by using and recommending an excellent disc sanding system that we don't sell. Or didn't sell, that is. Now Highland Hardware is pleased to offer the Power-Lock quick-change sanding disc system for turners and wood finishers of any ilk. Compact disc sizes (2" and 3" diameters) get into the tightest contours, while the tough resin-bonded abrasive, semi-stiff nylon backing, and flexible rubber disc holder allow smooth, long-lasting power sanding. Power-lock's unique fastening system provides instant positive attachment of disc to holder; the discs mount flat without adhesives and without a center screw, eliminating hardware that might mar the work.



Turners in particular are attracted to Power-Locks because of the ease with which discs can be snapped on and off the holder. A bowl or spindle on the lathe can be sanded through four or five grits in the shortest possible time; high-speed sanding with industrial-quality abrasives makes the work go very quickly, and only a few casual seconds are needed to change from one grit to the next. Many turners find that using their highest-speed drill (an inexpensive single-speed 1/4" drill works perfectly) lets them finish right up to 240 grit without digging in an edge, leaving swirl marks, or worrying about tearing a disc and damaging the work as a result. Power-Lock discs were originally designed for industrial use on metals, fiberglass, and plastics; they are rated for use at up to 20,000 rpm on the 3" size, which gives some idea of their toughness. Their al-ox abrasive stays sharp and remains bonded to the discs far longer than ordinary sanding discs, so that with occasional unclogging with an abrasive belt cleaner (or scrubbing under a faucet), each disc remains usable until you're practically sick of it.



2" POWER-LOCK HOLDER \$6.50
3" POWER-LOCK HOLDER \$6.95

2" POWER-LOCK ABRASIVE DISCS
Pack of 10 of one Grit \$3.95
Pack of 50 of one Grit \$17.95
(Specify grit: 60, 80, 100, 150, 240, or 320)

3" POWER-LOCK ABRASIVE DISCS
Pack of 10 of one Grit \$4.95
Pack of 50 of one Grit \$22.50
(Specify grit: 60, 80, 100, 150, 240, or 320)

Flex-Edge Discs

In addition to the standard Power-Lock discs listed above, we also offer Flex-Edge discs. On these, the outer 3/8" or so of the disc has not been laminated to the nylon backing, thus making it quite flexible for sanding very soft or delicate walls and rims. We stock Flex-Edge discs in 3" diameter only.

3" FLEX-EDGE DISCS
Pack of 10 of one Grit \$5.95
Pack of 50 of one Grit \$27.50
(Specify 60, 80, 100, 120, or 180 grit)

Power-Lock Buffing Discs

We also carry non-woven nylon buffing discs (like Scotch-Brite pads) for fine finishing and polishing. These 3" pads are available in 400 and 600 grit sizes.

3" BUFFING DISCS
Pack of 10, 400 Grit \$9.95
Pack of 10, 600 Grit \$9.95

Power-Lock Extension Mandrel

Another handy accessory is the 8" extension mandrel (*fits 3" disc holders only*), which will let you get your sanding discs into deep, narrow vessels and other hard-to-reach places.

Power-Lock Extension Mandrel \$5.50

Power-Lock Test Kit

We have at this time a limited supply of an excellent bulk package for those of you wishing to get into the Power-Lock system in a thorough way, as well as for anyone looking to stock up at the best possible price. The Test Kit includes about \$72 worth of equipment: 150 sanding discs from 1" to 3" size in several grits, four disc holders, a couple of different surface prep and buffing pads, a few flex-edge discs, and a handful of premium 2" discs suitable for use on hardened steels. This kit will get you started and keep you in business for a long time to come, all for \$49.95.

Power-Lock Test Kit \$49.95

Modern Practical Joinery

by George Ellis

This book is a republished edition of a book written by George Ellis first published in 1908. At the time of its original printing, it was recognized as one of the best books on joinery ever written. After leafing through the new edition for five minutes, I knew it was one of those books that I had to own.

It contains 486 pages divided into 27 chapters covering a wide range of subjects, including: hand tools; workshop practice; the steel square in joinery; doors and panelling; fittings for banks, museums, libraries and churches; airtight case work; shaped, curved and bevelled work; stairbuilding; the theory of handrailing; and an excellent chapter on moldings.

While this book is not "modern" in our terms, it still remains very "practical". The emphasis is on work done by hand, but the classical construction elevations provided are useful regardless of whatever method of work you might choose today. Good joinery doesn't really change, only the way in which we do it.

Although the chapter on machines is a bit outdated, Ellis does provide relevant information on fundamental machine techniques.

The book is a long one simply because the author covers the broad subject of joinery with great thoroughness. Ellis defines joinery as "the art of preparing, constructing and fixing the internal and external wood fittings of a building, as distinguished from carpentry, which in like manner deals with the constructive work."

This book is a true classic, and a must for the library of anyone serious about doing woodwork. — *Reviewed by Brad Packard*

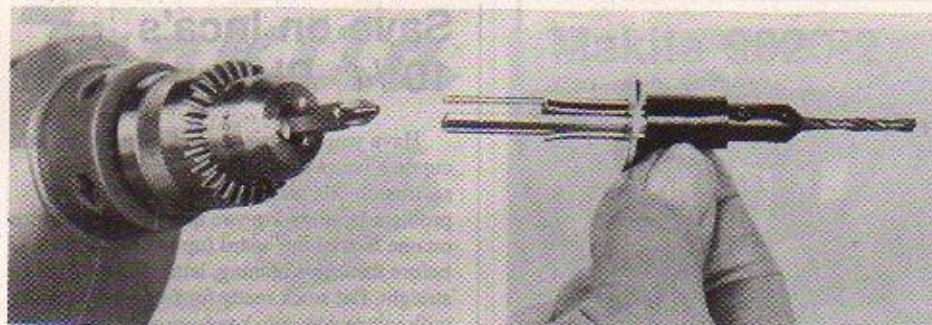
Modern Practical Joinery is available from Highland Hardware for \$15.95 plus \$3.00 shipping. Order form is on page 31.

George Frank Announces New Book, China & Italy Study Trips

World-renowned wood finisher George Frank leads a study trip to China June 3-19, with visits to Chinese furniture factories, museums, and the Xian Raw Lacquer Research Institute, with plenty of time for guided sightseeing. Cost is approximately \$3200 per person. A trip to study Italian furniture is scheduled for October 12-26. Cost is \$2150. For registration information, call (813) 923-3377, or write Eva Frank, 3504 Beneva Rd, Sarasota, FL 34232.

George's new "how-to-finish" book, *George Frank on Woodfinishing*, has just been released by Sterling Publishers. This 144 page hardbound volume contains step-by-step details for the French polishing and decorative filling techniques for which he is famous, as well as fundamentals of using shellac, lacquer, oil, varnish, and wax. 80 full-color photos.

It is available from Highland Hardware for \$19.95 plus \$3.00 shipping.



Chuck-Mate Quick-Release Countersink Bits

EVERY NOW AND THEN the job of choosing a new product becomes blessedly easy. Nobody has to put on a big sales pitch, or call you back twelve times, or tell you that the Lord will call them home if you don't buy their stuff. Some tools are so obviously *right* that you can take one look and start talking about how many to order. We had the pleasure of running across such a product not long ago, and we think you'll feel the same way we did about it. Chuck-Mate countersink bits are fantastic. The design looks right, works right, and doesn't cost an arm and a leg. If the Chuck-Mate countersink system had been invented thirty years ago, you would already have saved about a year's worth of fumbling time while putting things together with screws.

By now, millions of people have discovered that driving screws with a drill or cordless screwdriver is the only right and sensible way to live. (Most use drywall screws, because their sharp points, thin shanks, and hardened phillips heads make machine installation a breeze.) Truly dedicated assemblers buy two drills, one for drilling and/or countersinking, the other for use as a screwdriver. The rest of us do a lot of grumbling and spend a lot of time changing from drill bit to phillips bit and back again. For those of you who've already bought a second drill, don't worry, maybe you can sell it to your brother-in-law. For the rest, congratulations - Chuck-Mates are about to make life much easier.

Choose a screwdriver bit of 3/4" to 2" length, and chuck it in your drill. Notice that the chuck jaws hold three sides of the hex-shank bit, leaving three gaps between. The Chuck-Mate countersink bit has three long prongs which cleverly slip right into these gaps alongside the driver bit; three short prongs land on the chuck jaws to stabilize the system, and a washer pulls down on all six prongs to lock the whole thing in place. Zip! You're set up for piloting and countersinking. Pull the locking washer loose, slip the Chuck-Mate off, and zap! You're back in screwdriver mode. It's almost too good to be true.

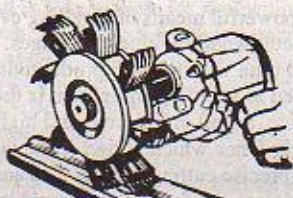
We stock four sizes of Chuck-Mate countersink/pilot drills, for #6, #8, #10 and #12 wood screws. Countersink diameter is 3/8" for #6-10, 1/2" for #12, with 3/8" max. depth. An optional stop collar can be used for positive control of countersink depth. Bit length can be adjusted for hole depth from 1/2" to 1-3/4". And the bits are standard stuff; broken or worn-out bits can be replaced with twist bits of appropriate diameter from your local hardware store. Chuck-Mates are sold individually, or as a set of all four sizes. Also available are #5 and #9 self-centering Vix bits for hardware installation, fitted with the Chuck-Mate mounting system.

CHUCK-MATE Countersink/Pilot Drills

For #6 Screws	\$12.50
For #8 Screws	\$12.50
For #10 Screws	\$12.50
For #12 Screws	\$14.50
Set of All 4 Above	\$48.95

3/8" Stop Collar (fits #6, 8, & 10)	\$2.50
1/2" Stop Collar (fits #12)	\$2.50

Chuck-Mate with #5 Vix Bit	\$12.50
Chuck-Mate with #9 Vix Bit	\$12.50



Sand-O-Flex Contour Sander

Sand-O-Flex has long been the professional's choice for sanding curved surfaces and contours that normally require tedious hand sanding. May be used for wood carvings, moldings, and turnings without destroying detail. Firm cushioning bristles force abrasive strips around corners, following contours and distributing pressure evenly over surfaces to prevent flattening of rounded areas.

Weights 9.5 oz. Comes fitted with 1/4" mandrel for chucking in electric drill. Maximum rpm is 2500. *Wear eye protection.* Includes roll of coarse abrasive, which is fed from 4" diameter body of sander as abrasive wears. Refills available in 2.44 yard rolls.

Sand-O-Flex Contour Sander	\$19.95
Coarse Refill	\$4.95
Medium Refill	\$4.95
Fine Refill	\$4.95

EverSand Sanding Pads

ANOTHER NEW sanding product from Highland Hardware is the EverSand collection of sanding pads, which promise to make hand sanding as easy as it's ever likely to become. The unique EverSand system starts with an industrial-grade 3M resin-bonding process far more durable than that found on conventional sandpaper. In fact, the bond is so good that the manufacturer can guarantee these pads will outlast ordinary sandpaper 10 to 1. The stuff is waterproof, which of course lets it be used wet or dry, and also lets you wash it off every time it begins to clog with dust.

Each pad consists of a 1/8" closed-cell foam core with sheets of different grit laminated on opposite sides: 100 and 220 grits on the medium pads, and 280 & 400 grits on the polishing pads. The pads are stiff enough to be easily held and used on flat surfaces (with no slippage to deal with as when using folded sheets), and flexible enough to wrap around tight contours for sanding in the round. Folding the pad doesn't break it or leave a sharp edge to damage your work. Measuring 2-3/4" by 4-7/8", the pads are just right for most hand sanding, and can be cut with household scissors to any custom shape desired.

Also available in the same two-grit configurations are two EverSand sanding blocks: one with a 3/4" wood core, the other a flexible model with 3/4" medium-density foam. These blocks, 2-3/4" by 4", fit quite comfortably in the palm for extended sanding with even pressure distribution on flat or contoured surfaces.

If your work is too delicate for machine sanding, or whenever you've sanded as fine as the machine can go, these EverSand pads will suit your finishing needs perfectly. From polishing wood to cleaning rusty tools to rubbing out an oil finish, EverSand pads will do the job, and keep on doing it.

EVERSAND SANDING PADS

100/220 grit Medium Pad	\$1.79
280/400 grit Fine Pad	\$1.79
Six-pack: 3 of each pad	\$9.50

WOOD-CORE BLOCKS

100/220 grit Medium Block	\$2.79
280/400 grit Fine Block	\$2.79

FLEX-CORE BLOCKS

100/220 grit Medium Block	\$1.99
280/400 grit Fine Block	\$1.99

Order Form is Located on Page 31.

INCA

Inca's Unique Radial Arm Saw Reduced to \$599

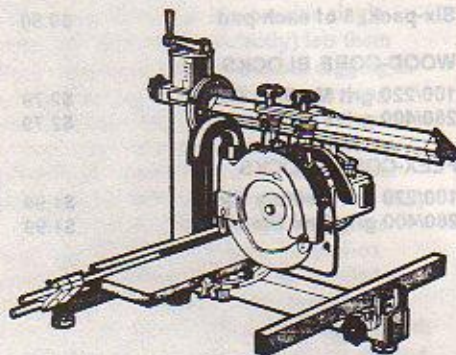
No other radial arm saw in this price range comes close to matching the capacity and features of the 810. By utilizing the optional long extension arm, the saw can cross-cut panels an incredible 28" in width at 90 degrees (18" at 45 degrees). Without the extension, maximum crosscut is 16" at 90 degrees and 11-1/2" at 45 degrees.

Instead of relying upon a rotating arm for miter cuts the way most radial saws do, the 810 features an extra-stiff steel box beam rigidly fastened to a large flange and clamping assembly. For miter work, the table is rotated, not the arm. As a result, crosscuts are far more accurate than is possible with any other radial arm saw in this price range. The table itself can be repositioned forward or back and clamped in the most advantageous position for the job at hand. The saw motor, supported by a cast iron roller carrier with four ball-bearing rollers, rides on the arm. Rip cuts are made by sliding the saw motor off the arm, turning it 90 degrees and sliding it back on. This process takes less than a minute, and provides a stable and accurate mount for repeat ripping. Maximum depth of cut is 2" at 90 degrees and 1" at 45 degrees. Maximum blade diameter is 9". Motor is 110v 1 HP.

An optional router carriage with a plate to support a router is a low-cost accessory which adds great flexibility to this piece of equipment. It can be installed or removed in seconds, and gives you unparalleled control of your router for cuts at any angle.

Saw and accessories can be shipped UPS.

810	9" Radial Arm Saw	\$599.00
810.1	Extension Arm	\$138.50
810.2	Metal Stand	\$198.75
810.4	Router Carriage	\$124.50



Includes 3 HP Motor & Switch

Inca 2100 Table Saw Special Edition Now Only \$2795

Inca has produced for the U.S. a special edition of its heavy-duty 12" table saw which features a 3 HP motor with magnetic switch as standard equipment. Saw, motor and switch bought separately last fall would have cost \$3290. While current supplies last we are offering the new edition (Model 2100SE) for only \$2795, almost a \$500 savings.

This large industrial-duty machine is designed to handle work ranging from ordinary ripping and cross-cutting to precision joinery applications, and is capable of doing so on a production basis. The convenience built into the 2100's design make it both a joy to use as well as a powerful means of handling even the most difficult woodworking challenges. Its fast set-up time will increase productivity.

Included as standard equipment is the Inca Masterfence, a well-engineered and highly versatile rip fence which allows instantaneous setting of precise cutting widths. The auxiliary straight edge on the fence can be used in any of four positions to accommodate workpieces of all sizes. Ripping capacity with standard rails is 25" to left or right. Optional long rails increase ripping capacity to 50".

The standard table size is an incredibly large 27" x 31" with a full 12" of table surface in front of the blade. The mitre guide is the classic Inca design featuring a fully adjustable fence and adjustable drop stop.

For bevel cutting, the saw's 1" arbor tilts up to 45 degrees, and a vernier scale allows setting the angle to within an accuracy of 1/6 degree.

Optional is an extremely solid and well-built tilting mortise table, and an overarm European SUVA blade guard.

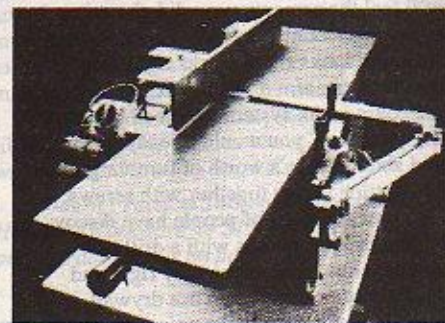
Call or write for an illustrated color brochure on the 2100. If you're in the market for a large industrial-duty table saw, we urge you to order while supplies remain at the low \$2795 price. Shipped by truck freight collect.

Save on Inca's 10 1/4" Planer-Jointer

Have you ever tried to get an accurate, safe cut on a warped board? The wide jointer section on this machine can solve this problem by allowing you to joint a flat surface on one face of the board (up to 10-1/4" wide) before thickness planing, letting you create straight, flat stock ready for further processing with your table saw, bandsaw, or router.

Two models of this superb machine are available. Each is an extremely smooth-running machine capable of excellent results on even the densest hardwoods, and the price was recently reduced on both models.

The newest model 570, which had been selling for \$2250 including 2 HP motor, now is available for \$2145. It features the revolutionary Swiss 3-knife Tersa cutterhead. It produces an incredible 18,000 cuts per minute, and uses disposable self-aligning double-edged planer knives which require just 30 seconds for accurate installation. Utilizing the thicknesser's 11 fpm feed rate (high speed is 16 fpm), the 570's cuts-per-inch ratio is a staggering 136, producing the smoothest machined finish on hardwoods this side of a super surfacer.



The model 550 is identical to the 570, except that it uses a 2-knife cutterhead with conventional knives whose height is adjusted up or down by turning set screws located near the end of each knife. At the lower feed rate, the 550 produces 91 cuts per inch, still an outstanding ratio which results in superbly smooth finishes.

The 550 is currently on special at Highland Hardware for \$1795 including 2 HP motor, while limited sale quantities last. Its price last fall was \$1950.

As an automatic-feed thickness planer, either model handles material up to 10-1/4" wide and 6-1/4" thick. The stainless steel planer table requires no feed rollers, making possible a completely straight, even cut. As a jointer, it provides an amazing 10-1/4" wide cut, with a table length of 42". Height of both infeed and outfeed tables is adjustable. Changeover from planer to jointer requires only a few seconds.

Both planers are shipped truck freight collect.

Makita



MAKITA BO4550 DUSTLESS PALM SANDER

This new version of Makita's palm sander includes a dustbag and is quite efficient at collecting sanding dust through holes in the sander's base. After a quarter sheet of sandpaper is mounted, a device is used which instantly pierces 6 holes in the paper allowing dust to enter the collection system. 1.6 amps, 14,000 opm. 2.1 lbs. Ball-bearing constr.

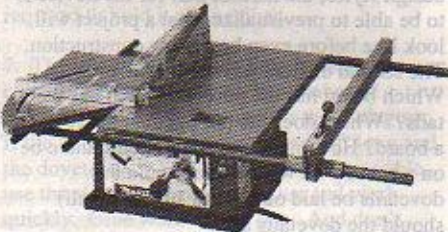
BO4550 Dustless Sander \$59.95



NEW MAKITA 6720DW CORDLESS SCREWDRIVER

Makita quality is now available in this popular new style of cordless screwdriver. Though cheaper versions can be found, Makita's entry is made to hold up under rugged industrial conditions. High-torque reversible 150 RPM motor features electric brake to avoid stripping screw heads. Uses 1/4" hex bits. Drives screws up to #8 x 3/4". Weighs .9 lbs. Length is 8-1/4". Built-in 2.4V battery recharges in 3 hours. Charger is included.

6720DW Cordless Screwdriver \$49.95



MAKITA 2711 10" TABLE SAW

This new tablesaw from Makita comes very close to defining what a contractor's saw should be. The saw with motor weighs only 71-1/2 lbs., an easy load to take to and around the job site. The 12 amp, 3800 rpm, 115V direct-drive motor puts out 2HP with enough torque for any cutting job. The 10" blade cuts 3-5/8" deep at 90°, or 2-1/2" deep at 45°. Quick-lock fence allows 24" rip right of the blade. A unique built-in sliding table with detachable miter fence allows accurate mitering and cut-off up to 13-1/2" wide at 90° or 12" wide at 45°. Table is 27-1/2" x 23-1/2" including sliding assembly. Shipped by UPS.

Makita 2711 10" Tablesaw \$499.00
Legstand for 2711 \$75.80

Makita 9820-2 Blade Sharpener on Sale for \$175



The 9820-2 comes equipped for sharpening jointer and planer knives up to 16" long with great speed and accuracy. It will handle any make of knife from 1/2" to 2" wide and up to 3/8" thick.

The great advantage of the Makita sharpener over conventional grinders lies in its use of waterstones; sharp, fast-cutting abrasives found only in Japanese waterstones and the cooling action of gravity-fed water lubrication allows efficient, non-stop sharpening while completely eliminating the danger of overheating a knife's cutting edge and spoiling its temper.

The 1000-grit stone supplied with the machine will put a fine edge on even the dullest knife in a hurry, or will hone in less than a minute after first grinding on the optional 120-grit coarse Green wheel. The Green wheel does an incredibly fast job of grinding out nicks and reshaping bevels, and is also suitable for sharpening carbide tools. An optional 6000-grit polishing stone is usually used for final polishing on hand tools, but can be used for putting a superior edge on machine knives when they're being used on really challenging lumber. Doing your own sharpening with a 9820-2 also provides several important advantages over using commercial sharpening service.

ECONOMY - you don't need two sets of knives; spend twenty minutes with the set that needs sharpening and put them right back on the machine. Your knives will also last many times longer when they're not subjected to an arbitrarily heavy and wasteful grind.

QUALITY - the standard 1000-grit stone provides an edge much sharper than the usual commercial grind, sharp enough to shave if you're good at it. This lets your machines do their job better and easier than ever, so you reduce wear on the machines, improve your millwork and reduce finishing time. And your knives will need sharpening less often to boot.

The 9820-2 will also put an edge on just about any hand tool in the shop. The optional accessory jig (mfd. by Highland Hardware) lets you grind and hone chisels and plane irons (up to 2-1/2" wide) to a straight, sharp bevel without worrying about heating the edge. Carving tools, turning tools, even kitchen knives and scissors can easily be worked with the tool rest removed for full access to the stone.

Technical data is as follows: motor is rated for continuous duty at 175 watts, 1.6 amps at 110 volts, with no-load speed of 560 rpm. Weight (with stone) 19 lbs. Stones are 8" diameter, 1" thick, easily interchanged. Water supplied by removable, variable-flow tank. 16" machine knife holder (holds two or three short knives in tandem) is standard equipment.

The 9820-2 has long been one of our best-selling power tools; we've always recommended it as an excellent buy in a sharpening machine. For all your grinding and sharpening needs, we think there's no better value anywhere.

Special Price thru 7-31-88 \$175.00

9820-2 Sharpener	Regular \$195.00
Highland Accessory Jig	\$10.95
120 Grit Green Wheel	\$42.00
1000 Grit Medium Wheel	\$38.00
6000 Grit Fine Wheel	\$49.00



MAKITA 6093DW Cordless 2-Speed VSR Driver/Drill

This may well be (for the time being) Makita's ultimate 9.6-volt cordless drill. The 6093DW features variable speed within two distinct ranges, 0-400 rpm or 0-1000, allowing the user to maximize torque for heavy screwdriving or large diameter boring, or to opt for maximum installation or drilling speed. The tool also offers a six-stage variable-torque clutch for total control over screwdriving force. The 6093DW comes with removable one-hour fast-charge battery, 110-volt charger, a double-ended #2 phillips bit and a steel tool case. Net weight is 3.8 lbs.

6093DW Cordless Drill	\$149.00
Spare 9.6 Battery	\$48.00
Replacement Charger	\$58.00

The Story of Dovetails

By Bill Stankus

THE CLASSIC woodworking joint known as dovetails is one of the best methods ever devised to hold wood together. The name dovetails comes from the fact that the shape of the joint's surfaces flair out in a manner suggestive of the tail of a dove. The interlocking joints for the two board edges are called tails and pins. It is easiest to see this when the two boards are not mated together because the tail piece does look like a row of bird tails and the pin piece is best seen as a row of angled locking surfaces.

The origins of the dovetail are so far back in the history of Europe, Asia and the Middle East that it is impossible to speculate as to when and where it came to be. However, it is easy to construct a reasonable scenario as to why it came to be. Until the advent of quality glues and mechanical fasteners the only guaranteed way of keeping furniture (or other items requiring framework) together was to create some sort way for one board to interlock with another. Added to this was the fact that glues could be considered unreliable (not water resistant) and that the working of the wood required hand tool usage. Furthermore, ancient and modern craftsmen alike have wanted their wares to resist the ravages of wood movement brought on by temperature, humidity, seasonal changes and age. And to answer these problems there are two broad groups of woodworking joints: the mortise and tenon group and the dovetail group.

The mortise and tenon group includes a diverse range of joints, such as, the simple mortise and tenon (either in round or flat stock, through, blind or wedged); the double mortise and tenon; fox-wedged; haunched; open; oblique; mitered; notched; and pinned; to name a few.

Generally, the mortise and tenon group can be thought of as a way of joining together wooden frames or carcasses. Examples of the frame type of constructions are chairs, door frames, stick carcass construction, timber and frame houses and barns, window and picture frames.

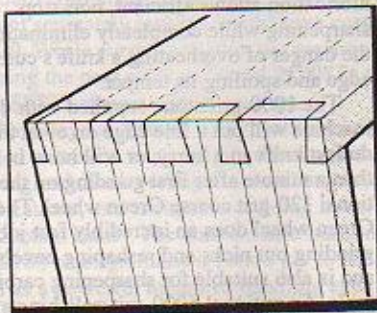
The Multiple Mortise and Tenon is a version of solid carcass joinery that is well suited for cabinets, chests of drawers and other similar constructions.

Bill Stankus, a designer/craftsman living in New York, recently completed the excellent new 111-page Leigh Dovetail Jig Owner's Manual. This article is an excerpt from the manual.

The dovetail group is equally as diverse including such examples as the through (or common) dovetail; half blind; half lapped; sliding; stopped; single dovetail; end to end; asymmetrical; angled, blind; twisted, and coggled.

However, the dovetail group lends itself to a wider selection of wood sizes than the mortise and tenon group. Dovetails are possible in almost any length, thickness or width of wood.

As useful as the mortise and tenon is, it is the dovetail that has become the symbol of fine craftsmanship. Perhaps the mortise and tenon is not regarded as highly by the general public because it is generally hidden in the wood and because the dovetail is much more visible. For example, if dovetails are used to construct a chest of drawers out of highly figured walnut, the visual impact of the dovetails and beautiful wood together will certainly be more than the sum of the parts. Master craftsmen, as well as those with no woodworking background would have positive feelings for this chest of drawers because of the joinery and wood. And that is how symbols of fine craftsmanship are created.



The relationship of dovetails and craftsmanship is not without merit. The skills necessary to use dovetails in woodworking are rather specific. First, one must know what type of dovetail joint a project may require. Secondly, one must know how to lay it out, cut it, glue and clamp it and then do final clean-up.

Before electricity came about (that period is now referred to as The Era of Traditional Woodworking), dovetails were cut with saw and chisel. The skills necessary to previsualize the dovetail layout and then to saw and chisel it out were learned by apprentices from masters over long periods of training time. In fact, apprentices were sometimes required to make their own tool chests (including drawers) using a variety of dovetails as part of their rites of passage out of apprenticeship.

As power machines (water, steam and electricity) entered the workshop it wasn't long before all sorts of massive contraptions were cutting dovetails. However, these machines were principally for mass production. And these goods looked mass produced and bland in their uniformity. The inflexible machine turned out work that had repetitious, uniform dovetail shapes and spacings. In the

smaller workshops variable shaped and spaced dovetails were still cut by hand and those who believed that machines were creating impersonal and graceless woodworking turned to the smaller workshops as symbols of all the "right" ways of woodworking.

Fortunately for all of us we can have a perspective on this history. Even though the dovetail is still thought of as a symbol of craftsmanship, we can use it for all of the best reasons: it is attractive, resists wood movement and is very strong.

DOVETAIL DESIGN

The other aspect of the dovetail group that must be discussed is that of design. Design is probably the hardest word in woodworking to define (or at least to be agreed upon). It can be thought of as personal or of some school or movement. And in any case the definition can still be rearranged to suit any need or whim. Generally, design can be thought of as a plan with a style. With that simple definition in mind it can be seen that dovetails have been part of just about every woodworking style except nailed plywood! Traditional, Shaker style, modern, Early American, Scandinavian, Japanese, Chinese and ancient Egyptian are but a few of the designs where dovetails can be found.

Unlike the early times when dovetails were looked upon as something to cover over with moulding and trim, today's style is to proudly show the dovetail. Today's craftsman is very fond of showing off the natural beauty of wood. In fact, one of the main factors of today's interest in wood is the usage of natural colors and patterns. It certainly isn't accidental that meticulously crafted joinery is used in harmony with the elegant appearance of natural wood.

Setting aside the business of specific design styles, the hardest part for the novice is to be able to previsualize what a project will look like before even beginning construction. The second difficulty is the layout work. Which board has the pins and which has the tails? Where does the pin begin at the edge of a board? How many dovetails should there be on a board? At what angle should the dovetails be laid out? How big (or small) should the dovetails be?

The common answer to these questions is to say that only through experience will the knowledge and skill develop. However, that's a bit like telling the struggling young artist that he can't have a chance at a gallery show because he hasn't had a gallery show yet. How does one know where the entry point is unless there is some hint.

So here are a few hints:

1. Dovetails are meant for joining the end edges of two boards together, that is, the end grain of boards and not the side (or long) grain. Part of the strength of dovetails is derived from the fact that the grain direction and dovetail direction are more or less parallel to each other.

2. When laying out the pattern of dovetails note that it is the pins that lock up the tails. The pins must end at the board's edge with what are called half pins. Half pins do not have to be exactly half of the width of the other pins; they just aren't symmetrical.

3. Once the two half pins are determined it isn't too difficult to visually decide how many pins to put in between. One of the advantages of using the Leigh Jig is that the finger guide assembly is ideal as a visual aid for layout work. The shape of the fingers allows you to easily previsualize the basic shape, location and orientation of tails and pins on the end of a board.

4. Harmony, balance and appropriateness are good words to use when laying out dovetails on wide or narrow boards (and don't forget them on regular work either). For instance, a tight row of numerous thin dovetails might look fussy on a large tool chest. Whereas, a similar set up might look perfect for a jewelry box made of ebony and maple.

5. Make sample pieces of Through and Half Blind Dovetails that are approximately 6" wide and have even spacing between pins and tails. These samples will be very helpful the next time dovetails are made. For example, if Through Dovetails are being considered, simply set the two sample Through Dovetail boards next to your work as a visual guide. The real aid is being able to see the three dimensional nature of the dovetails.

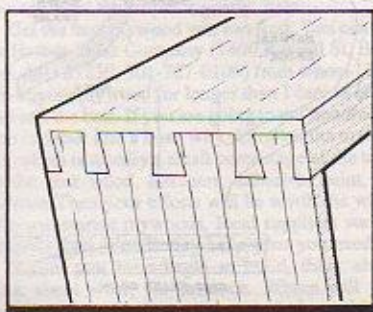
6. Dovetails are extremely strong because of their interlocking nature and the amount of glue surfaces within the joint. So if the project is for holding a complete set of steel bench planes or is for displaying doll house furniture consider the number of dovetails required to hold it all together.

7. The width of the boards must also be considered, not only as to the number of dovetails and their size but also the *gluing up*. If the work piece is 24" wide and 50" long and the dovetails are as close together as possible, use the slow-setting type of glue and work quickly. Glue waits for no one. And don't think of those hefty bar clamps as "the final solution".

8. Aliphatic resin glues ("yellow" glue) and polyvinyl acetates (PVA or "white" glue) are the most common glues used in today's shop. Both of these are excellent glues. But, there are situations in dovetail woodworking when it is possible to take advantage of each glue's unique properties. For example, PVA glue generally has a slower initial grab and set up time than does aliphatic resin glue. These factors make PVA well suited for projects with a large number of dovetails. Both glues work well when gluing dovetails because they have molecular bonding across the joint interface. And that means that there is no visible glue line. The ideal situation is to have

well-fitting dovetails with a thin, even distribution of glue. Aliphatic resin and PVA are not meant to be gap filling glues.

9. If moisture resistance is necessary for dovetails, resorcinol or urea formaldehyde glues can be used. However, these are thick glues and it would be best to glue up trial pieces to determine if the dovetail fit is too tight when these glues are used.



10. The attractive design of the dovetails lends itself well to being seen. When designing a hanging wall cabinet, for example, allow the side boards to have the tails. If the top and bottom boards have the tails then the cabinet will appear to be assembled with box joints. Also having the tails in the side boards will give the cabinet more structural stability because the downward pull of the side boards will only cause the tails to wedge tighter in the pins.

11. The different characteristics and physical properties of wood will affect the construction of any project. Hardness (density), grain structure, and imperfections will be the most influencing of how joinery succeeds or fails. Hard woods, such as ash, oak and maple can generally be considered woods that require precise cutting. The joints in these woods do not readily compress themselves when being assembled. Therefore, joints should fit together with minimum resistance. Softer woods, such as pine or mahogany can be slightly compressed when assembled. An old trick used for hand cutting dovetails in softer woods is to cut the dovetails very slightly oversized so that the final effect is one of very tight joints.

This isn't necessary when using the Leigh Jig because the Jig and router allow controlled machining of wood. Joinery tolerances will be learned as you work with the various types of wood.

THE LEIGH DOVETAIL JIG

One final thought. The making of dovetails has mostly been with hand tools. And using hand tools is quite acceptable. In fact, never before in history have so many woodworkers had access to the variety of international tools as there are now in the market place. But therein lies the problem. Education, training and practice are so important to tool usage that there is no way to overstate it. For example, to properly use

Japanese hand tools the range of things to know is staggering. There are a wide selection of saws, chisels and planes of varying styles and qualities. Then there is the business of tool maintenance: sharpening, setting chisel handles, and maintaining hollow ground chisel and plane iron backs, to name a few items. Furthermore, the mixing of different systems doesn't always work. A case in point would be the sawing of the tails and pins with a thin kerf Japanese saw and then using the British method of cutting out the waste area with a coping saw. The problem here is that the kerf from the Japanese saw is too narrow to accept the coping saw blade.

The point is this, to use these wonderful hand tools requires a whole lot more than the purchase price. And the specific problem relating to dovetails and the typical modern woodworker is TIME. Do you have the time necessary to simply practice saw and chisel cutting? How much effort have you expended to learn sharpening tools to razor edges? And if you are not cutting dovetails on a fairly regular basis do you have time to relearn all the required skills of saw stroking, sawing straight down a scribed pencil line or chiseling true to a set mark. And finally, even if you are satisfied with your techniques, is cutting dovetails by hand the best use of your time?

Fortunately, there are modern options to problem solving in this woodworking world of ours. To compliment the selection of great hand tools is the Leigh Dovetail Jig. Although there have been other router dovetail jigs to come along, none have satisfied the woodworker's needs for efficient dovetailing, like the Leigh Dovetail Jig. The Leigh Jig provides virtually all the flexibility of hand cutting dovetails with machine speed and precision. By using it and a router, one can efficiently and quickly cut dovetails with a minimum of start-up fuss. The Leigh Dovetail Jig is adjustable, controllable and it allows for repeatable accuracy time and time again. In fact, you may have been avoiding dovetails simply because of the time it can take to make them. Now, thanks to the Leigh Dovetail Jig, finding new and creative projects will be the first step into the world of quality dovetail construction. Enjoyable technology, beautiful woodworking.

The new Leigh Dovetail Jig Owner's Manual (from which this article was excerpted) is available to purchase from Highland Hardware for \$8.95 plus \$3.00 shipping. Recent purchasers of the Leigh Dovetail Jig will be sent one automatically by Leigh if the warranty registration card has been mailed in.

Through July 31, 1988, Highland Hardware is offering the following special pricing on Leigh Jigs (add \$6.00 shipping):

	Suggested Retail	SALE
Model D-1258R 12"	\$314.00	\$247.50
Model D-1258R 24"	\$379.00	\$297.50

Boatbuilding with John Wermescher

©1988 by John Wermescher

NOW THAT YOU HAVE lofted your plans full size onto your lofting "floor", the next logical step in the process of building a boat is to begin construction of the building base and boat framework.

A pause here can avert a serious mistake. Remember, this craft is still more art than science. Some head scratching is required. What is the difference between a good boatbuilder and a bad one? A good one studies each new situation and makes careful, thorough plans for executing each step. A bad one is eager to barrel on, putting things together slap dash and trying to fudge his errors, which are many.

The dearth is in craftsmen who will take the time to build really good boats.

It is all too easy to build disaster into a boat, to proceed in such a way that she will open up, crack, leak or rot in short time. It is sad, dangerous, and all too common. When you go out on the water, you trust your safety and life to your boat's integrity. Don't take a chance. At the very least, avoid setting up a lifetime of dreary maintenance chores, repairs, and rebuilding projects that start almost the same year she is launched and continue ad nauseum, ad infinitum.

Learn the tricks to building it right (reread my columns on materials in *Wood News* 16 and 17.)

Traditional methods for constructing a good minimum maintenance boat have been developed over hundreds of years by boatbuilders whose livelihoods, if not their very lives, depended on producing good boats. Often they were work boats and the economy of a fishery depended on minimum maintenance and a reasonable life span.

Today, many consider such methods old-fashioned, outmoded or quaint. Others, thank goodness, will build only in the traditional way. Through their efforts, the renaissance in wooden boatbuilding began in the early seventies. The entire craft of wooden boatbuilding had just about died out as old men died without teaching their methods and techniques to young people. Such was our runaway love affair with "fiberglass".

You have the choice of building in the traditional manner or building with modern methods. Or you can intelligently blend the two. Suppose you built a traditional plank-on-frame cruising boat, but feared that the time-honored canvas-on-plank decks might be asking for leaks. There's no reason not to make the decks plywood and cover with a synthetic fabric set in epoxy resin.

I think you should at least learn something about traditional methods and the reasons for their use, particularly if you plan to build more than one boat in your life.

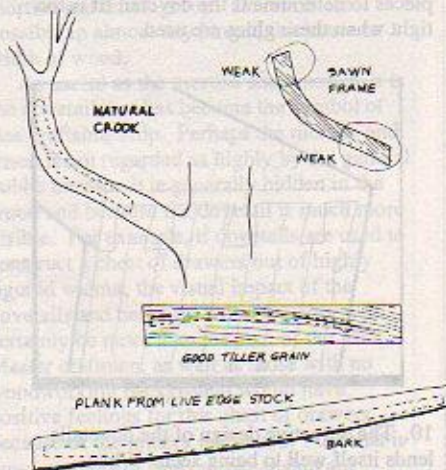
Traditional methods were employed simply because modern materials and methods were not available, and people had to do the best they could with what they had. They became darned clever at devising ways to: 1) Keep the water out and the goods in; 2) Keep the boat from falling apart; 3) Deal with swelling and shrinking; and 4) Prevent rot.

A good example of traditional and modern ways to solve a problem is the construction of frames or deck beams. Originally, obtaining wood with a special curve, such as a frame or deck beam, meant entering the forest and hunting for limbs of the appropriate curvature, then cutting them, taking them to the site, whittling them down, and installing.

An extension of this idea is to find lumber that has grain curvature in it to match needed curves, and then

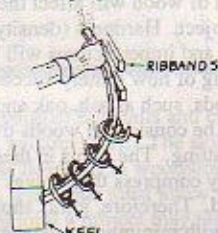
saw out in relation to this grain. Many lapstrake canoes and other small craft built today are planked with cedar which was "fitch sawn". The lumber comes out from the tree in regular straight passes of the mill saw, with a "live edge" - the bark still on it.

Every boatbuilder employs this technique to some extent. If I need to make a small tiller, I hunt through my wood supply, find the fir, oak or ash I want, then start looking at the grain to find something with a little grain curve to follow the line of the tiller.



Often frames are sawn out of stock with only a basic regard to grain. These are invariably weak in spots and must be beefed up: made thicker or doubled, adding material cost and weight.

Early boatbuilders found that if wood is soaked in hot water, better yet boiled or, even better, bathed for a time in wet steam, it becomes soft and pliable. This applies to most woods, some more than others. The best material for steam bending seems to be white oak. Steam it long enough and a pretty hefty piece of frame stock becomes limp enough to horse into position, taking a smooth curve determined by pieces (ribbands) set up for this purpose.



Now they had grain strength, a good curve and no more weight than necessary. But there are problems. The oak had to be carefully selected for cleanness and straight grain. Even then, pieces often broke in bending. A perfect curve lying in exact frame position was not always possible. In time, these stressed frames often cracked in use and had to be replaced or beefed up.

Still, it was the best system available until recent years and many thousands of fine boats have been built with steam-bent frames and lasted indefinitely. Lots of them are still around, and lots are still being built.

It becomes apparent then why so many amateur boatbuilders go for a flat bottom or vee bottom boat. None of these bending problems (until you come to the deck beams, if any).

The modern system, of course, is lamination. Construct a simple bending form to the curvature of your member (perhaps a little extra curve to account for springback), saw up thin strips of oak, ash, etc., use epoxy resin for glue and laminate them together. Techniques for doing this will be covered in a later issue.

This is an example of method differences, and similar examples can be made for stems, keels, transoms, planking, etc.



The major point of difference between traditional and modern is that, even doing the best they could, yesterday's boatbuilders knew they could not produce a perfectly rigid, one-skin structure. They knew their boats had to be made of hundreds of small pieces of wood which could not be held together perfectly rigid forever. The boat was going to "work". It would give and take, twist a bit, swell and shrink, rack a bit here, open up a bit there. They learned how to allow for this working, non-rigid boat. They used various combinations of materials between faying (matching) surfaces: Tar, white lead, cotton wicking, oakum, putties and goos of every kind.

They hoped the stuff would give and take as the planks or whatever swelled and shrank. They hoped the stuff would stay in place for a season or two and keep the water out. They sized their planks to allow for swelling shut when the boat got wet. They made their joints to allow for swelling and shrinking. They installed stopwaters, soft wood dowels to swell in place and seal an entry point, such as where a stem member met a keel end and that joint was crossed by planking.



They provided ventilation. Last, they provided plenty of limber holes so that water would drain to the lowest point in the bilge, and they installed a good hefty bilge pump. They had a working hull and bilges were expected to have water.

Today we have epoxy resin. And veneers. Plywood. And synthetic fabric sheathing materials of all kinds. And sealants that not only remain elastic for a long time, but adhere tenaciously to faying surfaces and add strength to a joint. By using advanced laminating techniques to make up the entire hull of a boat, with veneers and epoxy resin, we are now able to build a "monocoque" hull: one without any seams, joints, or even frames. No way it can leak or work. It is all of one piece, like an egg shell, but hardly as fragile. Because the grain of the veneers is reversed in every layer of this "cold molding" system, and because all layers are welded together with epoxy resin, the hull is strong in every direction and very light, very stiff, very resilient. Virtually no frames are needed. No chines and minimal keel and stem structures. These are built by lamination, too. Add an outer sheathing of some good fabric like Versatex, set in epoxy, coat all other surfaces with a couple layers of epoxy resin, and you have something as near indestructible as you are likely to find afloat.

You can see that in such a system wood wastage is minimal. No longer do you need large pieces of clear straight-grained stock. Lots more use out of a tree.

Stitch and tape, tack'n'tape (or whatever you call it) methods achieve almost the same result, using marine plywood on surfaces designed for plywood bends, and tying the plywood joints together with resin, filler and fiberglass strips. The joints are temporarily held together with wire twists, staples or brads, later removed when the resin has set. That's it.

In all these systems: no worry with working or leaking, no worry with rot, as the resin effectively seals out moisture forever and the rot fungi can't live.

Chances are, if you have already purchased plans for a boat, you have made your choice of methods, or it has been made for you by the designer. Whatever the method, understand the techniques involved for dealing with the four points listed earlier.

It comes down to this. When fastening in any piece of wood, you must ask several questions:

1. Is the joint secure?
 - Is it made as carefully and tightly as possible? (Should it, in fact, be tight, or is swelling anticipated?)
 - Will the fastenings you are using last forever?
 - Will the glue or compound never let go?
2. After the boat is finished, will the joint be accessible for future inspection/repair (not always possible)?
3. Is it well drained and well ventilated? Or is it in a place where moisture will collect and little fresh air will enter?

If the answer to 2 or 3 is "no", they you must poison or seal. Poison is the traditional answer, but not a very pleasant one. I'm talking about rot here, of course, the main bane of wood construction. If you poison the food source (wood) of rot fungi, they will not be a problem as long as the food remains poisoned.

Poisons generally take the form of metal salts in solution and are brushed onto the wood repeatedly, soaking in. If the piece is small, it may be dipped. The old standby is Coppertox, a solution of copper salts. Cuprinol is copper naphthanate. Pentacure is a chlorinated phenol and is especially dangerous to use. Not that any of them are safe. You must avoid skin exposure and breathing the fumes. The real problem comes when you sand woods thus treated. The dust is toxic either inhaled or landing on sweaty skin.

Compounds of TBTO, tributyl tin oxide, are especially effective, toxic and expensive. I would hesitate to use this material, so great is its potency. Bottom paints employing TBTO are now outlawed in France and Great Britain, as well as several of our states. Federal law prohibiting their use is pending. There is too great a danger to the marine environment. What about your own environment?

Because these materials are usually water soluble, they will leach out in time and the rot spores will jump to the advantage. While this is an economical way to combat rot initially, it is questionable how long it will last. There are some poisons dissolved in oil and sometimes oils alone are used. Fungicidal bedding compound should be used where bedding is done in an environment prone to rot. (Note: I recently learned that fungicidal bedding compound is no longer carried by suppliers, or manufactured in the U.S. It is considered hazardous to the environment. Suggestion: While I am a staunch environmentalist, I cannot imagine that the wooden boatbuilder's use of fungicidal bedding compound will have a significant effect on the marine environment. If you want to have a fungicidal bedding compound, buy a can of regular bedding compound and stir in a mildewcide/fungicide, available at your local hardware store.)

The modern alternative is to coat every square inch of wood that goes into the boat with epoxy resin, making sure that you leave at least two net coats after sanding. Epoxy resin is not cheap and using it is a hassle, no two ways about it. But once you have sealed off all the wood this way (all the wood, not just some of it) you have a boat which will not take on moisture or support rot. The resin coating is also a good armor against wear and abrasion and is not affected by salt water, alcohol or any other chemical. It will, however, deteriorate with exposure to ultraviolet light, sunlight. You must protect the resin with paint or varnish containing a UV filter.



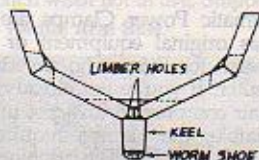
Plan ventilation. Fresh air dries out stale areas and keeps down mildew and rot. Unless an area is really sealed off, such as a flotation chamber, put plenty of holes or slits in the walls to allow air to circulate. Make sure any areas subject to water intrusion are able to drain into the bilge well, and make sure that the bilge, through limber holes, drains well from all sections. Make sure that all parts of the boat drain well. A familiar error is a chine that was not bevelled on its top, so that a trough is formed to hold water and cause

trouble. Don't think that because you have a tight bottom, you are not going to get water. Condensation is a killer.

Slopes and ventilation. Good joints. Tight work. Good materials... I hear more garbage lately about how plain exterior plywood is good enough, especially if you are going to sheath the boat. If you are going to use the boat for more than a season, if you are going to sell the boat, or if you take pride in your work, plain exterior plywood is not good enough. The veneers are inferior. The core has voids. The gluing specs are not what they are for marine grade. And beware of people who sell "marine grade" plywood. Some of them are, how shall I put it gently, liars.

Get the best plywood you can find. You can find it at Harbor Sales Company (1400 Russell St, Baltimore, MD 21230, 301-727-0106) from whom I have been buying plywood for longer than I care to admit. They sell the best. If you are going to put hundreds of hours of labor into a boat, why skimp on the material cost, which is usually a small percentage of the total? Get the best wood, fasteners, adhesive, paint, and hardware. Then your efforts will be worth the while. For some marine plywoods, local suppliers such as Carlton's Rare Woods may have what you need.

Before you even begin to build, think ahead. Think about wear, for instance. Where will your particular boat experience a great deal of wear? If it is a small boat that you will be using in shoal waters, often containing rocks or stobs, or you will be putting her onto sandy, gravelly or shelly beaches, her bottom will take a lot of wear. Best sheath with a good tough fabric like Versatex set in epoxy. Best put some extra material on the keel, too. In a larger boat, without sheathing, a sacrificial member called a worm shoe is added to the keel.



Wood boats operated in salt water have to have their bottoms painted with a toxic bottom paint to discourage barnacles and ship worms, or teredos. These are really small bivalve creatures, like tiny clams. They rotate their shells like an auger and will bore through a wood hull in no time. The effect is drilling a hole neatly through your hull and the result is what you'd expect. Bottom paints discourage such creatures, but don't stop them. You have to be on the lookout continually.

In warm waters, bottom paint has to be renewed a couple of times a year. The keel, especially, receiving undue wear and being down where it is hard to reach, usually gets infested badly. Thus an extra board of some fairly resistant or treated wood is fastened to the underside of the keel to take the worm invasion. When it gets riddled, it is simply renewed. The worm shoe idea is a good one, if only to take wear.

Rub rails at the gunwale are a wear member. They should almost never be attached with adhesive, but screwed and bedded in place, to be renewed after too many collisions with docks and pilings. Often the stern takes a lot of abuse. Plan to use mighty hard wood here or sheath it. In a small boat, put a bang iron, a half oval strip of bronze, on the stern to take the punishment.

Toe rails, especially forward and aft, take wear from dock lines, shoes, etc., so do coamings often-times. Plan now for good checks in the toe rails, well-placed cleats for the lines and some extra toughness to the toe rails in those places.



In all but the smallest boats, sailed by people who are partially nude, decks take a beating. The bigger the boat the more the problem: shoes, lines, anchors, poles and other gear, as well as sand and dirt grinding down the deck continually. I won't go into laid and sprung decks of teak, etc., as these are for pretty large boats owned by people with the money to maintain them. For the average small boat, marine plywood makes the most sense. Give it a couple coats of epoxy resin, both sides, and then cover it with Dynel topside, bedded in resin and painted to your likes. The Dynel finishes are fuzzy, giving you a perfect non-skid, and it will wear forever. It is lightweight and easy to work.

Finally, put on a good marine paint and/or varnish. Do a proper job of prep work, priming and painting. Bed all your hardware in a good bedding compound. Use enough so that it squeezes out all around and you have to scrape up and clean off excess. Use enough finish, a minimum of three coats of enamel or five coats of varnish. With a very high build varnish you can get away with three.

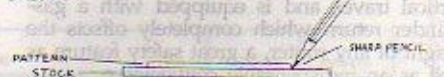
Do it right. It might be the only boat you ever build. If you do a halfway job, it might be the only boat you ever sail...

Minimum maintenance. In today's hurry world, most folks want to scoot up to the lake on a Saturday afternoon and get out on the water and have fun for a while. None of this spending hours on maintenance. There are so-called "no maintenance fiberglass" boats. They come into my shop from time to time (you guessed it - needing maintenance). Every boat needs maintenance. It can be minimized, regardless of hull material, by intelligent planning and careful building.

Which is where I'll start next time with setting up the building form, backbone members and frames. Since the actual cutting of parts begins here, I've included here an outline of procedures.

Getting Out a Part

1. Carefully check the finished size and shape of the part to be made.
2. Research the wood best suited to this part and determine the size needed.
3. Choose stock carefully. Consider color and grain, defects, checks, splits (look at all surfaces). Consider straightness (both directions). Consider economy of cut - how many can you get out of a piece of stock? How many do you need? Allow for saw kerfs, jointing, planing, etc.
4. Rip, joint, plane... Whatever is needed to get straight, square, clean blanks of exact proper dimensions for final finishing of a rectangular piece, or marking for cuts to other shapes.
5. If shapes are to be cut out of a prepared blank, mark carefully from a pattern with a sharp pencil, held as follows:



6. Cut. If using a large bandsaw, saw just outside the line; then plane to the line. If using a table saw or radial saw (assuming a good blade), cut precisely - a high quality blade will leave a nice clean edge with no further treatment needed. If using a small bandsaw, split the pencil line precisely - minimum finishing will be needed.

John Wermescher is an Atlanta boatbuilder, woodworker, and commercial artist.

MULTI-ROUTER

Production Joinery Machine

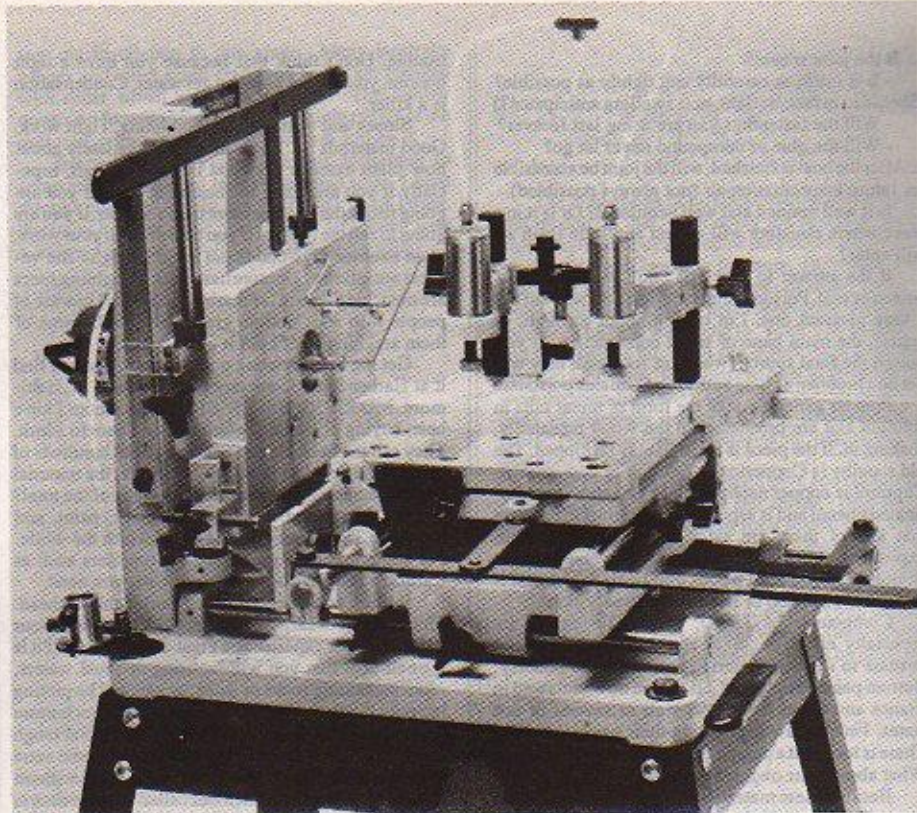
This new American-made jointmaker is a dream machine for commercial-duty production of almost any solid-wood joint imaginable. Extraordinarily heavy aluminum alloy castings, low-tolerance computer-controlled surface machining, and complete X-Y-Z axis control with linear ball bearings on solid steel ways make the Multi-Router the smoothest, most precise and most versatile joinery device we've ever heard of. An excellent video-tape presentation is available to provide an in-depth view of the machine at work in a shop environment - details below. Equipped with the optionally available pneumatic clamp system, the Multi-Router will be equally at home on the factory floor or in a one-man custom shop.

While its specialty is mortise and tenon joints (up to 1 1/2" x 3"), the Multi-Router also produces dovetails, box joints, splined miters, sliding dovetails, round stub tenons, and numerous decorative joints. The tilting work surface (0 to 45 degrees) makes both simple and compound-angle joints almost unbelievably easy. Mortises are set up and milled using built-in stops for control in every dimension. All other joint components are produced under template control; once set up, the machine will mill anything from one to a thousand parts with no further ado.

The work mounting table rides on four 3/4" diameter hardened steel ways which offer 8" of side-to-side and in-and-out travel. Thompson linear bearings assure tight, precise movement with almost dreamlike ease and smoothness. 20" lever handles move the table along both axes with positive control and excellent mechanical advantage. The vertical platen serves as router mount and positioning jig for stock set-up and some milling operations. It is bored for mounting either a Makita 3612BR or a Bosch 1604 router, and most other makes and models can be mounted with additional boring. The platen offers 6" of vertical travel, and is equipped with a gas-cylinder return which completely offsets the weight of any router, a great safety feature as well as an indispensable convenience.

A variety of optional templates is available for production of standard tenons, box (or finger) joints, 14 degree dovetails and round tenons. An optional ball-bearing-tipped guide stylus is required for use with any of the templates. Standard tenon templates are extremely easy to use, as the stylus is completely controlled within a closed track.

Variable-size tenon templates are also available to provide complete assurance that your tenons can be made to fit even if your mortises are coming out slightly over or under absolute dimension (such as will occur after your bits have been sharpened, or if they weren't perfectly sized to begin with). All the variable-size templates are used in a master insert holder; each tenon size set comes with three inserts to bracket tenon size in very small increments.



The pneumatic Power Clamps are available either as original equipment or as an accessory system for those who already own the Multi-Router. If you're not already outfitted with an air compressor, low-cost units are readily available; the clamps require only minimal S.C.F.M. at 70 PSI. The machine can of course be used without the Power Clamp system, as it comes provided with two manual hold-down clamps which mount in any of the work table's 14 sockets.

Whether you want a machine for commercial mass production of chair parts, or if you're just looking for the ultimate router jig, you will find the Multi-Router to be an outstanding combination of ingenious design and meticulous execution.

The Multi-Router is shipped by truck freight collect. Shipping wt. is 99 lbs. If you're interested in the Multi-Router, be sure to consider our finance plan. Monthly payments on a Multi-Router are as low as \$39 a month, with no money down.

Seeing is believing, and we encourage you to borrow the video and get a first-hand look. (Warning: even though this video is almost purely instructional in nature, it's also very persuasive - watch at your own risk!) To receive the video for up to 30 days, send us a check for \$20 (or charge by phone toll free 800-241-6748) to cover a \$15 refundable deposit and \$5 handling fee. If you buy a Multi-Router during those 30 days, we'll credit your \$20 toward the purchase and let you keep the video manual.

MULTI-ROUTER

08.52.01	Model 101-L Multi-Router	1295.00
08.52.02	101-L with Air Clamps	1525.00
08.52.03	Machine Stand	79.00
08.52.04	PC-1 Air Clamps	230.00
08.52.05	Ball-bearing Follower Stylus	45.00

Tenon Sizes Available (Inches):

1/4 x 1	3/8 x 1	1/2 x 1-1/2
1/4 x 1-1/2	3/8 x 1-1/2	1/2 x 2
1/4 x 2	3/8 x 2	1/2 x 2-1/2
1/4 x 2-1/2	3/8 x 2-1/2	1/2 x 3
1/4 x 3	3/8 x 3	

Standard Tenon Templates

08.52.11	Std. Tenon Templates, Each	13.75
(Specify size from chart above)		

Other Standard Templates

08.52.31	Dovetails (Pins and Tails)	33.00
08.52.32	1/4" Finger Joints	16.50
08.52.33	3/8" Finger Joints	16.50
08.52.34	Round Tenons, Each	13.75
(Specify size: 1/2, 5/8, 3/4, 1, or 1-1/4")		

Sets of Standard Tenon Templates

08.52.41	All Five 1/4" Tenons	64.50
08.52.42	All Five 3/8" Tenons	64.50
08.52.43	All Four 1/2" Tenons	52.25
08.52.44	All Five Round Tenons	64.50

Complete Standard Template Set

08.52.51	Set of all 23 Standard Templates plus Follower Stylus	339.00
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Variable-Size Tenon Templates

08.52.61	Master Insert Holder for Variable-size Tenon Inserts	22.50
08.52.62	Set of 3 Var.-Size Tenon Inserts	12.00
(Specify one of nineteen tenon set sizes from tenon size chart above)		

6" PRECISION COMBINATION SQUARE

This precise and versatile square will instantly become your favorite marking, checking, set-up and measuring tool. The main difference between this and less expensive combination squares is accuracy; it's not easy to make an adjustable square that can be relied on to lock down square every time. The accuracy of this little beauty isn't simply a product of the machined 90 and 45° surfaces; it's also entirely dependent on the machining



done within the groove where the blade locks down. The bottom of this groove isn't simply milled flat, for that would risk abrading the critical edges of the blade where all your measurement readings and layout marking take place. Rather, a narrow rail is left standing proud along the center of the groove, so that only the center of the blade registers on the rail's machined surface. All four edges of the blade are graduated (etched, not painted), with scales in 1/8", 1/16", 1/32" and 1/64" to suit any degree of accuracy you require. The blade can be set for up to 4-1/2" extension at 90 or 45°; it can be set for use as a conventional try square, or can be set to any reading for use in scribing or measuring depth. A hardened steel scriber is housed in the stock, which also contains a small spirit level. This may well be the best tool in the shop for measuring depth of cut on tablesaw or router, as well as the handiest square you'll ever own for joinery layout.

06.30.15 6" Precision Square 32.50

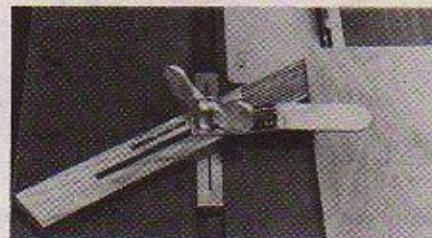


NEW RYOBI MODEL RA200 PORTABLE RADIAL ARM SAW

We have now sold a good number of this new saw, and the response has been quite good regarding quality and performance. While the blade size is only 8-1/4" in diameter, careful design of the arbor has permitted a full 3" maximum depth of cut at 90°, or 1-3/4" at 45°. Its 11-amp (2 HP) 110 volt motor provides plenty of power, and is switched on and off by conveniently located controls. The no-load blade speed is 5000 rpm. An accessory spindle features a speed of 18,500 rpm for routing.

Perhaps most convenient of all is the tool's overall weight: just 53 lbs., making it light enough to carry to the job, or store under the workbench when not in use. Shipped UPS.

RA200 Radial Arm Saw 269.00



NEW RYOBI TS-200 COMPOUND MITER SAW

Ryobi is one of the first on the market with a compound miter saw, and the only one thus far with an economy model. Also, at 14 lbs., it's the lightest. While its cutting capacity is less than the premium-priced models, it is quite adequate for most jobs.

Maximum cut at 90° is 2-3/16" x 5". At 45°, it is 2-3/16" x 3-9/16". Positive stops at 9, 22-1/2, and 45° left and right. Left bevel cuts up to 45°. Features spindle lock, electric brake, and externally accessible brushes. 8 amps. 5000 rpm. Blade size is 8-1/4".

Excellent for crown molding, as well as ordinary light-duty mitering work.

TS-200 Compound Miter Saw 179.95



DELUXE FEATHER STICK

Feather sticks have been used for years as shopmade jigs for holding difficult stock and more importantly for preventing kickback. Until now, it was difficult to clamp a feather stick to the saw table. With a quick turn of the knob, this new feather stick locks securely in the miter slot of your tablesaw, bandsaw, or shaper. (Fits slots 3/4" x 3/8" wide).

The clamping device can easily be refitted with other wooden feather sticks you make yourself to fit special needs.

Deluxe Feather Stick 19.95

Toll Free Orderline (800) 241-6748

Prices effective through July 31, 1988 except where otherwise noted. Typographical errors subject to correction.

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Delta's New 15" Scrollsaw

EVER SINCE HEGNER redesigned the scrollsaw, growing numbers of woodworkers have been anxiously awaiting the day when someone would finish the job and make a scrollsaw affordable as well as functional. Now Delta Machinery has done exactly that, with the introduction of their model 40-150 15" scrollsaw. At a mere \$150, the saw might first inspire concern that, like other inexpensive entries, it wouldn't be worth owning regardless of price. But wait till you try one — sawing is believing, as dozens of customers here at the store have discovered. The 40-150 works better than anybody would be willing to expect, based on price alone. Don't let anybody try to fool you: there's no way you're going to get pure Hegner quality for \$550 less than usual. If you need commercial-duty equipment, or simply prefer to own the very best there is, then by all means consider a Hegner scrollsaw. But with the Delta 15" scrollsaw you can certainly expect to get the best hobbyist saw you've ever seen, do any kind of scrollsaw work imaginable, buy a lifetime supply of blades, and have something left over for that tropical vacation besides.

As with other tools in their economy line, Delta has again gone to Taiwan for iron castings at a very competitive price. Their own quality control standards are enforced, and as with Delta's other modestly priced machines, a two-year parts & labor warranty backs up materials and workmanship on the tool. The saw's design virtually assures superb performance, because that design is borrowed from the best. This Delta saw uses the rocking parallelogram mechanism pioneered by Hegner, and even without Hegner's sophisticated bushings and precisely fitted assembly, the Delta saw convincingly demonstrates the system's effectiveness. High blade tension, high-speed (1725 spm) 3/4" stroke, and floating blade clamps provide clean, smooth sawing with virtually no blade breakage problems. Weighing 37 pounds, the 40-150 runs quietly without excessive vibration. The saw's 1.6-amp motor lets you scroll in stock up to 2" thick, though this and any other scrollsaw is really made to work best in 1" and thinner material.

What you give up in exchange for your hundreds of dollars in savings is convenience in a couple of areas. The 40-150 comes equipped with what Delta describes as a combination blade guard and work hold-down, which in practice is actually just a blade guard; it certainly

SAVE WITH OUR \$149.95 DELTA SCROLLSAW PACKAGE DEAL

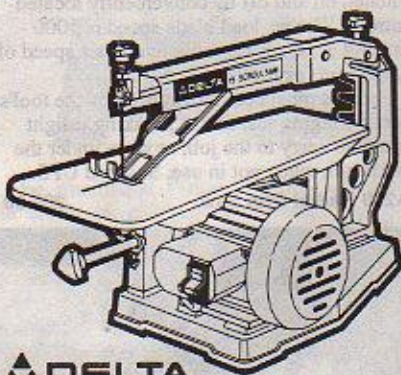
So that you're ready to begin work as soon as your new saw arrives, we're including these FREE with your purchase: 62 assorted blades, 2 bestselling pattern books by Ed Sibbett, Jr.: *Wooden Puzzle Toys* and *Easy-To-Make Articulated Wooden Toys*, plus Highland Hardware's own Scrollsaw User's Guide.

Scrollsaw List Price	\$173.00
62 blades	\$22.00
2 books	\$5.90
User's Guide	\$3.95
TOTAL VALUE	\$204.85

PACKAGE DEAL \$149.95
plus \$6.00 shipping

You save \$54.90!

To order, use the orderform on page 31. Specify the **Scrollsaw Package Deal**. A large supply is scheduled to be on hand at Highland Hardware beginning in late April.



won't keep your work from chattering if you bind up on the blade during hard turns. Without a hold-down, it takes a little extra practice before it's easy to simultaneously avoid chatter and exercise delicate control over the work, but that can certainly be accomplished. A second convenience found on costlier saws is a blower to clear sawdust from the area in front of the blade. Another trade-off point becomes evident when it's time to change the blade; the only way to secure either clamp is to lock it down in the end of the upper arm. That is standard procedure, of course, after threading the blade through your work for an internal cut, but it's sort of a nuisance when you're just trying to install a new blade for normal work. Fortunately, it's easy as pie to chisel a shallow rectangular mortise (9/32 x 3/4") in the surface of whatever bench or stand you dedicate to the saw, and let that be a holder

for either top or bottom clamp while you tighten the clamp screw.

These sacrifices are probably fair trade for the purchase price, because you don't give up anything where it counts, in cutting wood. The slightly shorter than average stroke length (17" and more is quite common) is probably one reason the saw runs as smoothly as it does, and the high strokes-per-minute rate assures clean cut surfaces with little or no finishing required. High blade tension and the rocking parallelogram drive mechanism guarantee a relatively vertical stroke through tight turns and thick stock. The arm-lift spring next to the tension rod at the rear of the upper arm keeps the arm from flopping around in your way while you're installing blades, and positively disengages the upper arm from the drive when you break a blade.

The lock-down screw above the upper blade clamp doubles as another safety device; set just a quarter-turn above the clamp, it lets the clamp pivot freely, but prevents it from flying in your face when the blade snaps. The pivoting clamps are a superb design feature, at least as important as the tension and drive mechanisms. When you can't find your wire cutters, the easiest way to break a thin piece of metal is to bend it repeatedly at one point until it weakens and dies. If the blade clamps on a scrollsaw didn't pivot (as used to be standard), you would naturally expect to break blades constantly. But with pivoting clamps, bending loads are distributed evenly along the entire blade, leaving no hot spots prone to early failure. The clamps on Delta's model 40-150 saw actually go one better than Hegner in one way: side tabs nest over the arm, locating the clamp in exactly the same position every time it's installed. If you square up the table the first time you use the saw, your cuts will always be square without having to make any adjustments after changing the blade. Incidentally, the Delta 40-150 uses standard 5" plain-end blades, and it works very well indeed with the Pebecco and Premium Double-Tooth blades listed on page 18 of our catalog (and included in the blade assortment in our Package Deal).

Scrollsaws are steadily gaining recognition for the versatility and precision that they bring to powered woodcutting. Craftspeople are using these tools more and more for work that looks like carving, marquetry or inlay, along with the traditional toys, puzzles and lettering that have always been the scrollsaw's forte. The design revolution pioneered by Hegner made scrolling a practical and efficient way to get the job done. The price revolution pioneered by Delta will make it a popular choice as well. — ZJE



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