

WOOD NEWS

Published by Highland Hardware, Inc.

Serving Woodworkers

Number 20, Fall 1987

Mail Order Sales and Service

Highland Hardware Now Offers INCA Tool Sales Nationwide

HIGHLAND HARDWARE is proud to have served woodworkers in the Southeast for almost a decade as one of the country's leading dealers for Swiss-Precision Inca stationary tools.

Now, thanks to a change in marketing policy by Injecta Machinery Corporation, Highland Hardware and other Inca dealers are no longer restricted to regional territories, and can actively sell Inca products to customers in all 50 states. For our many thousands of customers around the country who have grown used to our quick and reliable mail order service in the past, we are pleased to add these superb cabinetmaker's tools to our catalog offering.

Over the years, we have come to appreciate the care and expertise which go into their design and manufacture, and though some of them are expensive tools, we regard them among the best buys in woodworking tools on the market today.

The surprisingly small amount of service ever required on Inca tools is testimony to

the high quality and excellent construction of these outstanding saws and planers. A high level of user satisfaction and repeat business is the norm for this line of tools. For Highland Hardware customers who do experience problems or who have questions regarding Inca tools purchased from us, our technical staff is as close as the telephone, and we are glad to offer the benefit of our many years of hands-on Inca experience.

Included in this issue of *Wood News* is Hugh Foster's feature on one of Inca's newest tools, the model 2100 12" tilt-arbor table saw. A brief description of some of the other Inca products available from us by mail or phone order is also included on page 12.

We are always glad to have you visit our store for a demonstration of the Inca tools, or call or write us for more information.

Highland Hardware Hires "Mr. Bandsaw"

BECAUSE OF HIS action-packed seminars at woodworking trade shows around the country, Brad Packard has become popularly known as "Mr. Bandsaw".

Employed the last four years by Injecta Machinery Corporation, national distributor for Inca tools, Brad has demonstrated and sold Inca throughout the Southeast, calling on tool dealers and assisting their customers. He was a professional woodworker for six years prior to joining Injecta Machinery.

We are pleased to announce that Brad has recently accepted the position of Tool Sales Manager at Highland Hardware. Effective immediately, he will be available to render assistance to woodworkers interested in Inca machinery, as well as other tools in our product line. He joins Zach Etheridge as one of our resident power tool troubleshooters, and will also spearhead our employee training program. We welcome Brad and his family to Highland Hardware and Atlanta.



Pictured above is Irish woodturner Liam O'Neill harvesting material for a bowl. He teaches a weekend seminar on woodturning at Highland Hardware November 7-8.

Fall Seminars

A FULL SCHEDULE of Highland Hardware educational events is on tap for woodworkers in the Atlanta area this fall. Here is a list of seminars and dates. Details and registration information can be found inside on page 2.

Sept. 26	Woodworking Fundamentals with Zach Etheridge
October 3	Stationary Tools and Biscuit Joinery
October 10	Routers and Jigs with Zach Etheridge
October 17	Sharpening with Zach Etheridge
November 7-8	Woodturning with Liam O'Neill
November 13	Toshio Odate Slide Lecture
November 14-15	Shoji Making and Japanese Tools with Toshio Odate
November 21	Planes with Zach Etheridge
November 22	Hand Tool Joinery with Zach Etheridge

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Fall Woodworking Classes at Highland Hardware

Woodworking Fundamentals Saturday, September 26, 9am to 4pm

For beginning woodworkers, this class will answer one hundred and one questions about the essential tools and accessories used in hand woodworking. Participants will survey workbench design and function; vises; tools for measuring & marking; tools for stock preparation, joinery, assembly and finishing. If you're interested in woodworking but don't know where to start, here's the place. The instructor will be Zach Etheridge. Cost for the day is \$25.

Stationary Tools and Biscuit Joinery

Saturday, October 3, 9am to 4pm

This is a free all-day look at the care and feeding of popular stationary tools: jointers, planers, bandsaws and tablesaws. Safe, efficient and creative techniques are demonstrated on each tool, accompanied by set-up, tuning and maintenance tips. Whether you're shopping for tools and need to know what to look for, or already have a shop-full and are looking to improve your skills, this is a good investment of your time.

We'll take an hour at the end of the day to acquaint you with the mysteries of biscuit joinery, the impressively efficient joinery technique that's currently the hottest new thing in woodworking. Admission is free. However, please register in advance.

Routers and Jigs

Saturday, October 10, 9am to 4pm

This is a full day on the most versatile machine in the shop. Zach Etheridge will start with router basics, and continue through shop-built jigs for shaping and joinery, commercial dovetail jigs, and raised-panel construction. You'll also get the step-by-step on the unique table-mounting system developed here at Highland Hardware. Cost is \$25.

Sharpening

Saturday, October 17, 9am to 4pm

Sign up early; this one always sells out fast. Sharpening skills are absolutely essential, and are easier to acquire than you think. Emphasis is on sharpening plane irons and chisels using Japanese waterstones; any other kinds of tools will also be addressed. Bring along a few tools to work on, and bring your own stones if you have them — if you don't, use ours and find out how they work. Zach Etheridge instructs. Cost for the day is \$25.

Woodturning with Liam O'Neill

Nov. 7-8, Sat. 9 to 4, Sun. 9 to 3

Liam O'Neill will be with us for a weekend of woodturning, Irish style. Any aspiring or already-addicted turners who missed Liam last year have another chance to see a highly talented and thoroughly amiable craftsman demonstrate technique with a vast array of tools, and create his unique brand of beauty on the lathe. Liam will cover everything from basic turning to making bowls full of holes — an experience not to be missed. Cost for the weekend is \$60.

Register for seminars by visiting the store, or by mailing the order form found on page 31 of Wood News along with a check for the seminar fee. Visa/MC users may register by phone at (404) 872-4466. (Fees are refundable if you cancel at least two weeks prior to the seminar). Location for all classes is our seminar room located in the warehouse behind our store.

Toshio Odate Slide Lecture

Friday, November 13, 7:30-9:30 pm

Toshio Odate returns to Atlanta for another weekend of hands-on shoji making and instruction on use of Japanese woodworking tools. On Friday evening Toshio will share slides of his work, from his famous early "melted wood" sculptures to the enormous and extraordinarily evocative environmental pieces that have been his trademark in recent years. Come meet Toshio and share an unusual evening with us whether you're signed up for the class or not. Cost is \$5.

Shoji Making & Japanese Tools, with Toshio Odate

Nov. 14-15, Sat. 9-4, Sun. 9-3

Toshio Odate conducts a small group through the intricacies of building a traditional Japanese shoji screen. This is an excellent opportunity to experience first-hand the feel of a different culture, and to do some first-class hand woodworking as well. Use of traditional Japanese woodworking tools will be demonstrated. All materials, including shoji paper and rice for glue, will be provided. Registrants will be provided with a list of tools to bring. (Students can bring either Japanese or Western tools or some of each). Class size is limited, so register early. Cost for the class, including Friday night, is \$90.

Planes, with Zach Etheridge Saturday, November 21, 9am to 4pm

Making shavings with the noblest of hand tools is the topic of this popular class. Jointer planes, smoothing planes, block, rabbet, and combination planes will be discussed, demonstrated, and used by participants; emphasis is on joinery, finishing, and shaping by hand. Zach will also discuss tinkering with your planes to make them better than any money can buy. Bring any planes you have, especially old and unusual ones. Some are available for those not yet equipped. Sharpening skill is prerequisite. Class size is limited. Cost for the day is \$25.

Hand Tool Joinery with Zach Etheridge

Sunday, November 22, 9am to 4pm

Stock preparation, layout, and cutting the fundamental joints for woodworking are Zach's subject of the day. Planing (basic skill is prerequisite, please), sawing and chiseling are the basic skills to be practiced; mortise & tenon and dovetails will be accomplished by all. Registrants will be provided with a list of tools to bring; some are available here for communal use. Class size is limited, so sign up early. Cost is \$25.

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Fall, 1987

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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 Wood News. Enclose black and white or color photos. Submit material to Editor, c/o Highland Hardware. Deadline for next issue is Nov. 30, 1987.



The Enhanced Multi-Router (with Air Clamps)

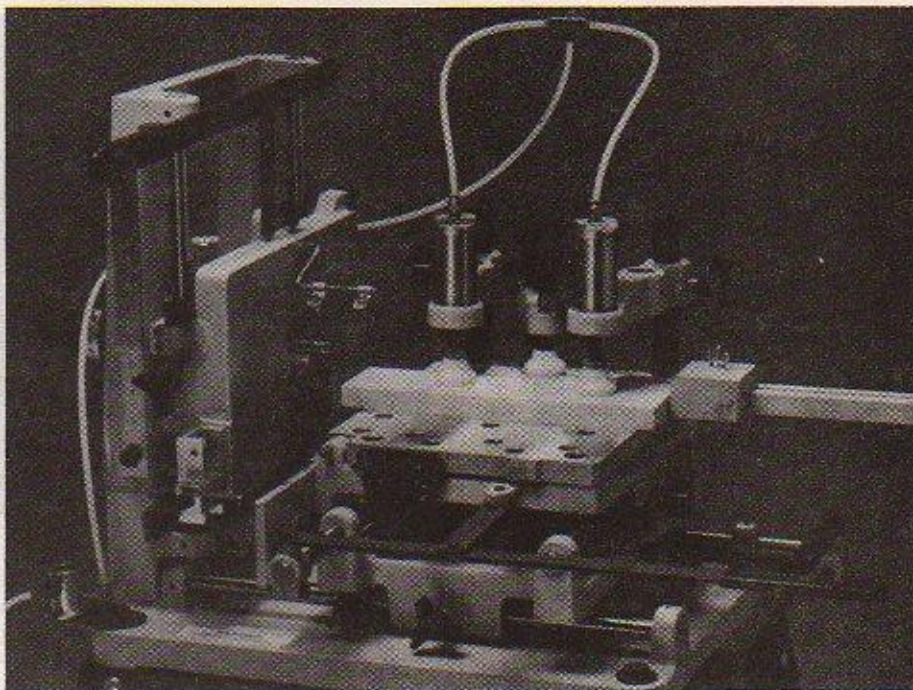
THE MULTI-ROUTER, a new American-made joint making machine which has been on the market for less than a year, is now available equipped with a slick new air power clamp system. For those who said "what more could one ask for in a furniture-maker's dream machine" after seeing the Multi-Router demonstrated in its debut at trade shows last winter, its maker (the JDS Co. of Columbia, SC) has responded with a clever air clamping system which greatly enhances the tool's practical production capabilities.

Also brand new is an instructional half-hour VHS video which allows you to see the machine in action from the comfort of your living room. Perhaps we should warn you that if you are the sort of person whose imagination has ever run wild considering what could be accomplished by jiggging a router in an infinite variety of set-ups, seeing this video will make you want to jump up and order a Multi-Router immediately.

The machine is designed for highly precise production of structural joints in solid wood. While its specialty is mortise and tenon joints (up to 1/2" x 3"), it also produces box joints, dovetails, splined miters and round stub tenons. Simple and compound angled joints are easily set up with multi-position locator pins and a work table that tilts up to 45°.

The work table is mounted on 3/4" solid steel ways which offer 8" of side-to-side and in-and-out travel. Linear ball 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. A vertical platen serves as router mount and as a positioning jig for stock set-up. It comes bored for mounting either a Makita 3612BR or a Bosch 1604 router, and most other makes and models could be mounted with additional boring. The platen offers 6" vertical travel, and is equipped with a gas-cylinder return which smoothly raises the cutter above the work upon completion of a template-guided cut.

A variety of optional templates is available for production of tenons ranging from 1/4" x 1" up to 1/2" x 3". Other optional templates enable 1/4" and 3/8" box joints, 14 degree dovetails, and 1/2", 5/8", 3/4", 1", and 1-1/4" round tenons. Mortise production is set up using adjustable stops on the ways and requires no templates. The optional 3/8" ball-bearing guide stylus is required for use with any of the templates. To assist you in choosing, we offer sets of selected templates as listed in the box at right.



Precision double fluted HSS spiral end mills are available from us for achieving the best results with the Multi-Router. An optional steel stand provides a secure mount for the machine, or it can be mounted to a sturdy workbench.

The power air clamps are available either as original equipment or as an accessory system. If your shop is not already equipped with an air compressor, low-cost units are readily available, and 1/2 hp or 3/4 hp tankless compressors provide ample capacity for rigid clamping. For the Multi-Router demonstrator in our showroom, we found at Sears a small 3/4 hp compressor for under \$100 which works great. Of course, the Multi-Router can be purchased and used without the air clamp system, in which case stock is held by two quick-set hold-down clamps which mount in any of the table's 14 mounting holes.

Whether you want a machine for commercial mass production of chair parts, or you are just looking for the ultimate versatile mounting facility for your router, you will find the Multi-Router to be an outstanding combination of ingenious design, meticulous precision, rugged construction, and first-class execution. We offer with pride the Multi-Router to our customers, and welcome your inquiries. If your interest is piqued, we urge you to borrow the video and witness for yourself the possibilities.

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 from us within the 30 days, keep the video and your \$20 is credited towards your purchase.

Machine prices below are FOB Atlanta, truck collect. 101-L shipping weight is 99 lbs.

Multi-Router Model 101-L					\$1295.00
Multi-Router Model 101-L with PC-1 Air Clamps					\$1525.00
Machine Stand					\$79.00
PC-1 Air Clamps					\$230.00
TEMPLATE SETS:	1/4" Tenons (5 templates):	1", 1-1/2", 2", 2-1/2", 3"			\$68.75
	3/8" Tenons (3 templates):	2", 2-1/2", 3"			\$41.25
	1/2" Tenons (3 templates):	2", 2-1/2", 3"			\$41.25
	Round Tenons (3 templates):	1/2", 3/4", 1"			\$41.25
	Dovetails (2 templates)				\$33.00
	Finger Joints (2 templates):	1/4", 3/8"			\$33.00
Ball-bearing Follower Stylus					\$45.00
SAVE! Set of all 18 templates listed above plus follower stylus:					\$289.00
SPIRAL END MILLS:	Diameter	Shank	Cutting Length	Overall Length	
	1/4"	3/8"	5/8"	2-7/16"	\$14.70
	3/8"	3/8"	3/4"	2-1/2"	\$14.70
	1/4"	3/8"	1-1/4"	3-1/16"	\$16.85
	3/8"	3/8"	1-1/2"	3-1/4"	\$16.85
	1/2"	1/2"	2"	4"	\$24.15

The Maloof Joint

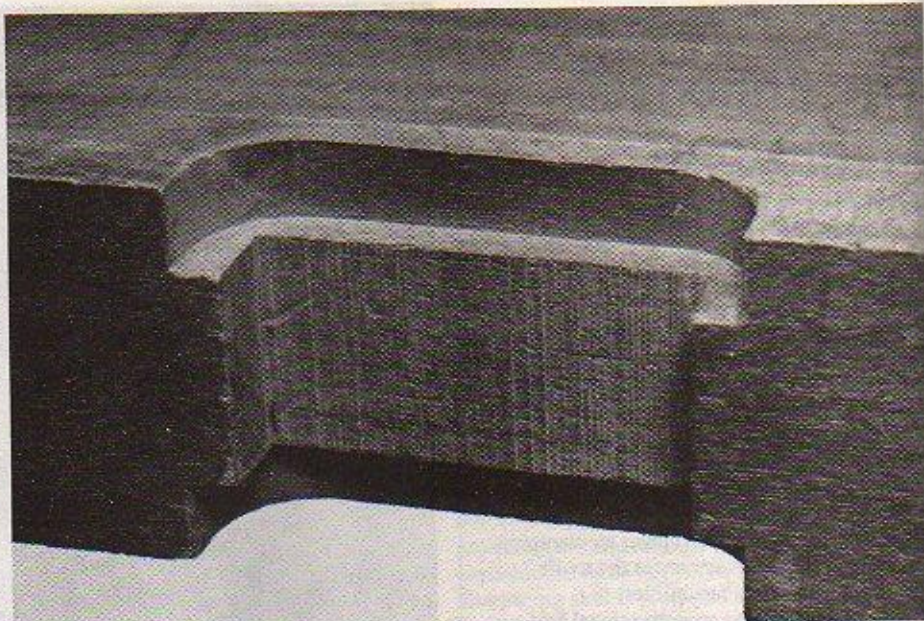
Sam's hybrid half-lap is attractive, strong, versatile, and very easy to make.

By Zach Etheridge

THE MODIFIED HALF-LAP JOINT that Sam Maloof devised for attaching the legs to the seats of his world-famous chairs is pretty clearly of sound design; it looks as though the wood grew that way, and Sam reports not a single failure over the 35-year history of the joint. The engineering principles of a half-lap joint are familiar to anyone who grew up with a set of Lincoln Logs: interlocking notches at a 90 degree intersection provide bracing against almost every kind of stress, and offer lots of glue surface as well. The only stress the structure doesn't resist is tension, but of course a couple of long drywall screws can take care of that rather effectively.

Sam was not content with a simple half-lap joint, however. Such a joint is easy as pie to make quickly and accurately on the tablesaw, but it has the aesthetic appeal of a squashed bug. And there's one other drawback: it won't work at the rear corners of the seat, where the notch won't have an outside wall to make the interlock work. An astonishingly easy way around both obstacles is to create a tongue and groove effect within the notches. This provides a visually interesting joint, adds glue surface as well as mechanical strength, and provides an interlocking structure for the rear corners. The wonderful thing is that this modification requires minimal physical labor and practically no intellectual effort at all (now that Sam has done it, of course), depending as it does entirely on the hand-held router and bearing-guided bits.

Zach Etheridge is Highland Hardware's Product Engineer.



The only two bits required are a rabbet bit and a rounding-over bit, but there's a catch: they must produce curves of equal radius if you're going to produce a joint as elegant as Maloof's. Now, as you know, the numbers used to describe these two kinds of bits don't have anything to do with each other. The size of a rounding-over bit refers to the radius of the cutting edge, but the size of a rabbet bit refers to the width of the rabbet it will cut and says nothing about the bit's radius. So it's not as easy as it might seem to match up the two bits. Most rabbet bits are 1-3/8" in diameter, so the curve produced by the outside edge would match up with an 11/16" rounding-over bit – and it's no accident you've never heard of an 11/16" rounding-over bit. That's the bad news.

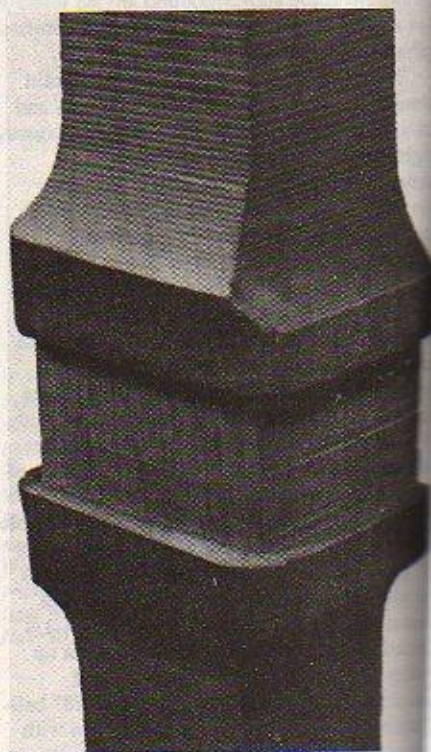
Here's the good news: Highland Hardware stocks a cute little 1/4" rabbet bit with a 1" diameter cutter, which will enable you to produce Maloof joints exactly like the master's with the greatest of ease (and with a 1/2" rounding-over bit). Here's how:

(Though the Maloof joint can be used in many different situations where structures intersect at 90 degrees, we'll use the chair joints to illustrate the construction process.)

Start with the seat, where the front leg will join it. On the tablesaw, cut a dado in the edge of the seat. The depth of cut should be 1/4" less than the final depth you want the leg to penetrate into the seat. Sam dados 1/2" deep. The width of the dado should be precisely 1/2" less than the width of the leg.

Put the 1" o.d. rabbet bit in your router, and set the depth of cut to 3/8". On the top and bottom of the seat, rabbet around the three inside edges of the dado. This leaves you in effect a larger dado with a thick 1/4" tongue running around the inside.

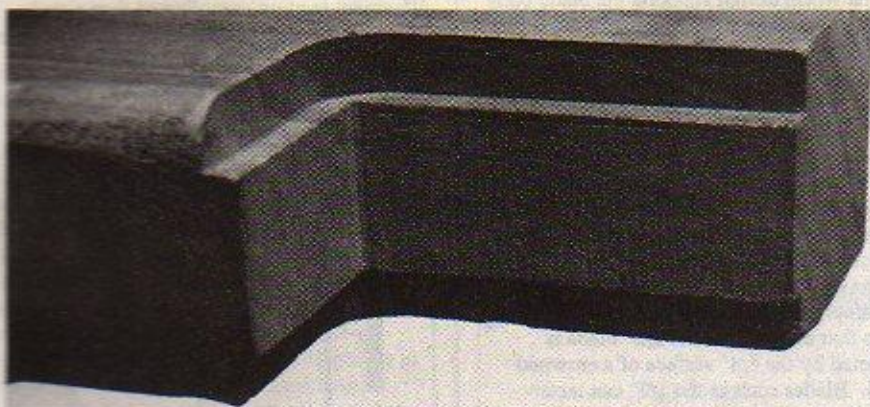
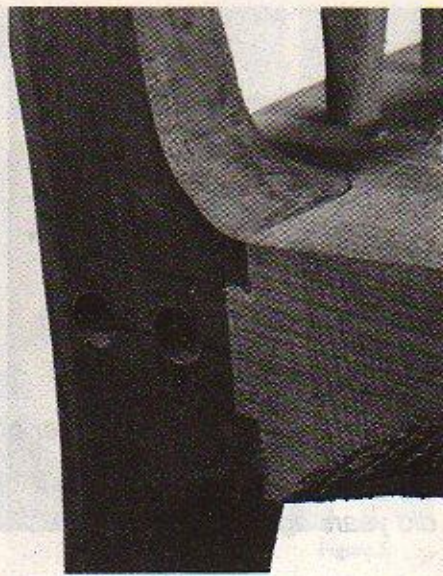
Now take up the leg and mark around the front, back and inside faces where you'll cut dados on the tablesaw. The dados will be 1/4" deep, and precisely the width of the tongue you just created in the seat. Before you cut them, however, you'll want to put the 1/2" rounding over bit in your router and round over the two inside corners of the leg in the vicinity of the joint; thus sculpting the radius that will mate precisely with the round corners left by the rabbet bit in the seat. Now cut the three dados in the leg, and try out the fit.





The joint at the rear corners of the seat is quite similar. From the edge of the seat, the dado is cut to a depth $1/4$ " less than the final thickness of the leg. The width of the dado is only $1/4$ " less than the width of the leg. You'll lay out and dado the front and inside edges of the leg $1/4$ " deep, rounding over only the inside corner.

The outside corner is likely to be the configuration of the Maloof joint that you'll use most often in other pieces of furniture. In pieces of appropriate design, the joint works wonderfully well in tables, shelves, and other open-frame kinds of construction where rectangular solids meet at 90 degrees. Try it – and then see if you can think up any new joinery techniques that work as easily and effectively as this one. Keep us posted on the results.



Anyone interested in experimenting with the joinery described here can order the carbide router bits from Highland Hardware via mail or phone.

The $1/4$ " Rabbet Bit with 1" diameter cutter (and $1/4$ " shank) sells for \$26.50.

Our $1/2$ "-radius Rounding-Over Bit with $1/4$ " shank (no. 10.20.26) costs \$26.50. With $1/2$ " shank (no. 10.20.71) it costs \$28.50.

Add shipping charges described on page 31. Our toll free order line for chargecard customers is (800) 241-6748.

A Maloof-style Chair in miniature

While shooting the photography for this article at the store, we were serendipitously visited by Trish Schwartzberg, a frequent Highland customer who has been busy studying the Maloof chair on display on our mezzanine (an artifact from one of Sam's seminars here). Equipped with her trusty Hegner scroll saw and Dremel Moto-Tool, she had just finished completing a startlingly realistic miniature version of her own (illustrated at right actual size).

Her husband, Ron, has likewise just finished a full-size version. They are now each in the process of copying a Maloof rocker (each to his or her favorite scale).



Bandsaw Alignment

Times change and so do woodworking techniques and expectations. The woodworker of today expects more from the bandsaw than his predecessor did years ago.

©1985 by Mark Duginske

IDEALLY THE BANDSAW is the most useful tool in the shop. It can resaw thick stock or slice off thin veneer, cut straight lines, curves, circles, tenons and dovetails, and the list goes on. There's only one catch. *To do all these things well, the saw has to be very accurately adjusted.* It is a mistake to assume that the bandsaw comes from the factory already adjusted and ready for serious work. The more you expect from your saw, the more aligning and adjusting you will have to do. This takes no special tools or gadgets, just a little time and attention. This article will present some straightforward suggestions for improving bandsaw performance by focusing on wheel alignment, a critical but often overlooked adjustment.

With the European influences of the past ten or fifteen years we now expect to be able to accurately resaw and rip on the bandsaw. When we attempt these things with the average American bandsaw, it often leads to frustration. American bandsaws come from the factory best suited for cutting curves with narrow blades. Because of the factory setup, or perhaps better phrased, "lack of setup", large blades ideal for resawing perform poorly. But by re-adjusting the wheel alignment for blade size and tension, the larger blades can be used successfully.

There are two types of bandsaw wheel designs. The wheels are either crowned or flat. The flat wheels are slightly crowned, but for our purposes, we will call them flat. Both designs have advantages and disadvantages. Each design has a somewhat different effect on the blade; thus there are two completely different tracking systems. The crowned wheel is popular in America for use on

consumer-grade tools, and is used on the Sears, Delta, and Taiwanese saws. The flat wheel design is often used on larger industrial saws and some European machines. One example of a flat-wheeled saw sold in the U.S. is the Inca from Switzerland. The crowned wheel is used because it makes tracking very easy. It is like an automatic transmission in a car. The flat wheel is like a standard transmission; it takes a little practice, but it allows the operator more control and flexibility. Crowned wheel tracking is easy because the crown exerts a controlling force on the blade, pulling the blade to the top of the crown. This tracks the blade in the middle of the wheel. The flat wheel design allows free movement of the blade without any controlling force such as the crown. With the flat wheel design, small blades are usually tracked in the middle of the wheel, and large blades are tracked with the teeth off the tire. With both systems, the top wheel angle exerts final control on the blade.

One of the big differences between the flat and crowned wheel designs is the amount of surface area between the tire and the blade. The flat wheel design supports the blade body no matter what the size. The top of the crowned wheel only contacts about 1/4" of the blade. The largest blade that maintains full contact with the crowned wheel is the 1/4" blade. This is perhaps the only justification for using a 1/4" blade for resawing. The 1/4" blade is not very stiff. To maintain stiffness of the 1/4" blade, tremendous tension is needed which in some cases can damage the bandsaw. See box at end of this article.

The larger blades best suited for resawing on ordinary bandsaws are 1/2" wide. This means that only half of the 1/2" blade is supported by the 1/4" surface of a crowned wheel. Blades such as the 1/2" can teeter-totter on the crowned wheel and increase the likelihood of vibration and harmonic flutter. Under heavy sawing stress the blade can rock on the crown causing loss of tension, lead, and wander. **Lead** is when the blade pulls consistently in one direction. **Wander** is when the blade pulls to one side and then the other. Lead is usually blamed on the blade, assuming that one side of the blade is dull. This can happen, but wheel misalignment can also cause lead. **All of the problems of the crowned wheel are magnified when the wheels are poorly aligned.**

For the best performance, the bandsaw wheels should be *coplanar* (lying in the same plane). This is more critical with crowned wheels than with flat wheels because of the controlling force the crown exerts on the blade. If the two crowns are not in the same plane, each crown vies with the other for control of the blade. The more the crowned wheels are out of alignment, the more the top wheel needs to be angled to track the blade in the center of both tires. See Figure 1. This misalignment puts an unwanted and unpredictable stress on the blade. Imagine trying to ride a bike with the wheels out of line and out of parallel. One or both of the bike wheels

will bind. The same is true with the bandsaw wheels. Narrow blades are more flexible than larger blades and thus tolerate the misalignment better than large blades. Misalignment increases vibration, flutter and heat, and shortens blade life. You need to use more tension to stabilize the blade and maintain accuracy if the wheels are misaligned.

A coplanar wheel relationship greatly improves bandsaw performance by improving efficiency. The wheels work together rather than opposing each other. The blade will literally track itself without any unwanted pressure. The coplanar relationship uses the advantages of the flat wheel system and negates some of the disadvantages of the crowned wheel system. You will notice less vibration, more accuracy, more power, and less lead and wandering. You will get better results without the need to overtension the blade. You will get better performance from blades larger than 1/4". You will notice this particularly when you are resawing and making straight cuts.

If wheel alignment is so critical, why isn't it done at the factory? Unfortunately, the alignment is more complicated than simply lining up the wheels with a straightedge at the factory. As the tension on a blade is increased, the wheel alignment may change. Wheels that are coplanar with no tension (or only a small amount of tension) can become out of plane when the tension is increased to an adequate amount. See Figure 2.

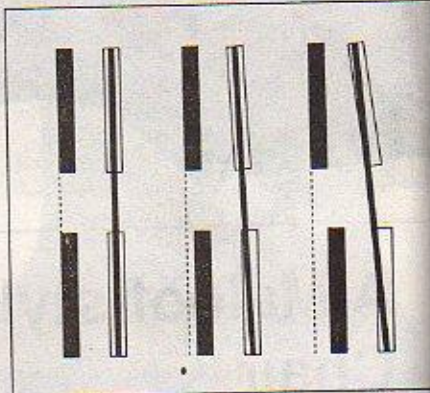


Figure 1.

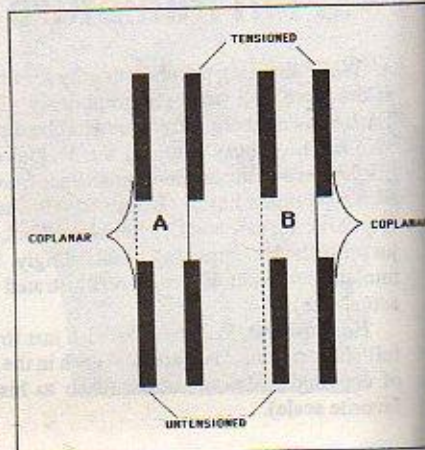


Figure 2.

Mark Duginske is a woodworker from Wausau, Wisconsin.



Figure 3.

The coplanar relationship is most critical when you are tracking larger blades that are highly tensioned. For this reason the wheels should be aligned when the large blade is on the saw. This will insure that the wheels are coplanar when the relationship is most critical. You are conforming the bandsaw to the blade rather than the usual method of conforming the blade to the saw. This realignment is very important for crowned-wheel machines though less important for flat-wheel machines. If your crowned-wheel bandsaw has historically performed poorly at resawing and ripping straight lines and no amount of tracking adjustment seems to help, improving its performance may simply be a matter of properly aligning the wheels for a correctly tensioned 1/2" blade.

A good test case for this alignment technique is my recent experience with a new Sears bandsaw. Over the years I have realigned a number of saws of different size and make. When I first tried the Sears, I could tell it needed attention. It would cut curves with the 1/4" blade, but wandered when straight cuts were attempted. It did poorly cutting thick stock or resawing. The blade would pull to one side. Increasing the tension did not greatly improve its behavior, nor did using a large blade.

The first part of the alignment process was to install a 1/2" three-tooth hook blade, my favorite resaw blade. I use Lenox blades, but Sears offers a three-tooth hook that also works well. The Lenox is .025" thick and the Sears is .030". The performance for both blades is good. After installing the blade I tensioned the saw to the 1/2" blade setting on the saw's tension scale. Since these scales aren't always precise, I then double-checked the blade's tension in another way by plucking the blade and listening for a clear musical note.

The wheels were then aligned with a straightedge, which can be a length of wood that has been jointed. On the Sears bandsaw, the alignment process is done by moving the **bottom** wheel. On this one, I had to move it inward a full 1/4" on the shaft. [Note: Delta bandsaws (and Taiwanese copies) are aligned by adding or removing washers on the **top** wheel shaft. Inca 10-1/2" bandsaws are aligned by moving the **bottom** wheel]. The top wheel is then angled (using the tracking adjustment knob) to be parallel with the bottom wheel. The two edges of each wheel should then touch the straightedge. The straightedge should be as close to the center of the wheels as possible. See Figure 3.

After the first alignment, you should always rotate the wheels several times by hand to make sure that the blade is tracking. Then you should recheck the alignment.

If the wheels are warped, you will get a different reading against the straightedge each time that you check the alignment. Thus, it's a good idea to mark the original wheel positions in relationship to the straightedge. Use a pencil, magic marker, or file to mark the wheels, and then check in other positions to make sure the wheels are true.

After realignment, the Sears worked much better and would adequately resaw with the three-tooth 1/2" blade. It also ran the 1/4" blade with more control and accuracy.

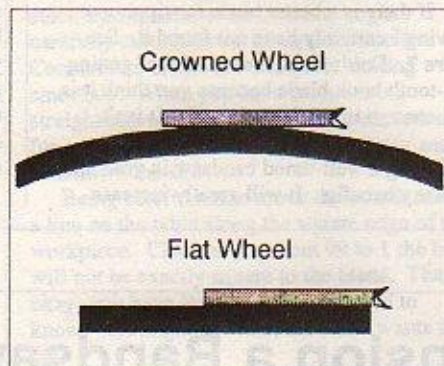


Figure 4.

Again, my suggestion is to align your saw for the biggest blade that you use. It is not good to use a blade larger than 1/2" unless you have a very large saw. If the largest blade you use is a 1/4", align the saw with that blade. Don't be afraid to realign your saw often. Consider especially if you plan to do a lot of work with one particular blade that it's a good idea to align the saw for that blade. Think of it as just another adjustment that you should make. You can still use the top wheel angle (set using the tracking knob) for any final adjustment, but don't depend on it too much. Remember, wheel alignment is the more fundamental adjustment. After you align your saw a couple of times, it will become very simple and easy to do. The minute that it takes is a small price to pay for good performance.

If you have a crowned-wheel saw and you realign the wheels using a 1/2" blade, you

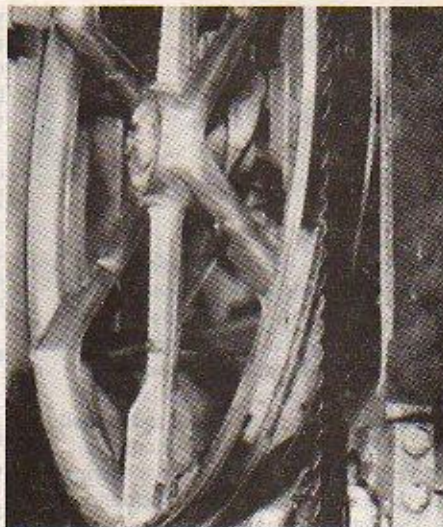


Figure 5.

may notice that the blade doesn't track in the middle of the wheels. The blade may track so that the blade is closer to the front of the saw. The blade is balancing on the crown and the teeth are applying less weight than the solid back of the blade. In contrast, on a flat wheel saw, the flat wheel supports the larger blade up to the teeth. See Figure 4. This lack of support for blades over 1/4" is the biggest weakness of the crowned wheel. Proper alignment of the wheels helps stabilize the blade, but it cannot make up completely for the lack of support by the tire. The photo (see Figure 5) shows the crowned wheel colored with blue chalk and the 1/4" line where the 1/2" blade is contacting the crown. The picture shows the blade tracking toward the front of the saw. If the blade does track toward the front of the saw, you should use the tracking knob to angle the top wheel slightly backwards so the blade rides in the middle of the top wheel. This will give the blade some extra support.

In Figure 6 below, the photo shows the bottom wheel on the Inca saw which is flat. The teeth of a 1/2" blade track off the edge of the tire.

(continued on next page)



Figure 6.

Bandsaw Alignment

(continued from previous page)

The strong point of the flat wheel system is the amount of blade support, especially for blades wider than 1/4". This greatly adds to the stability of larger blades. The flat wheel is less sensitive than the crowned wheel to misalignment. A drawback of the flat wheel is that it takes practice and skill to track small blades. Blades smaller than 1/4" should be tracked very lightly against the thrust bearing because there is no crown to hold them in place. The flat wheel tends to be much better than the crowned wheel for straight cuts with larger blades (ripping and resawing) because of less lead and wandering. This means that you can use a rip fence for ripping and resawing. The rip fence gives much better support than the single point. It would be good if crowned-wheel bandsaw manufacturers sold an optional flat wheel tire which could be quickly changed. This would allow maximum performance with bigger blades.

The crowned wheel and the flat wheel designs both work. Remember that the saw is only one-third of the partnership. The operator and the saw blade are the other parties involved. There is no magic sawblade that does everything well. A good blade for cutting curves will not be the best blade for resawing. If you have one saw, you will have to get used to changing the blade for different tasks. If you are real serious, or if you use

your tools to make money, it is a real timesaver to have two different bandsaws, each aligned for a different blade. One can have a large blade for resawing and ripping, the other a small blade for scrollwork.

On the large bandsaw in my shop, I use a three teeth per inch hook tooth blade made by Lenox. The blade is very efficient at removing wood and leaves quite a smooth finish. The large gullet between the teeth can hold a lot of sawdust, which is helpful when cutting thick stock. With fewer teeth, the

If your crown-wheeled bandsaw has historically performed poorly when resawing and ripping straight lines and no amount of tracking adjustment seems to help, improving its performance may simply be a matter of properly aligning the wheels for a correctly tensioned 1/2" blade.

blade runs cooler than a small-toothed saw. Lenox blades are usually equally sharp on each side which decreases the likelihood of lead. If there is a better blade for ripping or resawing I certainly have not found it. See Figure 7. Don't make the mistake of getting the 4-tooth hook blade because you think it is close enough to the 3-tooth hook. It isn't.

Having a well-tuned bandsaw in your shop has many benefits. It will greatly increase

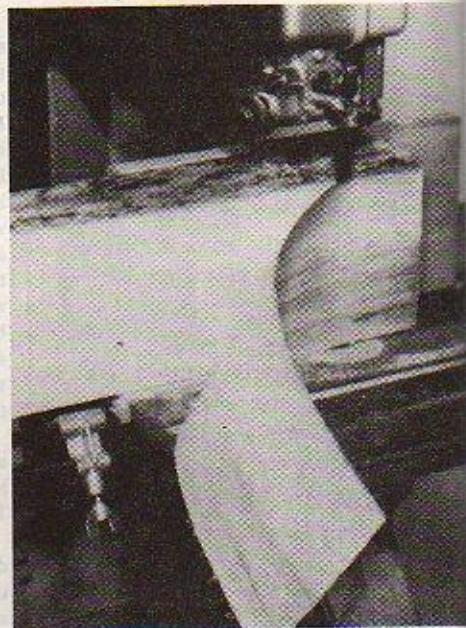


Figure 7.

your confidence and your options. It makes the work more efficient and enjoyable. It also has another important benefit: safety. When your bandsaw is accurate, you can use it for cutting, especially ripping, small pieces that would be dangerous on the table saw or radial saw. There is no dangerous kickback with a bandsaw. If a well-tuned bandsaw can help you avoid an accident, all the attention you give it is certainly worth the effort. In a sense, the more of your woodworking operations you can coax your bandsaw to do for you, the safer and more fun your woodworking will be.

Can You Over-Tension a Bandsaw Blade?

Yes ! ! !



The picture at left shows the sheared-off bandsaw wheel shaft of a Powermatic bandsaw. This is an example of a phenomenon called metal fatigue. If metal is flexed back and forth enough times under enough force, it will break. Bandsaw shafts are designed to tolerate a certain force. It is a force well above the level of force exerted by a normally tensioned blade, i.e., a blade tensioned according to the saw scale. At this tension or "endurance level" the shaft should last virtually forever. A shaft can easily tolerate a one-time force over the endurance level, but fails if that force is applied to the same shaft millions of times or cycles. The revolving shaft of a bandsaw is a good place for applying the compression-tension cycles that cause metal fatigue. It would only take 15 to 20 hours of use to accumulate a million cycles. The greater the excessive force, the lower the number of cycles it would take to cause the failure.

Adequate tension is important for bandsaw performance, but it is only part of the solution. Increasing the tension cannot make up for improper wheel alignment or the wrong blade choice. If you have to greatly exceed the tension scale setting for good performance, it is a clue that you are doing something wrong. If you do not correct the problem and continue to use excessive tension, you risk the chance of damaging your bandsaw. — M.D.

Making Thin Ones out of Fat Ones

By Jack Warner

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HARDWOOD is most commonly available in actual thicknesses of about three-quarters, six-quarters and eight-quarters of an inch, and a lot of woodworkers settle for one of those without a second thought.

That's often a mistake, for several reasons. To begin with, three-quarter stock is boring. Everything is three-quarters — especially plywood.

Assuming that three-quarters is acceptable structurally for a project, you'd be surprised how much better four-quarters or even five-quarters will look almost every time.

And there are lots of projects — jewelry boxes, silverware cases and the like — where three-quarters is much too fat; it looks clumsy.

There are times when the best thickness can be arrived at by planing; if you are building a small project that needs half-inch stock and you have some three-quarter boards that have a distinct cup or bow, then you will probably have half-inch boards by the time you get them flat.

But of course it is a terrible waste to leave a quarter of an inch or more of a perfectly good wood on the floor just to get it to the right thickness.

Thus every woodworker should learn the techniques of resawing, and never hesitate to use them. In addition to making thin boards of fat ones, it also provides you with the same design possibilities as veneer, such as bookmatching.

Bookmatching is simply the process of placing two resawn boards, or two leaves of veneer, in the exact sequence in which they were cut and then opening them up like the pages of a book to expose two faces that are generally close to being mirror images.

I recently read in a woodworker's magazine an article on resawing in which the author said he always preferred resawing on the table saw because the band saw leaves too rough a surface.

I cannot agree with that. I'll resaw on my table saw when I can do it in one pass, certainly — but that's hardly resawing; it's just ripping. Of course, you can only resaw on a

table saw wood that is no more than double the greatest depth of cut available on your saw.

I dislike the procedure because it is slow — unless your saw is equipped with at least a three-horse motor or bigger, you are likely going to have to make a good many more than the minimum two passes. And it is potentially dangerous, especially with the larger motors. The slightest bind and you'll get the workpiece in your face.

I much prefer a well-tuned bandsaw for resawing. It still isn't easy, but neither is it dangerous.

If you intend to do some serious resawing, especially in very dense wood, start with a new blade with no more than three teeth per inch; generally speaking the coarser the better. Get everything adjusted just right. But don't start resawing yet; it's apt to be a disaster if you do.

Most bandsaw blades don't want to cut parallel to the blade. This is generally because the set of the teeth is not perfect. It's aggravating, but you have to deal with it.

Take a piece of scrap stock, a couple of inches thick, square up an edge and with a marking gauge, run a straight line down its length an inch or so from the edge. Exactly where the line is doesn't matter, as long as it's straight and parallel to the square edge.

Run the blade guides down to clear the stock by a quarter of an inch and begin carefully cutting down the line freehand. Concentrate on the cut and get it running smoothly. When you have been cutting straight down the line without any deviation for several inches, hold the board steady and shut down the saw.

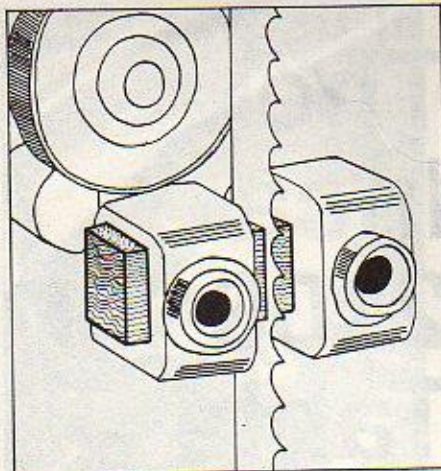
Being careful not to move the board, mark a line on the table along the square edge of the workpiece. Chances are about 99 to 1 the line will not be exactly square to the blade. That's okay; you have learned what you need to know — the angle at which the blade wants to cut.

When you set your fence to resaw, see that it is parallel to that line. My saw, an Inca, is one of the few with a fence that can be set at an angle. If yours can't, then plane up a nice stable piece of hardwood for a fence and clamp it to the table.

If you get the fence set right, and if you make certain your workpiece has one flat edge and one flat side that are exactly square to each other — the edge goes to the table and the flat side to the fence — then you should have no trouble resawing. Take it easy and don't force the work.

If I'm slicing a thick board into three or more pieces, I take it to the jointer to resurface the fenceward side between each cut; overly fussy perhaps but I like to be sure everything's square.

Always remember you are exposing new wood when you resaw; the resawn boards are going to move some and will have to be planed true after they have stabilized. Make sure to allow for that waste when you divide the board for resawing.



Cool and Slippery

New Bandsaw "Cool Blocks" Prolong Blade Life & Increase Accuracy

Cool Blocks are made to replace the original metal guide blocks which came with your bandsaw. They are made of special composite phenolic resins impregnated with graphite, and can be set closer to your blade than metal blocks, thus offering a more stable, guided cut.

Conventional metal guide blocks create friction and heat by their metal-to-metal contact with the blade, leading to blade fatigue and premature breakage. Cool Blocks eliminate this problem so blades run cooler with less friction and last longer.

The dry lubricant in Cool Blocks is formulated to give sufficient blade lubrication but will not stain the wood. The blade will run smoother and quieter. Cool Blocks pay for themselves quickly by extending the life of your bandsaw blades.

Set of 4 blocks costs only \$9.95 plus \$3.00 shipping. Available for the following bandsaw models (be sure to specify your model):

- Delta 14" (and Taiwanese copies)
- Sears
- Inca 10-1/2"
- Shopsmith

Order Cool Blocks from Highland Hardware, 1045 N. Highland Avenue, Atlanta, GA 30306.

Charge card users order toll free: (800) 241-6748

The Inca 2100 Table Saw

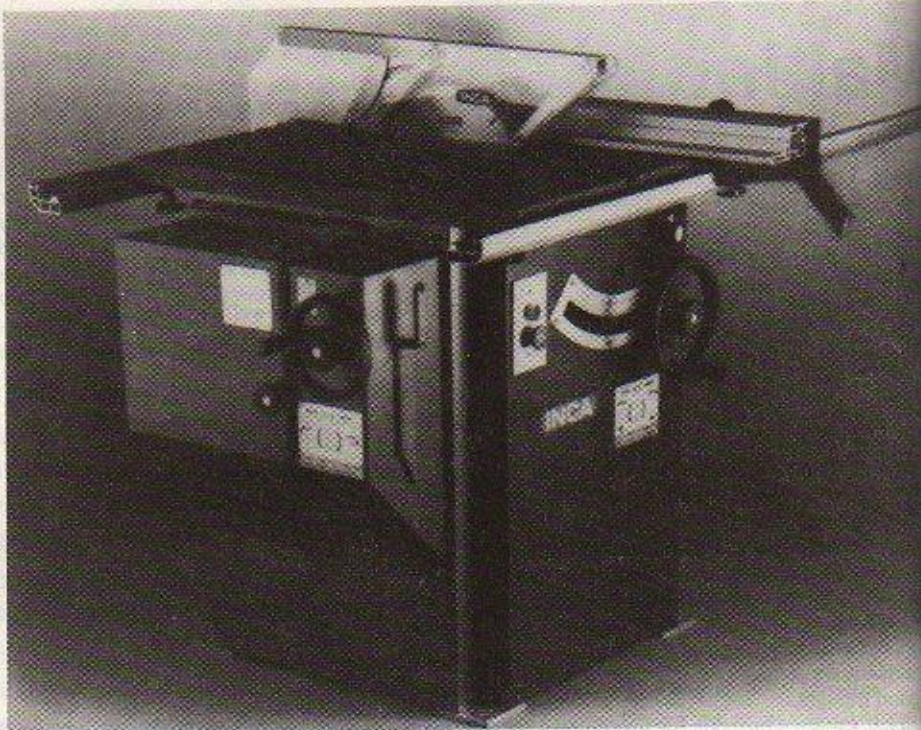
©1987 by Hugh Foster

IF ALL YOU WANT to do is rip some lumber, you probably don't need the Inca 2100 table saw. Only at first glance does it remind you of other table saws, and in no way does it remind you of earlier Inca products which have often tended to be deceptively small.

"Small" is hardly the word to describe this saw: It measures 27" wide and 31" deep without the extension wings. (Contrast that to the 36" width and 27" depth of my Delta UniSaw with *both* wings in place.) If you were to place a pair of extension wings on the Inca, it would be 53-3/4" wide. Too, the Inca wings are pre-ground to accept standard round base routers, a definite plus. Mount the right router there and you have the equivalent of Krenov's shaper. In fact, in my dream shop there will be an extra wing and an extra router so that I don't ever have to take the set-up apart. Have I given it away too soon? I like this product, and I expect it to revolutionize the entire table saw market in this country. Even if it doesn't, I want one. Here's why.

There are 12 inches in front of even a

Hugh Foster is a woodworking English teacher and writer from Manitowoc, Wisconsin. This article first appeared in the December/January 1987 issue of Popular Woodworking magazine, and is reprinted with permission. Subscription information is available by writing them at 1300 Galaxy Way, Concord, CA 94520.



fully raised 12 inch blade, and that fully raised blade will cut through 4" stock in a single pass. The massive 1" arbor is just one contributing factor to the saw's almost unbelievable accuracy.

The top is made of two castings, glued and bolted together, to ensure a flatter surface for a longer time. There are eight leveling screws in the throat plate (in contrast to the four on my UniSaw). The engineering throughout is masterful; the precision of the machine permits more

The massive Inca arbor (right) is shown here next to a Sears arbor (left) and one from a UniSaw (center).



accurate sawing than I have ever done before. It demands, by example, more precise work than I have done – and I always thought I was at least a fair craftsman.

The blade rides straight up and down rather than through the arc that other table saw trunnions ride. This ensures that you can always mark top-dead-center of cut simply by once marking the center line of the blade. This feature will be especially useful when you are working with jigs. In contrast to most other saws, the inside of this one does not act as a dust collector. An air foil system ejects virtually all sawdust from the saw into standard 4" venting systems. Keeping the works clean this way will enhance long-term accuracy.

The base is made of heavy gauge reinforced steel, double-thick at the boxed corners. The motor mounts accept standard U.S. motors, and 3 to 5 horsepower is recommended. With a 3 HP motor, the saw weighs about 325 pounds.

The hand wheels are large and easy to manipulate. A gauge on the front panel gives precise depth of cut. But the best feature of all is the fencing system, the most convenient of any I've ever seen. First, there is a main fence that rides on extruded extension rails in a dovetailed keyway that permits quick, accurate adjustment. Built into these rails is a measuring system second to none. It features an adjustable ruler with "zero" set by the user for each operation. The

1/32" gradations are read by a built-in magnifying glass. A three-position "user" fence rides on the main fence. This allows you to choose whether to have the fence low, high or normal, and adjustments can be made extremely quickly. Indeed, I found the fence to be the saw's most useful feature. Returning to my trusty Unisaw with its plain vanilla fence will be something of a letdown, one that a UniFence or even a Biesemeyer fence unit won't likely cure.

One of the reasons the saw blade rides straight up and down is that the unit is meant to be used with its optional mortising table. The mortising table for this unit is twice the size of Inca's other mortising table, with twice the number of hold-down positions.

There are some safety features that also add greatly to the unit's convenience, e.g. the arbor lock for adjusting the mortising cutter's chuck also makes changing saw blades easier.

This is a saw for woodworkers who want to do precision joinery rapidly and on a fairly large scale.

I did not get to sample the sliding table, but it will also be available as an option for this saw. I can't imagine it being a necessity, for the miter gauge is also far superior to the miter gauge on my Unisaw - it is smoother tracking and far more likely to be square to the blade. On the Inca, there was no need to hold the miter gauge "just so" in the slot to get perfectly square cuts.

Just ripping is not what this saw is about. This is a saw for woodworkers who want to do precision joinery rapidly and on a fairly large scale.

The Inca 2100 table saw is to saws what the Inca planer is to small jointer planers: its accuracy is unmatched at any price and there is no slip or slop in it anywhere. It is so fine that a craftsman in the market for a new saw would be foolish not to check one out, if not actually acquire one. Speaking only for myself, I would much rather have this

than my UniSaw; but it is likely to cost at least \$900 more than the current issue of that UniSaw, and there's virtually no way I can justify the expenditure. However, Santa, if you're listening, I'd really like one for my shop. I sincerely believe this saw would not only bring a new dimension of accuracy to my work, but would also help me accomplish that work more swiftly and safely.

Highland Hardware stocks the Inca 2100 Table Saw and many of its accessories, and can arrange rapid delivery.

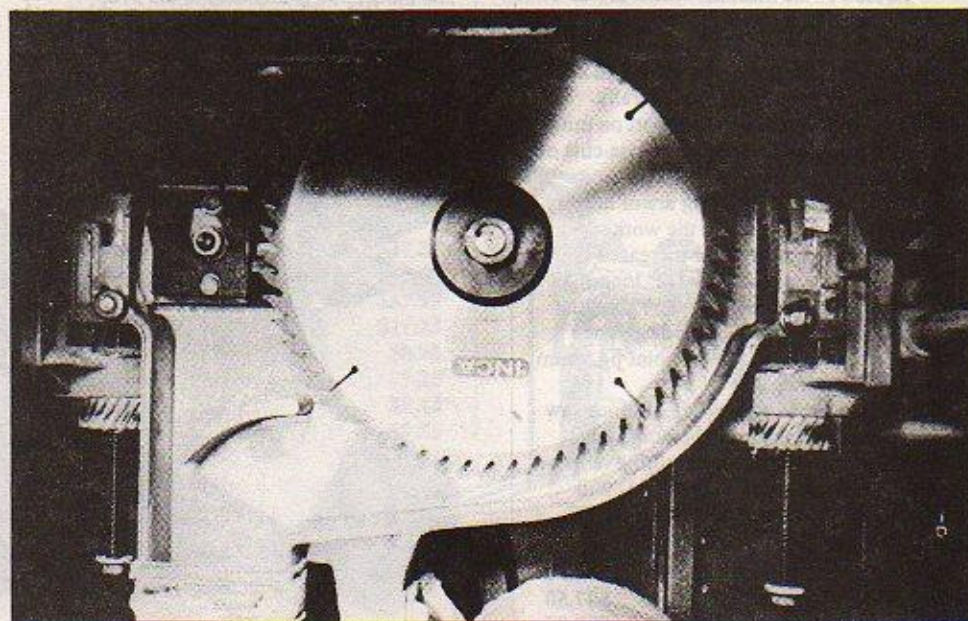
Current price of the 2100 without motor is \$2550. Configured with 2 hp motor and manual switch, cost is \$2790. With 3 hp motor and magnetic switch, cost is \$3290. Optional mortise table and chuck are \$1295.

We are always glad to demonstrate the tool for you in our store, or discuss its features with you by phone.



An optional mortising table is available for milling mortises off the saw arbor.

Because the arbor assembly is mounted on two threaded jack screws at the front and back, it can be raised and lowered in a straight line.



INCA Tools

We welcome your order for Inca Tools. Machines are covered by a Five Year Limited Warranty. Motors and switches are covered by a One Year Limited Warranty. Prices listed here are FOB Atlanta, GA, and are subject to change without notice.

For brochures on specific tools, write us, or call us at 800-241-6748.

Model 249 Tablesaw

The Inca 10" tablesaw is a finely built machine which gives consistently smooth and precisely accurate results on cross-cuts, rips, miters, bevel cuts, dados, and rabbetting.

This particular model of the saw (249) includes a mortise table and chuck as standard equipment. The mortise table is Inca's "old" design, which is to say that this mortise table does not tilt as does the mortise table on the model 259 saw; however, the 249 mortise table is extremely sturdy and quite versatile. (Except for the mortise table design, the 249 saw is identical to the model 259).

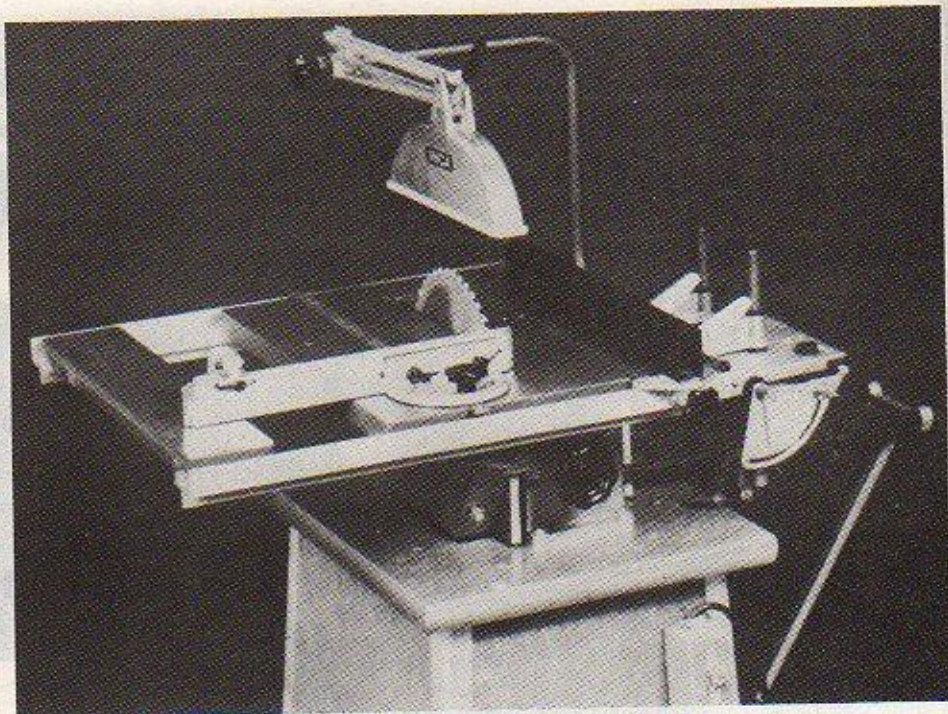
Highland Hardware made a special purchase of this model while it was still available, and is offering a spectacularly low price of \$999. In other words, you are paying the price for the basic saw alone and getting the mortise table and chuck for free!

Some of the saw's features include: Maximum depth of cut, 3-1/8". The fixed arbor, tilting table design with double locking trunnions assures a lifetime of dependable accuracy. It also allows for the power take-off on the side of the machine which drives the drill chuck fitted above the mortise table, providing a means for precise horizontal boring as well as cutting slot mortises. The precision miter guide features a laterally-movable fence for additional support on miter cuts, and a drop stop for multiple cross-cuts of short lengths.

The table and arbor housing are of heavily ribbed alloy die castings, and the work surfaces are hard anodized for increased rigidity. Standard rails are 25-1/2" long. Available optionally are 39" and 59" length rails. Other accessories include a rip fence micro adjuster, tenon jig, finger joint jig, drum sander and disc sander.

Our \$999 offer on the model 249 Inca saw is limited to our remaining inventory. The model 259 saw (which includes tilting mortise table and chuck, pictured above right) will remain available. Its current price is \$1299.

Model 249 Table Saw	\$999.00
1-1/2 HP 110/220 volt motor	\$164.50
Wiring, switch, belt & pulley	\$47.50
Stand	\$99.95



10 1/4" Planer-Jointer

Two models of this superb machine are available. Each is an extremely smooth-running machine capable of excellent results on even the densest hardwoods.

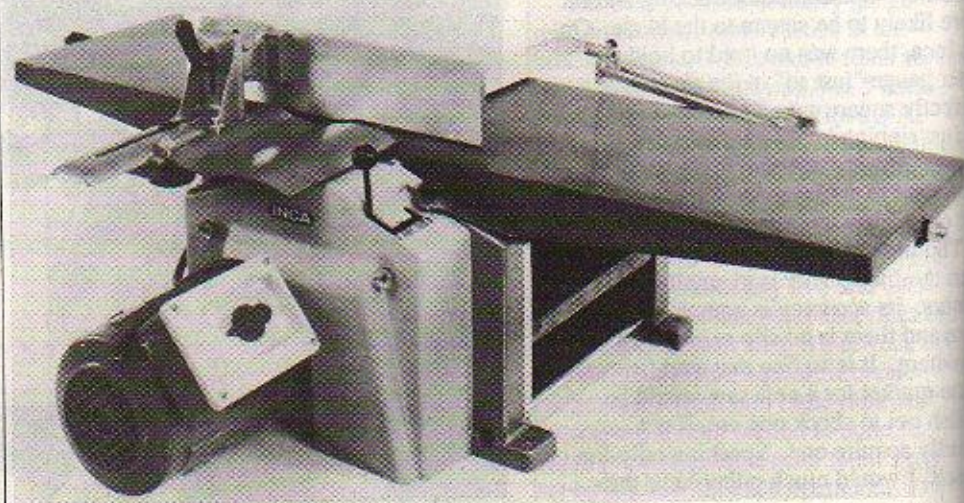
The newest model 570 features the revolutionary Swiss 3-knife Tersa cutterhead. It produces an incredible 18,000 cuts per minute, and uses disposable self-aligning double-edged planer knives which require just 30 seconds for accurate installation. Utilizing the thicknesser's 11 fpm feed rate (high speed 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.

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. The prices below include either a 115 or 230 volt 2 HP motor.

Model 570 Planer-Jointer	\$2250.00
Model 550 Planer-Jointer	\$1950.00
Stand for Either Model	\$99.95



Model 710 20" Bandsaw

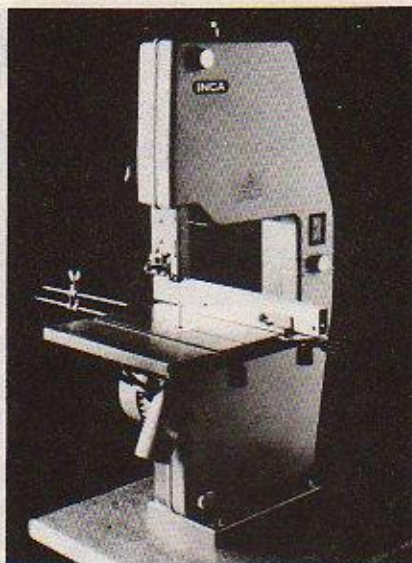
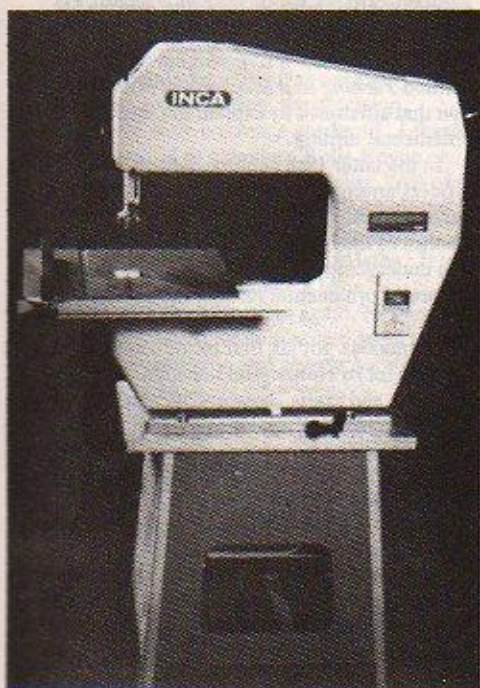
This professional cabinetmaker's bandsaw is perhaps the most versatile and well-made bandsaw ever manufactured, with excellent performance in scrollcutting, ripping, and resawing. Its 3-wheel construction provides a throat capacity of 20". Standard maximum depth of cut is 8", although this can be increased to 10" using an optional riser kit.

The outstanding triple ball bearing guide system permits control of blades as narrow as 1/16", or as wide as 1". The upper guide assembly is raised and lowered by rack and pinion gearing to adjust for stock thickness.

3-step pulleys facilitate blade speeds of 900, 1800, or 2700 feet per minute. Belt tension is set using a removable crank. A large cast table with hard anodized surfaces is supplied with a heavy duty rip fence as standard equipment, and is fitted for a miter guide which is available optionally. Also optional are long rails with extra legs permitting good support for large workpieces.

This saw is an outstanding engineering production and is ideal for the serious woodworker.

Model 710 20" Bandsaw	\$1499.00
1-1/2 HP 110/220v Motor	\$194.75
Stand	\$99.95
Miter Guide	\$97.50
Spacer Block Kit	\$195.00
Circle Cutting Guide	\$87.75
1/16" 24 tpi Blade	\$12.85
1/8" 14 tpi Blade	\$11.60
1/4" 6 tpi Blade	\$10.85
3/8" 6 tpi Blade	\$11.15
1/2" 3 tpi Blade (recommended for resawing)	\$11.90
3/4" 3 tpi Blade	\$16.25
1" 3 tpi Blade	\$19.50



Model 340 10 1/2" Bandsaw

This saw has perennially been one of our best-selling woodworking 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 length of a board. (This is one of our favorite operations which we demonstrate at our stationary tool seminars).

Available optionally is a special guide kit which allows use of 1/16" and 1/8" blades for precise control in cutting very tight curves and performing intricate fretwork. The built-in .6 HP 110 volt motor is direct-drive for maximum efficiency, and is amply powerful for 6"-thick resawing and heavy ripping operations in dense hardwood. An adjustable rip fence is included as standard equipment; a miter guide is available optionally. Other accessories include a circle cutting guide and a sanding belt kit for converting the saw to a cool-running narrow belt sander.

Model 340 Bandsaw	\$695.00
Stand	\$99.95
Miter Guide	\$59.95
Blade Guide Kit	\$59.75
(includes two 1/8" blades)	
Sanding Belt Assembly	\$37.35
Assortment of 6 Sanding Belts	\$10.60
Circle Cutting Guide	\$87.75
1/16" 24 tpi Blade	\$11.25
1/8" 14 tpi Blade	\$8.95
1/4" 6 tpi Blade	\$9.25
3/8" 6 tpi Blade	\$9.45
1/2" 3 tpi Blade (for resawing)	\$9.55

INCA

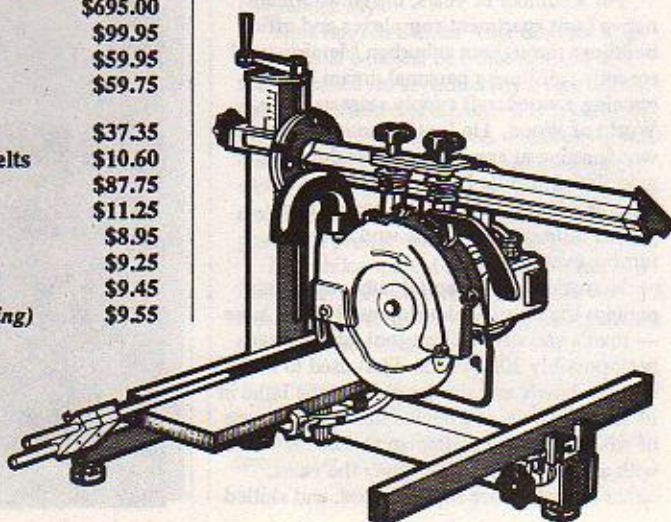
Model 810 Radial Arm Saw

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 3/4 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.

Model 810 Radial Arm Saw	\$625.00
Metal Stand	\$179.95
Extension Arm	\$123.95
Router Carriage	\$124.50



Ed Hernandez' Holtzapffel Lathe

By Tom Frazer

AT TEN PACES, E. C. "Ed" Hernandez' Victorian-era Holtzapffel ornamental lathe doesn't appear terribly impressive. Frankly, it looks somewhat like an oversized but spindly treadle-powered sewing machine connected by looping belts to an overhead dentist's drill.

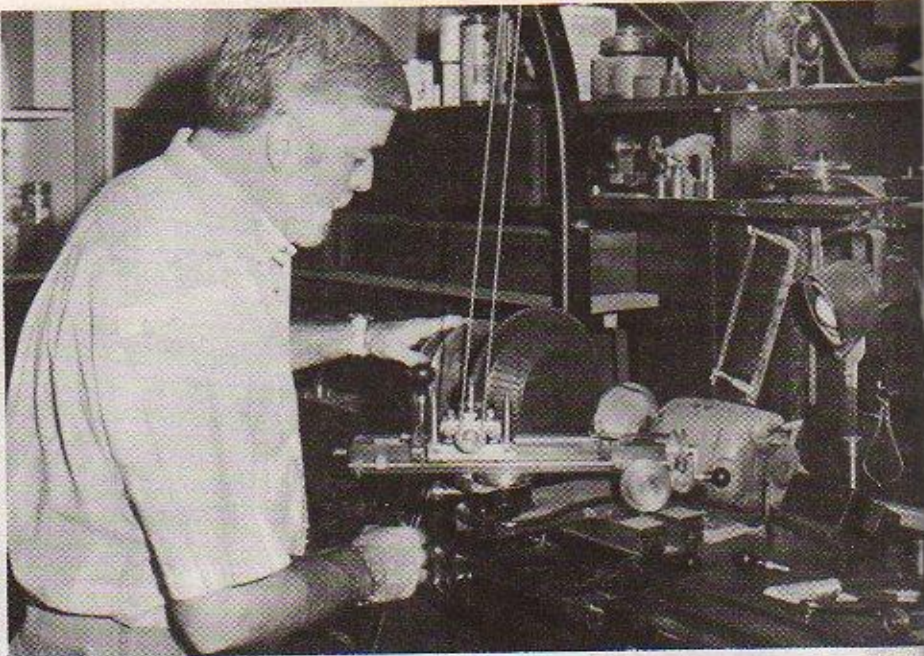
Yet, this "ultimate Rube Goldberg contraption" crafted 110 years ago in London by John Jacob Holtzapffel enables Hernandez to create exquisite works of art and to continue a hobby once pursued in their leisure time by Louis XVI of France and Peter the Great of Russia.

Using exotic tropical hardwoods like ebony or rosewood, Hernandez, 53, has employed his marvelous machine to produce graceful goblets, dainty ornamental boxes, and artistically inscribed plates.

In 1985, Hernandez' wine glass of African blackwood and ivory won second place in competition sponsored by The Society of Ornamental Turners in the category for beginners with less than five years' experience. The event was held in Queen's Parlor in London. And early this year, Hernandez won first place with a cup and saucer made of three pieces of cocobolo wood at a Louisiana Arts and Crafts Guild competition in Baton Rouge. Cocobolo, a variety of rosewood, comes from Panama, western Costa Rica, and Nicaragua.

For a number of years, the New Orleans native built apartment complexes and office buildings throughout suburban Metairie until recently fulfilling a personal dream by opening a woodcraft supply store called World of Wood. He first became interested in woodturning at age 16 while watching his grandfather, Emile P. Hernandez, Sr., use a lathe as a hobby. "When he passed away, I got his little cast iron lathe, and I've been turning ever since."

Hernandez' Holtzapffel lathe represents perhaps the ultimate development of the lathe — man's earliest machine tool which dates back possibly 3000 years. First used to make wooden bowls and similar objects, the lathe in its simplest form is a device that spins a piece of wood while the craftsman shapes the wood with a sharp cutting tool. Over the years, lathes became more sophisticated, and skilled



Ed Hernandez of New Orleans adjusts his Holtzapffel ornamental turning lathe. Note partially completed bowl in chuck. (Photos are by Tom Frazer).

artisans quickly turned out a multitude of utilitarian articles such as rocking chair spindles, lamps, and newel posts. Eventually, modern mass production and the advent of new materials made man-operated lathes more-or-less obsolete for commercial purposes — except perhaps for turning out today's custom-made baseball bats.

The Holtzapffel machine that the former developer acquired at a London auction several years ago is a rare remaining example of a custom-made ornamental lathe of the Victorian era, a time when artistic decoration was pursued with zeal and sometimes to wretched excess. From the 16th through the 19th centuries, particularly in Europe, ornamental turning was a popular art form that produced intricately decorated objects. Often they were of remarkably complex

design — such as the "Chinese celestial spheres" — in which ivory was turned into lacelike spheres, one within another within another. In the 16th and 17th centuries, ornamental turning was practiced by numerous members of royalty and by their appointed artist-turners.

Holtzapffel, an engineer from Alsace, moved to London in about 1790, and in 1794, Holtzapffel and Co. began making in its Charing Cross workshop what was to become regarded as the Rolls-Royce of precision tools. Customers were drawn from the upper classes who had the necessary money and leisure time to enjoy this esoteric hobby. And hobby it was, because the instruments were entirely too complex and slow to operate for profit. Indeed, Holtzapffel and his family felt compelled to write a five-volume work entitled *Turning and Mechanical Manipulation* that attempted to explain the intricacies of ornamental turning.

In the latter 19th century, British Army officers arranged for their ornamental turning lathes to be shipped along with them to the far reaches of the Empire. But by 1914, Europe was undergoing an upheaval, and the manufacture of ornamental turning lathes had ceased.

Hernandez got his first introduction to (and appetite for) a Holtzapffel lathe ten years ago at an arts and crafts show in Chicago. There he met Frank M. Knox of Manhattan, regarded as the doyen of ornamental turners in the U.S. "He had done some beautiful plates and some boxes that I thought were exquisite," says Hernandez. "We got to be friends with him, bought one of his plates, and I started searching for one of those lathes."

That same year, 1977, was when he "really got interested" in woodturning, Hernandez recalls. He took a short course from a well-



known turner named Russ Zimmerman in Putney, Vermont. There, Hernandez asked Zimmerman how he might acquire a Holtzapffel lathe of his own.

If not encouraging, the response turned out to be prophetic.

"He told me I would have a hard time finding one because most people who have one of these lathes usually die before they get rid of it," recalls Hernandez.

So about a year later, Hernandez joined The Society of Ornamental Turners, headquartered in Britain, which gave him access to the people who had these lathes. He began writing to the approximately 300 persons on the list, including those living in Australia, New Zealand, and South Africa. He started with the approximately two dozen Holtzapffel lathe owners in the U.S.

Finally a response came from a Richard Maud in England who informed Hernandez that two Holtzapffel lathes were expected to be auctioned in London. One was a machine owned by Fred Howe, considered the finest ornamental turner of modern times. Howe,

"The lathe has so many possibilities that my son and my son's son could use it for their lifetimes and never exhaust the designs that can be made."

Maud revealed, had suffered a stroke and was in poor condition. Should he die, his lathe was expected to be put on the auction block.

"Approximately a year later, Mr. Howe died," says Hernandez, "and I was able to go to England and acquire the lathe."

But not without considerable difficulty.

Even before Hernandez jumped into competitive bidding against 72 other hopefuls at Christie's auction house, he painstakingly checked out hundreds of disassembled parts and accessories to determine which part went with which lathe. This was necessary because, a century ago, the precision machines were not mass-produced. Likening a Holtzapffel to a modern Rolls-Royce or Rolex watch, Hernandez explains, "All of the lathes were made individually, and all the parts that fit on a particular lathe were numbered to correspond to that lathe. It took almost two years to make a lathe."

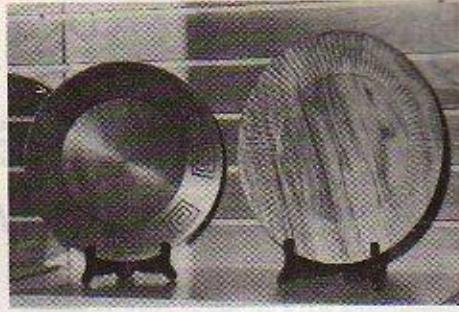
So with the help of an agent, Hernandez identified which lot numbers of parts to bid on, and eventually, was able to purchase Howe's lathe.

"Although my broker was seasoned at this type of work and was guiding me properly," Hernandez says, "there were some parts I failed to get: the parts, for example, that make the Chinese balls. I could have gotten those for relatively pennies."

Back in Metairie, it took Hernandez three months to clean and assemble the Holtzapffel, "and then try to figure out how to use it." Having previous experience with lathes and



Pictured above left are four goblets of purpleheart and ivory along with a small ring box of purpleheart, all turned by Hernandez on his Holtzapffel lathe. The right-hand picture shows two of his decorated plates which were turned on the lathe.



being mechanically inclined helped, he says. So did reading a set of four antique volumes written by engineers that gave him "a feel of how this machine worked." Exults Hernandez, "I tell you, experimenting with it has been unbelievable!"

But try to imagine the problem. The crate that arrived from England contained not only the lathe itself but also a dozen boxes of accessories. "I have about 1100 different bits that fit into approximately 25 different cutting frames," Hernandez says. Accessories also include a tap and die set for making replacement screws, as well as a complete assemblage of sharpening stones and paraphernalia to sharpen all 1100 bits, each a different size and shape.

Hernandez clearly is impressed with becoming associated with an elite tradition. "The people who bought these lathes would be the people of means in those times," he says. "They had a lot of time on their hands and were able to understand the engineering aspect of ornamental lathe work. It was a hobby machine for the lords and princes that was made from the Renaissance to the Victorian era."

Fewer than 100 Holtzapffel ornamental turning lathes remain, and today Hernandez believes he's among only eight owners who actually use their machines. "Many are in museums, and many are owned by collectors."



Lathe No. 2135 is in the Smithsonian Institution, and No. 1556 is in the J. Paul Getty Museum in Los Angeles. Some are not complete working lathes, and all are foot-powered, like an old-fashioned sewing machine," Hernandez says.

Like fellow members of The Society of Ornamental Turners, Hernandez took care to learn his lathe's "genealogy." "My lathe is No. 2325, and it was purchased for 100 pounds on January 4, 1877, by a Lord Overstone for Lewis V. Lloyd, Esq. And as a matter of fact, I have a copy of the invoice." The second owner was Thomas Herbert Edwards of Liverpool. When Edwards died, he left the lathe to his chauffeur, a Welshman named Griffiths. After trying for 10 years, Fred Howe finally persuaded Griffiths to sell the rare Holtzapffel. "Then through Christie's auction house, it came to me," says Hernandez.

At his home in Metairie, Hernandez also has a top quality English Myford lathe, as well as an oversized lathe that was custom built to his own design (pictured below left). With his largest lathe, Hernandez can turn bowls up to 44 inches in diameter!

Using his Holtzapffel lathe, Hernandez has manufactured about 100 pieces, some of which take about 40 hours to complete. Objects include plates, round boxes, goblets, chalices, and a cup and saucer. "The lathe has so many possibilities that my son and my son's son could use it for their lifetimes and never exhaust the designs that can be made," Hernandez says.

Thus far, Hernandez' tour de force is an ornamental pedestal box that consists of a round domed lid supported by a ring and five columns attached to a base. It is made in ten pieces of purpleheart wood which came from Central and South America and pink ivory wood that's native to South Africa. Hernandez liked his creation so much that he had postcards printed from a photograph of it.

In a philosophical context, Hernandez is fascinated with another aspect of his tool. "A lathe," he says, "is the only machine tool that can reproduce itself."

Tom Frazer of Metairie, Louisiana is a newspaper writer, woodworker, and frequent contributor to Wood News.

From Starving Artist to Profitable Artisan

... with a Scroll Saw

By Ronald L. King

RECENT YEARS have brought an explosion of interest in country crafts. All across the country you see advertisements for country fairs and craft classes. Many bazaars and flea markets invite local artists to show and sell their projects. The American public craves just about anything "country". It looks like the "starving artists" have found a way to feed themselves, producing country crafts and splashing on a few touches of paint or a stencil here and there.

Traditionally, being an artist meant you were willing to work for little or no profit; you simply pursued your art for the love of it with perhaps only a faint hope of some reasonable return for your time.

How times have changed!

An artist friend of mine once told me that if she painted ten watercolor paintings, she could probably sell three of them for about \$250.00 each, while the other seven would remain "for sale", be "given away", or put in the attic for the proverbial "showing". However, the end result was \$750.00 for ten paintings which took approximately 300 hours to produce. So my friend earned \$2.50/hour, less expenses such as materials, travel expense, etc. - not exactly an enviable profit!

But my artist friend has changed her business card. She is now an *artisan*; she makes country craft projects. And, I might add, she makes them just as fast as she possibly can. It's amazing what easy money

will do, even for an artist. For the first time in her career, she is actually making profits... good profits (let's make that *very* good profits.)

Sometimes she gets frustrated because there *too many* orders. She now must have an accountant handle the books, and she needs secretarial help with the correspondence with dealers, distributors, brokers, suppliers, and yes, even customers. It's almost as if she doesn't have time to be an artist anymore... and furthermore, sometimes she doesn't even have time to cook my dinner.

Yes, my artist friend is also my best friend, my wife. Now I'm known as the support team. I cook TV dinners, I type as fast as my two fingers allow, I answer the phone, I perform the janitorial services, and sometimes I even get to help with pattern cutting!

With mushrooming consumer interest in country crafts, it seems we're not alone. Lots of folks are buying scroll saws. It's hardly a surprise. Scroll saws are easy to use, safe, lightweight, and affordable. We looked around and thought it over; then decided we only wanted to buy this tool once. So we took no chances and bought the saw recommended as the best. We haven't regretted it. Although priced at almost \$1,000, we got our saw for only \$40 a month through the supplier's financing program.

With the high percentage of profits attainable for "cottage industrialists", it doesn't take long to recover the investment.

Don't be fooled into buying less than you need. Even the best is within easy reach for most of us, and the extra investment really pays off.

Our other "secrets"?

We have found that *uniqueness sells*. A successful product must instantly catch the attention of the buyer since almost all purchases of country crafts are spontaneous. A customer sees it, likes it, and buys it. Especially if the price is below \$20.00, you don't go home to think about it; you don't need spousal approval; you just buy it.

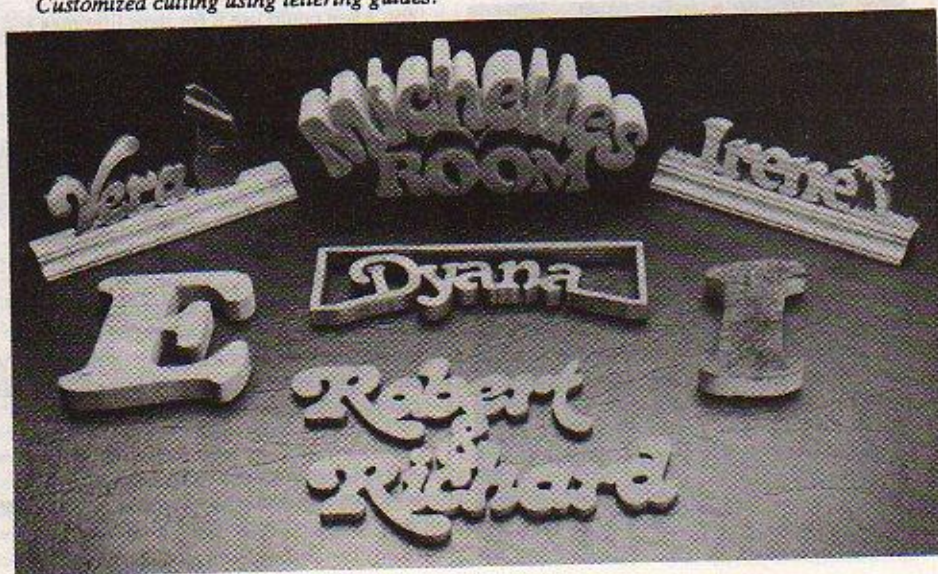
The challenge is to *constantly* create new and exciting items because they are only unique until you display them at the first show! Hot items are instantly copied; so we try to figure out how many the dealers will buy on their initial orders and have them all ready before we ever show a new item to the general public. In other words, we try to get our dealer orders first, because the items may only be unique for a few weeks.

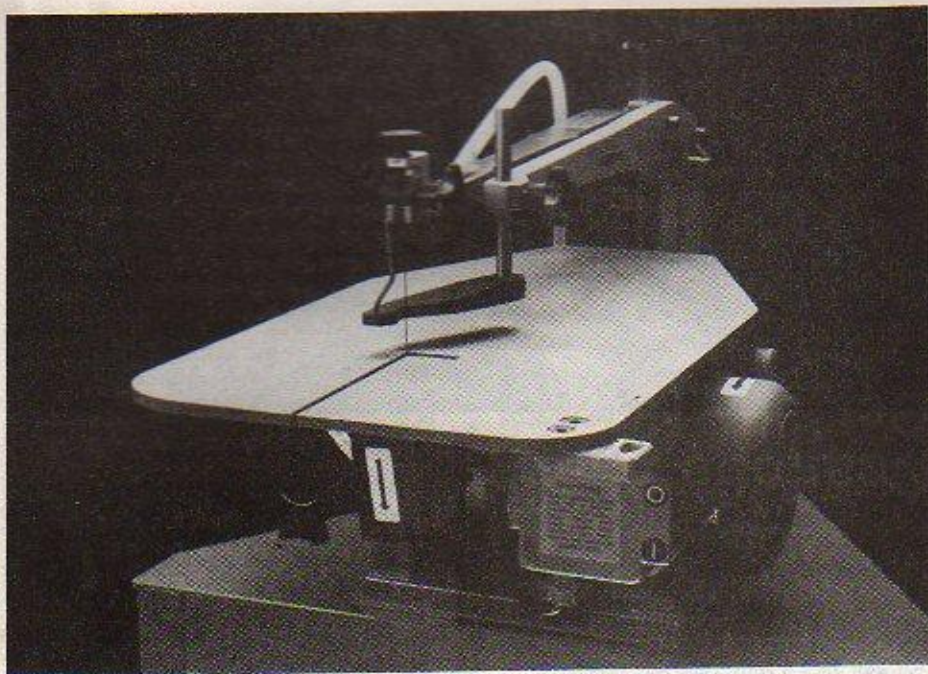
Of course, some of our friends have chosen other scrolling specialties, like semi-production or customized cutting. This can be as simple as a nameplate, company log, or a personal laminated photo jigsaw puzzle. For instance, one might offer two or three styles of wall or desk nameplates, perhaps with a choice of the type of wood used, and of course you let the customer choose his favorite lettering style. One friend uses lettering guides he purchased from his saw supplier and loves them!

We take orders for our customized products, but lots of people actually cut items out at craft shows. We are told doing the work at the show invites more emotional purchasing, reduces shipping and finishing costs, and eliminates returns. However, we are more comfortable doing the work in the privacy of our own shop. If we goof (and don't we all?) we simply start over again if we're in our shop; and perhaps more importantly to us, it keeps both of us free to talk with the people without the distraction of a scroll saw running at the shows. This is important to us because this is an excellent time for us to both sell and make contacts for future sales.

One of the most difficult tasks is to keep the number of products within reason. Once you have made the plunge into scroll sawing, there seems to be no limit to the number of items you can produce. You should constantly be evaluating each item; if it doesn't sell well, discontinue it right away. On the other hand, if a particular type of product sells well, then expand the line. We did that with unpainted Christmas ornaments last year. We introduced three items; they were well received, so we immediately expanded to twelve items. Since this type of product is so labor-intensive when painted, you can see that the unpainted versions were quite profitable when you realize we stacked as many as twelve high and cut them all at one time with our parallel arm scroll saw.

Customized cutting using lettering guides.





Multimax-2 Scroll Saw made by Hegner.

We use Hegner Scroll Saws exclusively, both the Multimax-2 and more recently, a top-of-the line Polymax. (Who would have thought five years ago that we'd be buying a \$2000 scroll saw, and pay cash!) We started with and still heavily use the Multimax-2. But some products are cut more efficiently on the bigger saw. More specifically, we utilize the benefits of the Polymax, such as the short stroke setting on some of the metal projects; and we seem to get more production and better quality control when we use a slower speed when cutting some of the plastics like Lexan® and Plexiglas®.

We have also found blade selection to be very important. We use AMI Premium Double-Tooth Blades for all our wood cutting up to 1-1/4" in thickness. While the blade design is not new, it is unusual and hard to find. For us, they produce a smoother cut and seem to break less often than all other blades we've tried, including those that came with the saws. Best of all, we pay only \$24/gross,

or less than 17 cents per blade. Compared to almost 60 cents each for other popular blades, we felt that over time, blade savings alone would pay for the difference in machine cost!

In the thicker hardwoods, we use the Gottfried blades from West Germany. They are more expensive, but they really hold up well.

Finally, we use a #9 jewelers blade for our metal cutting, which is generally limited to 1/4" thickness. Even when we are doing "tin" cutouts (actually mild steel) we use 20 gauge, or whatever free materials we can get. Cut it, stack it to approximately 1/4" thickness, which is approximately 8-10 pieces, and then sandwich it between two pieces of plywood using a brad to cleat together the perimeter about every 3".

Let me offer a tip on the subject of stacking. We stack the thin materials such as 1/16", 1/8", and 1/4" birch plywood, or any other thin woods we might be using, until the stack is 1-1/2" to 1-3/4" high, and then use the

hot-melt glue gun to run a zigzag bead around the edge of the stacked pieces. This quickly and easily keeps them all neatly stacked when we cut the patterns. Another time saver for us is the use of mimeographed copies of the various patterns instead of tracing or pouncing them. We simply use wallpaper paste, which allows us to reposition the pattern after initial placement. Also, it doesn't seal the wood in case we want to stain the project later. Simply brush the paste on and stick on the pattern to be cut. After sawing, you just pop the top pattern on a belt sander for a few seconds to remove the paper, and the job's done.

To eliminate sanding, you can use rubber cement instead. Then you can peel off the paper, and rub off the rubber cement. Let me warn you that a very slight residue remains in the wood, but this is only a problem if you are staining the pieces.

We also use double-faced tape, sometimes referred to as carpet tape, to hold together stacked pieces if only a few are to be cut.

While I am offering tips, perhaps the best tip I can offer the beginner is practice, practice, and more practice. Start with thin wood, cut gradual curves, and don't worry if you get off line somewhat. Then, practice cutting a straight line in thin plywood or masonite. Regular woods have variations in their cellular structure that make it a little more difficult. So first practice on something that doesn't have "grain". Then work your way into the more complex patterns, but don't get frustrated. In no time at all, you will be a pro.

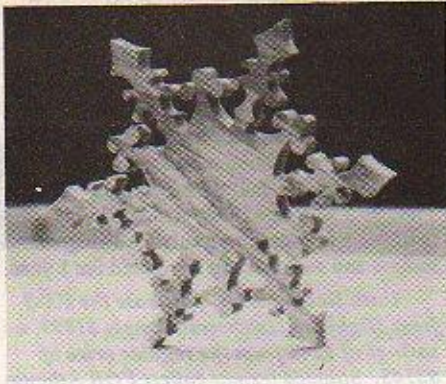
Like any new business, we have had our share of hard times. We have made mistakes, but we have also made some money. And, most important, we have made a lot of friends.

There are many different people doing scroll saw work; it's actually a very new fraternity, and its members all seem warm and friendly. Yes, scroll saws are used by big companies making jigsaw puzzles; and of course, some "starving artists" are using them to make a few dollars. But just as important, a lot of folks are simply having fun with their scroll saws. Why not join them?

Just remember the following key points:

- 1) Select an activity you like and can do well.
- 2) Choose the best equipment and supplier you can.
- 3) Keep the creative juices flowing for maximum success.
- 4) Learn as much as possible to streamline your efforts. (*The Scroll Saw Pattern Book* by Patrick Spielman is highly recommended.)
- 5) Enjoy!

Advanced scroll saw projects . . . Victorian carriage and a snowflake cut from patterns.



The Scroll Saw Pattern Book is available from Highland Hardware for \$12.95. Its companion volume *The Scroll Saw Handbook* (by Patrick Spielman) is also \$12.95. When ordering, add shipping charges indicated on page 31. Many of our Hegner products are described on page 18.

HEGNER Scroll Saws

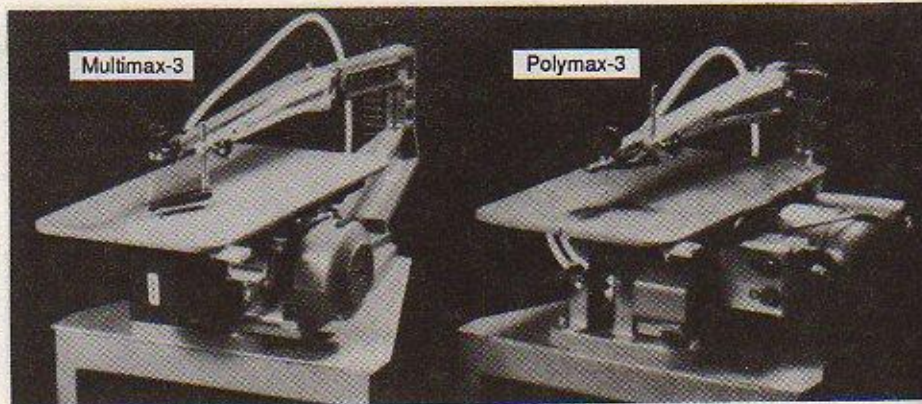
THE THREE HEGNER SCROLL SAWS offered here have set new standards for productivity and precision in scroll and detail sawing. Exclusive design features and meticulous West German construction provide fast, smooth, and extremely accurate cutting while insuring minimum blade breakage and maximum user satisfaction. 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-parallelgram 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 and arrive ready to run.



Sale Prices on Saws through December 31

The Multimax 2 (pictured on page 17) is the smallest of our three Hegner saws, with a 14-1/2" throat & 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 2 year parts and labor warranty.

**Sale priced at just \$799 (plus \$20 shipping)
from Highland Hardware thru December 31.**

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.

**Save \$100 through December 31. Sale price is \$1595. (Regular price is \$1695).
Shipped by truck 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. All Hegner motors and switches are warranted for 1 year.

Until December 31, purchase the PX-3 from Highland Hardware for only \$1899, a savings of \$246 from the regular price of \$2145. Shipped freight collect FOB Atlanta.

AMI Lettering Guides pictured below are available from us in 2" heights for \$49.95 per set. Cooper Black (bottom right) is also available in 1-1/2" (uppercase letters only) for \$19.95. Guides are tough .30" polycarbonate.



AMI Premium Double Tooth Blades, for cutting wood and soft metal, Pk. of 12

	Size	Width	Teeth/Inch	
05.29.41	1	.026"	30	4.00
05.29.43	3	.032"	23	4.00
05.29.45	5	.038"	16	4.00
05.29.47	7	.044"	13	4.00
05.29.49	9	.053"	11	4.00
05.29.51	11	.057"	10	4.00

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

	Size	Width	Teeth/Inch	
05.29.09	2	.028"	23	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	12	.063"	12-1/2	4.00

Gottfried Blades, for 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, Pair

05.29.05	Double Tooth or Pebeco	11.50
05.29.06	Gottfried	11.50

Toggle Clamps

CONVENIENCE AND EFFICIENCY are the name of the game when you put these quick-acting clamp fixtures to work in the shop. The three styles we offer will perform holding chores all over the shop on your production jigs, power tools and work surfaces. Wherever you want to hold something still, be it a workpiece, a positioning jig or a measuring device, a toggle clamp can do the job almost effortlessly.

We stock seven clamps chosen to fill a wide range of applications and budget requirements. All are provided with neoprene-tipped spindles and flanged steel bases with four holes for screw mounting (except model P1, which has a nylon spindle and three screw holes). Quality construction is evident throughout: heavy, corrosion-resistant steel

components are joined with close-tolerance stainless steel pivot pins and case-hardened bushings. All vertical-handle models have a special link design to virtually eliminate the possibility of pinching fingers or other valuable tools while using the clamps.

We've selected three vertical-handle hold-down clamps as the general-purpose workhorses of the line. The petite model V1 will probably suffice for many of your light to medium jiggling needs; its economy, compact size, and 200-lb. holding capacity will make it a favorite in many shops. There are two heavy-duty models, V2 and V3, both with 500-lb. holding capacity. The V3 offers extended reach up to 3-1/2" from the base flange.

In applications where a vertical handle might get in the way, one of the two horizontal-handle models should come in very handy. The model H1 stands only 1-5/8" high at the spindle when in use, low enough to clear router handles and travel unobtrusively on sliding jigs for the bandsaw and other stationary tools.

Two push-pull clamps fill out the line. Model P1 is economical enough to be used in a dozen light applications around the shop, and if you need more than its 100-lb. holding capacity the substantial model P2 will do just about anything you have in mind. The

spindles provided are for use in push-clamping; for pull-clamping work, use your own hex-head or carriage bolts, eye bolts, screw hooks or all-thread to suit your needs and imagination.

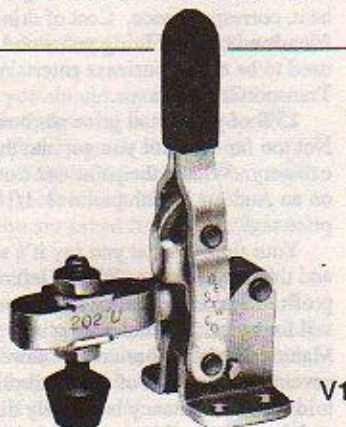
In fact, imagination is what will really put these clamps to work. By employing creative mounting systems and the occasional bit of replacement spindle hardware, you will be able to make one model or another function as radial-arm or miter saw work holders, bench holdfasts, miter guide hold-down clamps, and so on. Practically every router jig or fixture you've ever made or purchased can be more reliably and efficiently set up with toggle clamps, and certainly any jig in which you now use wedges to secure the work is an obvious candidate for a clamp which won't come loose until you want it to, and then will come loose without sending you off looking for a hammer.

To order toggle clamps from Highland Hardware, use the order form on page 31, or if paying by Visa or MasterCard, call in your order toll free:

(800) 241-6748

TOGGLE CLAMP PRICELIST

Vertical-Handle Hold-down Clamps



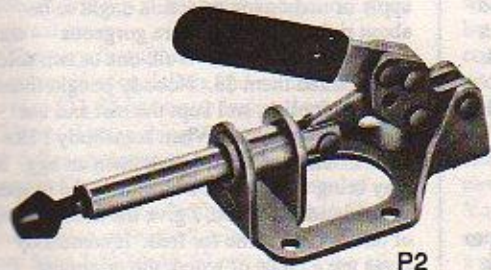
Model	Reach	Grip Range (Base to U-bar)	Holding Capacity (lbs.)	Price
V1	0 to 1-1/2"	3/4"	200	\$9.95
V2	0 to 2"	1-1/4"	375	\$12.95
V3	0 to 3-5/8"	1-1/4"	375	\$12.95

Horizontal-Handle Hold-down Clamps



Model	Reach	Grip Range (Base to U-bar)	Holding Capacity (lbs.)	Closed Height (with spindle)	Price
H1	3/8" to 2"	3/4"	200	1-5/8"	\$9.95
H2	3/4" to 2-1/2"	1-1/4"	500	2-1/4"	\$10.95

Push-Pull Clamps



Model	Travel	Spindle Height	Holding Capacity (lbs.)	Price
P1	5/8"	1/2"	100	\$8.95
P2	1-1/4"	7/8"	300	\$14.95

Deduct 10% discount from prices listed when buying 6 or more toggle clamps.

Pricing Treen

A Guide for the Perplexed

©1987 by Wallace Macfarlane

IF YOU START from square one, it will cost a bundle to make your first bowl. By the time you've paid for a new lathe, chainsaw and tablesaw, that bowl you're going to put peanuts in is a \$500 bowl. If you buy something better than bargain basement tools, that first bowl can easily cost \$2000. If you get new supporting tools, it could be a \$5000 bowl. As with the price of automobiles, the sky's the limit for a shop today.

Perhaps because I grew up during the 1930's, I pay attention to money. Sometimes I've a pocketful and other times damn little. Pearl Bailey was right: "I have been rich and I have been poor. Rich is better."

That doesn't really matter as much as where you stand to view the world. "The love of money is the root of all evil" 1 Timothy 6:10 says and 1 Timothy is right. Money is not evil but if you fall in love with a dollar bill you've got problems. Where I've ended up is wanting value when I buy. I don't always get it. I have limited use for a bandsaw, so I bought a Mickey Mouse model for \$125 and I should have known better. I cut enough stuff to pay for it twice over and then I gave up trying to keep the blade on the wheels. If I had to carve a motto to hang on my shop wall, I might quote Thoreau: "That man is richest whose pleasures are the cheapest," but there was no joy for me in a 5-and-10 bandsaw, Mr. Thoreau.

Like everyone else, I winced at the idea of paying \$10 for two ounces of cyanoacrylate glue when I bought my first bottle 2 or 3 years ago. Now I buy it cheerfully, because it is cheap for the job it does. I originate the wood I use and cut up yard trees or stressed trees or blown-over trees and often enough, I am ambushed by internal cracks and voids and the happy homes of beetles and borers. Cyanoacrylate and sawdust have salvaged a hundred pieces for me in the last six months. Salvage is too desperate a word. I could have used wood putty or glue and sawdust, but cyanoacrylate is quicker and a good deal better than the others in strength and appearance.

Growing up not rich, not poor, my thrills don't come from all the wonderful toys of our fantastic culture. It would be kind of nifty to own a resawing bandsaw instead of going at a log with a chainsaw and making a board smooth as best I can. Think of a thickness

planer yum-yum. A powerhouse router. A scrollsaw. A state of the art workbench to replace the one I made one afternoon 30 years ago of red fir planks with a 3/4" Doug fir plywood top for smooth. It's not so smooth anymore but I haven't flipped it recently. The other side is bound to be better. It always is.

Right now is the golden age of tools. They are seductive as Cleopatra. I put down a catalog with as much lust in my heart as any ex-president ever had in his. What saves me from giving way to this passion?

First, my blessed incompetence. I am ignorant about cabinets and sideboards and hutches. I can make something to keep dishes off the floor if I have to, but like the Old Man of Thermopylae I never learned how to do things properly. I don't want to learn how to dovetail any more than I want to learn ballet. I am as competent at carving wood as your ordinary drunken beaver. (But wouldn't it be nice to have a Foreman with a bunch of tungsten carbide cutters?) "If ignorance is bliss, 'tis folly to be wise," said Puck.

Second is time. I'm already short of time for things I want to do more than I want to fool around with new tools: tell jokes and laugh with friends and marvel at the world we live in with Pearlygate and Tailgate and Iranamok all in the headlines at the same time.

Third, I already have tools to match my competence. I have a grinder with 5" wheels my son gave me when he was a freshman at Berkeley. It came from Montgomery Ward and cost \$10. My old Shopsmith is like a treasured outhouse or a DC3; all you have to do is put on a new workpiece and it flies into the future, a brave ghost of the past. My utility chisel comes from a boy's tool kit. It pops off waste blocks and scrapes glue and (though I wouldn't suggest it to others) I use it instead of an icepick to guide wood through the table saw.

Nobody really starts from now and buys all new stuff. Woodworking is a progression. I nailed a found block to a found board with a found nail at age 5 and made a boat. Then it grows more complicated, and the kid who pays attention begins attracting tools and hanging onto them. I never met anyone who works with wood who was not interested early on.

A week ago I met a young man who actually makes a living carving gnomes, dragons, unicorns and like figures. Not a high-off-the-hog living, but he gets by. (Not only that, he uses lots of impossible wood for carving like locust and oak instead of bass and pear). He claims he is doomed. He has tried other jobs but always ends up with a knife in his hand. "I might as well enjoy it," he said. "It's inevitable. It's fate." I suppose I'm doomed to make rolling pins and bowls and champignons.

So I didn't have to spend a lot of money for the basic shop to make treen. Just as I have no real taste for booze — just luck I guess — exotic woods are no more exciting to me than ash or apricot or mulberry. I have a fundamental skepticism about lavender-colored wood and I don't think bright orange

wood is real pretty either. It is nice to have such curiosities around, but I don't lust much for purpleheart or padouk.

It may seem unprogressive and contrary, but I'm not so much interested in production as in what I produce. I can figure out how to make a basketful of balusters and when somebody wants them from me I say okay, the price will be steep and cash in advance and no firm delivery date. So far I've not had to make one. I want to do one-of-a-kind because my kicks come from the thing I make, rather than in the making of it. *How* I do something is low on the priority list to *what-the-hell* I am doing.

NOW AT LAST, we're back to the \$500 bowl. "How do you price stuff?" Helen Petre asked that very first day I sold wood at the Methodist Arts and Crafts show in fear and trembling. It's serious business laying your work on the line. "Minimum wage," I said for a fast answer. "Poop," she said, and she was right.

If you make a bowl a day for a year in your \$500 shop, the starting cost per bowl will be \$1.37. Keep it up for 10 years and you'll have nearly 14 cents capital investment per bowl. Try to put a figure on space, electricity, depreciation, maintenance and repairs. Add the cost of the wood. Marketing. Telephone, heat, correspondence. Cost of drinks with friends who might bring you wood. (This used to be called business entertainment.) Transportation. Taxes.

15% of your retail price per bowl as cost? Not too far out until you get into the "art" category. What's the paint and canvas worth on an Andrew Wyeth picture? 1/1000 of the price tag?

Your time is what you say it's worth, so add that to your cost. What's left over is profit. In produce markets traditionally you sell for twice the wholesale price. Manufacturers of toasters and towels get one seventh to one tenth of the retail price. I am told cost accountancy is a lovely discipline and that may well be so. I think it's an art form and entertainment, but not very useful in the real world when it comes time to price the things you make.

The price I put on mortars and pestles or yo-yos or dibbles is the price people will pay for them. I've had trouble with eggs. There's a company in Ohio that makes and sells wooden eggs, \$14.50 for a koa egg if I remember right and the cheapest egg was pine and sold for \$6-7. Okay, I thought, \$6 for apple or mahogany or acacia ought to be about right. The eggs were gorgeous — and nobody bought them. Well, one or two sold. So I marked them \$3. Nobody bought them.

\$3 is foolish, so I kept the rest and use them for lagniappe. When somebody I like buys a bunch of stuff, I give them an egg. If they bring along a kid who shows the proper appreciation of wood, I give the kid his choice of one to take home for free. If somebody gives me a piece of wood, the minimum return is an egg of that wood. The trouble with eggs is that I can't sell them. The price

Besides turning wood in his shop in Santa Ysabel, California, Wallace Macfarlane is a published science fiction author and frequent contributor to Wood News.

doesn't seem to matter. But as a make-weight, the 13th doughnut of a baker's dozen, as lagniappe — eggs make me friends.

Sometimes I warn young couples that eggs are a well-known fertility symbol and I formally eschew responsibility for psychometrics beyond my control. They giggle, but twice now I've seen babies whose mothers look at me funny.

I DON'T discount my prices. There are bargainers at any craft show and they haggle because they get things cheaper. By now I've worked up a series of observations about sawing down the tree, hauling it home, curing the wood, the price of chisels and the cost of electricity from those bandits, the San Diego Gas and Electric Company, and by the time I get back to the wood, I have myself convinced it should be marked higher. If the bargainer wants it, he buys. If he doesn't, buyers are like streetcars used to be, there'll be another along in a minute.

Another reason I don't bargain with people is that I'm not very good at it. I don't take kindly to being pushed or bullied.

"I can buy it cheaper."

"Do it."

"Look at the scratch!"

"Had to be some reason for that low price."

"I want a lot of stuff. Why not knock off \$20?"

"Funny you should say that. A fellow from Illinois took every bowl last week — he's got a gift shop south of Chicago somewhere. Said he'd double his money."

"At that price, I can't afford it."

"Then you are saved from the curse of possessions."

I try to be polite because a bland and deadly courtesy is better than poking them with a sharp stick. If they don't buy, the next guy will. If they mumble, "I might be back," quite often they do come back to find the piece sold. If it's not sold, at the end of the day the price stays the same.

The marketplace governs. By now I've sold hundreds of things I've made and have some idea of the price it takes to move them. I make elegant mashers and sell them at \$8-10-12-14, depending on the wood, the size, and mostly on how well I like them. I've marked a few at \$16-18, but I usually come back to \$14 after a few months of no sale. Once in a while, one is too nice to mark down. It may take a year to sell, but I turn flat stubborn and dig in my heels and get my price or give it away.

The very first time I sold wood I marked the prices in even dollars and no cents, because \$11.95 has never inclined me to buy a \$12 item. I price things in even rather than odd dollars because — because — because. Because I've got this feeling that impulse buyers think \$6 is a "softer" price than \$5, a "nicer" price, a "better" price. I try to stay away from \$20-30-40-50 prices. Maybe all this is foolishness, but I think \$32 sells easier than \$30, \$46 faster than \$40. I'm not going

to conduct a survey over a 10 year period to check out my feelings, but it feels good the way I do it, gang.

I sell things wherever I can, mostly at the Julian Arts Guild shows, about a dozen a year. There are another dozen shows close to home, some charging a percentage, others not. I have quite a few people coming to my shop to see what's new and what's upcoming.

Galleries charge up to 50% commission with the average about 40%. This is way too much for me. I have had gallery owners carry my things for 15-20% and I'm invited back tomorrow. But since I can sell all I want to make and pay no commission, or at the worst 15%, why fool with galleries? I was asked to consign stuff to one of southern California's topflight department stores, but while I enjoyed being asked, the hassle of invoice and delivery and inventory and vouchers was more busywork than I wanted to do. I could make as much money without the nuisance.

I was invited to participate in a by-invitation-only show in San Diego, bigtime stuff, but a quick look at bed and board away from home showed how ridiculous that would be. "Think of the glory," they said. "Think of the cost," I said.

Some days you sell only in the first hour, other days only in the last hour. Old timers say you will sell more on rainy days to fewer customers.

In the beginning it seemed most reasonable to price my wood by the competition. Trouble was, I couldn't find any. There are a few mortars and pestles around and some bowls and breadboards, but what I make is so ordinary it's different. I could set my own prices. People from New York, San Francisco, Boston, Washington DC, Los Angeles and Houston have bought stuff and then told me it was underpriced. I can only suppose they saw similar things in museum shops or galleries or Neiman-Marcus type gift collections.

My answer to the accusation of underpricing is that I want to move the stuff so I can make some more. As inflation creeps along and so does the demand for wood, I've increased prices and people seem to buy it at the same rate.

One fellow went around a show saying my wood was too expensive and he could do better standing on his head in high school. He combed his hair over a bald spot and had a gut and looked twitchy when I asked if he had any questions about the wood. "You carve it on a lathe, I bet, that's what I told Dolly." A fatuous smirk. He was 50-something with a new girl friend he had to impress. "Right on. You can make your own, I bet." He nodded earnestly, "Sure I can if I get a lathe — if I get a shop — nice work — real nice work you do." I said thanks and wished him well with fat and frizzled Dolly.

What anything is worth is what someone will pay for it. There is no use reducing your prices after only one or two shows. You get days when you could throw in a Circassian slave girl with every lazy Susan and get no takers. You will get a run on footrollers and then sell no more for three months. Some days you sell only in the first hour, other days in the last hour. Old timers say you will sell more on rainy days to fewer customers.

There is no necessary correlation between the cost of the piece and the price I put on it. Some things are expensive in time and effort and turn out ho-hum. If I price them on what they cost me, I invariably come back later and cut the price. From time to time I look at something and say "Hot spit," and add dollars to the tag. That doesn't happen often enough.

I put a "removable label" on the bottom of my wood. People have no trouble finding it. I've come to prefer oval labels 1/2" x 3/4". I do not mark "\$22.00". What I write is "22-". Customers are smart; they know what it means. And over the years two or three perceptive people have commented on what is subliminal to most folks, that the casual, non-coercive, low pressure marking adds to the ambience of the wood. I think ambience means the totality of effect and that's what I want to sneak up on customers about, the happy old, little old, cutesy and crafty and sincere old fellow who turns wood.

That's me. The price is right.



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Bosch Jigsaw Added

NOW AVAILABLE for the first time from Highland Hardware is the people's choice in industrial-quality jigsaws: the Bosch 1581VS. Use this saw one time, and you will 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.

Bosch pioneered the adjustable-orbit cutting action which is now a standard feature of almost every top-of-the-line jigsaw, and has incorporated into the 1581VS several other superlative features which make it the most efficient and convenient jigsaw we've ever used.

At 4.8 amps, the 1581VS is far more powerful than many "larger" saws, but

its 5.5-lb. weight makes it easy to handle wherever the job needs to be done. The 1" stroke can be set to speeds from 500 to 3100 strokes per minute for clean, cool cutting in materials from 3/8" steel to 2-3/8" wood. It's a great convenience to have the speed control knob separate from the trigger switch; speed can be precisely set and locked anywhere within the range, and can be changed during operation without difficulty. Four settings allow selection of orbital blade swing ranging from quite pronounced for fast sawing in thick wood to practically nil for thin wood, plastics, or metal.

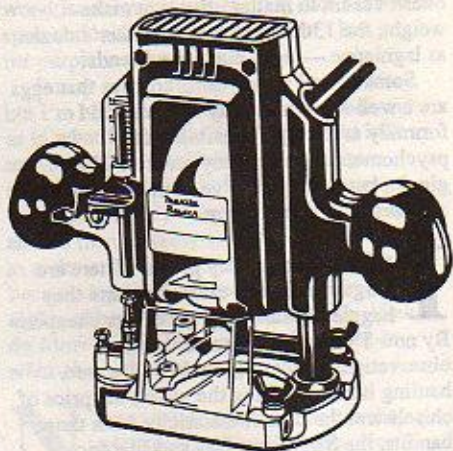
Even the built-in dust-clearance fan has three intensity settings, allowing the operator to select reduced blowing action for close-up work or when using cutting oil.

The 1581VS's base can be tilted to 45 degrees left or right, with positive detents at 0, 15, 30 and 45 degrees. In normal operation the base extends about 3/4" forward of the motor housing and blade position for good stability when starting cuts or working in thin materials. The base can very easily be repositioned, however, to allow cutting flush to a perpendicular surface using a regular blade.

Blade installation is another function where Bosch innovation makes a big difference. The only tool required is a screwdriver (provided, of course); blades are slipped into or removed from the plunger by hand. Since the blade shank is not drilled for mounting screws or locator pins, blades are much stronger and less prone to breakage than those of conventional design.

Consider all of the above features together, and it's easy to see why practically everybody says Bosch makes the world's finest jigsaw. We're very pleased to make them available to our customers, and our volume purchasing allows us to offer them at a price which is remarkably low.

Order the Bosch jigsaw from Highland Hardware for \$139.00 plus \$6.00 shipping.



Makita 3620 1 1/4 HP Plunge Router

BRAND NEW FROM MAKITA is this lightweight utility plunge router, combining for the first time Makita quality, the great versatility and convenience of plunging capability, and a compact 5.7-lb. design. At 7.8 amps, the 3620's powerplant will supply a constant 1-1/4 horsepower output, plenty of muscle for all kinds of general routing. Its 24,000 rpm operating speed assures clean, no-tear cutting on end grain, soft woods, laminates and other challenging materials.

The 3620 features a new base configuration for Makita, incorporating the best of both round and rectangular designs. With straight edges fore and aft, it's easy to guide the router against a fence or within numerous jigs; with left and right edges rounded to a 2-7/8" radius, the base can be used inside circular or curved templates without modification. Overall base dimensions are 4-1/4" front-to-back by 5-3/4" wide. Twin 8mm ports in the base accept the optional Makita straight guide, and can also accept 5/16" round steel rod for a variety of guided functions, and for the unique drop-in table mounting module developed by Highland Hardware.

Other features include a three-stop rotating turret for pre-setting depths of cut (designed not to overhang the base), a snap-in chip deflector shield, and a trigger switch built in to the right handle. The total plunge travel is 1-3/8". Collet is 1/4". The 3620 will accept the same guide bushings used in the Makita 3612 plunge routers, or, with the template adapter, will accommodate two-piece guide bushings from Black & Decker or Porter Cable.

The Makita 3620 light plunge router is available from Highland Hardware for \$99.95 plus \$6.00 shipping.

Bosch 1604 1 3/4 HP Router

The Bosch 1604 is well known as a superb utility router for all manner of general-purpose shop work. Its 10-amp motor provides plenty of power for shaping and joinery work, and its interchangeable 1/4" and 1/2" collets will let you use all the bits you now own and most of the new ones on the market as well. 25,000 rpm operating speed assures the cleanest, smoothest cutting possible. 7-3/4 lb. weight, low center of gravity handles and good visibility through the base make hand-held operation unusually easy.

Available from Highland Hardware for \$125.00 plus \$6.00 shipping.



Bevel Gages for Dovetailing

©1987 by John Wilson

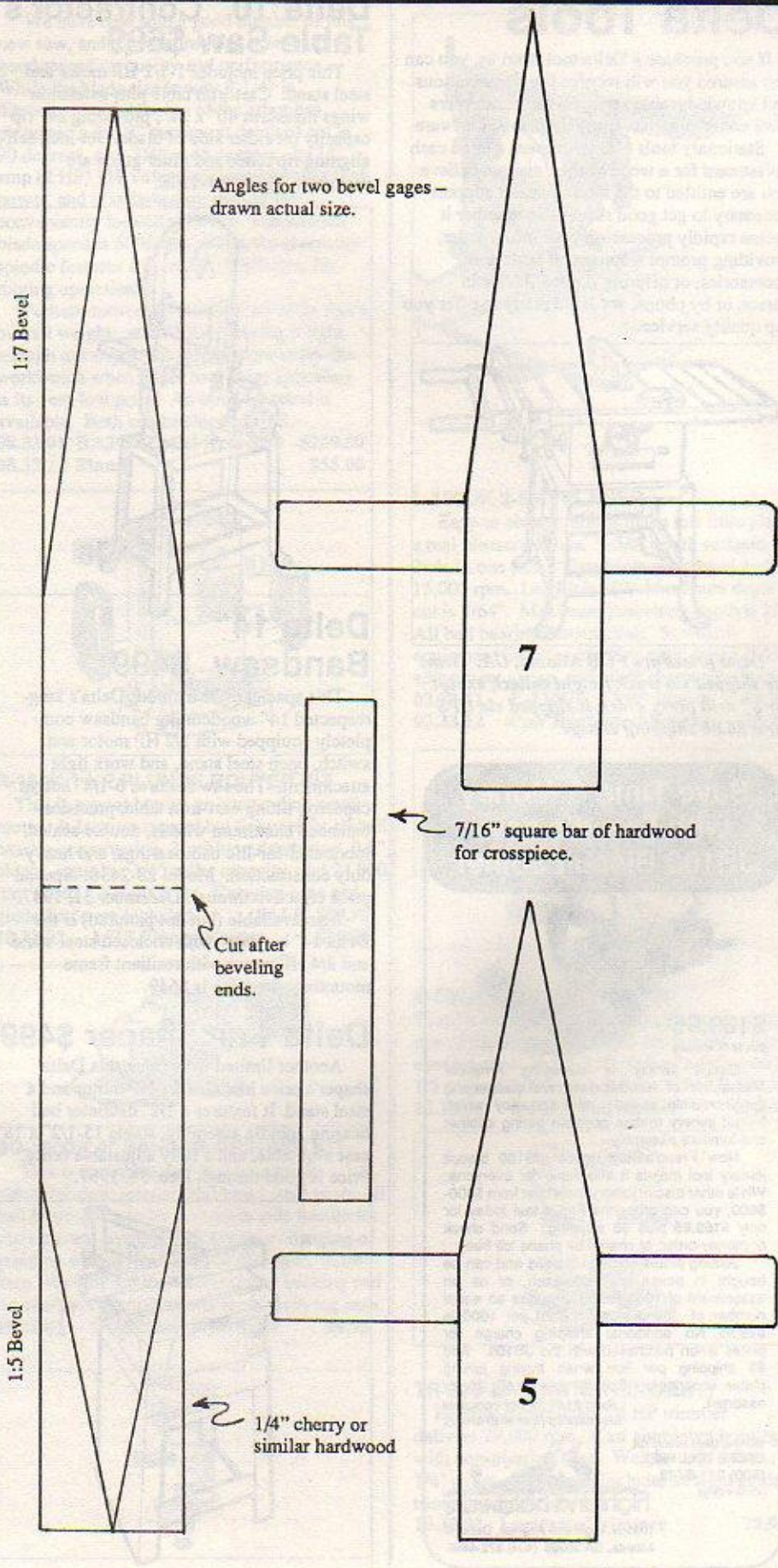
IT IS ALWAYS SATISFYING to make your own tool, especially one that does a better job than the ones pictured on the pages of those glossy 4-color mail order catalogs. These bevel gages are both easy to make and effective in use. The improvement in design is so obvious that it is surprising that they are not all made this way.

The feature I'm talking about is the combination of both a bevel and a right angle on the same gage. One very nice looking brass gage currently offered in the catalogs combines two different pitches on the same gage. However, when cutting dovetails, you need only one bevel at a time, though you always need a right angle. Having this right angle in the gage is much easier than using a bench square, which tends to be a bit large for comfort and efficiency.

I use 1/4"-thick cherry for the blade of the gage, and maple for the cross bar. The two pitches shown are for softwood and hardwood. Woodworkers and carpenters traditionally compute in ratios of run and rise rather than degrees of angle, so these two are set for 1:5 pitch for softwood and 1:7 for hardwood. They are drawn full size for you to trace.

It will be easier to hold the work if you cut the blade for the two gages from one piece of wood and cut it in half after beveling the ends. Simply glue the cross bar to the blade, making sure that it is located at the intersection of the beveled and straight edges of the blade. The challenge is to get the bar glued square to the blade. When you set the clamp to hold the work, it seems to squirm just as you finish tightening, spoiling the right angle. Try marking a right angle on the bench, then lay the glued-up bar and blade up to the edge of the bench while someone else tightens the clamp for you. Check it for square before the glue sets.

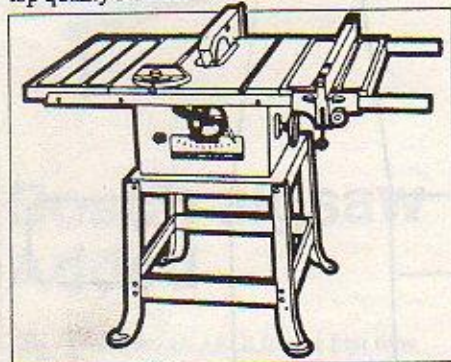
John Wilson is a craftsman, teacher, and Shaker historian. He taught a hands-on Shaker boxmaking seminar at Highland Hardware last spring, and is expected to return for another during the third weekend of April, 1988.



Delta Tools

If you purchase a Delta tool from us, you can rest assured you will receive the conscientious and knowledgeable service which customers have come to expect from Highland Hardware.

Stationary tools often represent a large cash investment for a woodworker, and we believe you are entitled to the kind of dealer support necessary to get good results. So whether it means rapidly processing your initial order, providing prompt shipment of parts and accessories, or offering needed advice in person or by phone, we stand ready to offer you top quality service.



Delta prices are FOB Atlanta, GA. Items are shipped via truck freight collect, except for 8" drill press which is shipped via UPS for a \$6.00 shipping charge.

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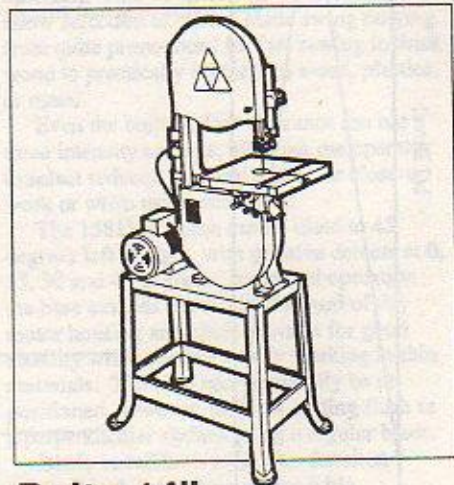
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Delta 10" Contractor's Table Saw \$699

This price includes 1-1/2 HP motor and steel stand. Cast-iron table plus extension wings measures 40" x 27", providing 24" rip capacity on either side of blade. Jet-lock self-aligning rip fence and miter guide are included. Model 34-410S.



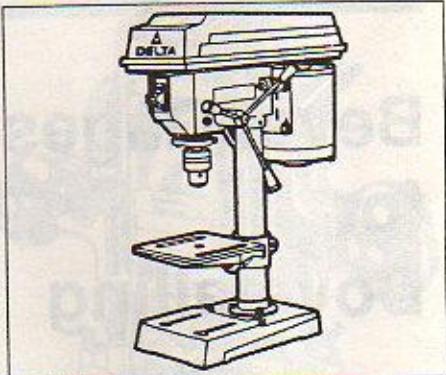
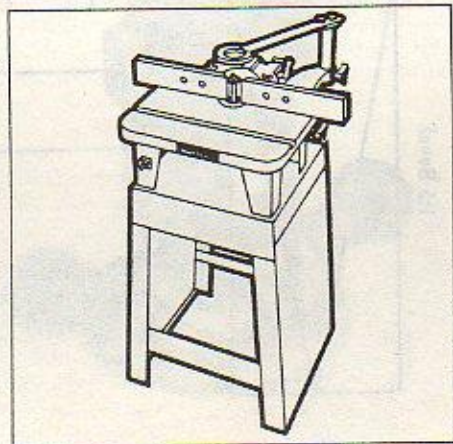
Delta 14" Bandsaw \$499

This special offer includes Delta's long-respected 14" woodcutting bandsaw completely equipped with 1/2 HP motor and switch, open steel stand, and work light attachment. The saw features 6-1/4" height capacity, tilting cast-iron table, precision-balanced aluminum wheels, double-sealed, lubricated-for-life ball bearings, and heavy-duty construction. Model 28-243S. Special price effective through December 31, 1987.

Also available (but not pictured) is the Delta 14" bandsaw with enclosed steel stand and 3/4 HP motor with resilient frame mounting. Its price is \$649.

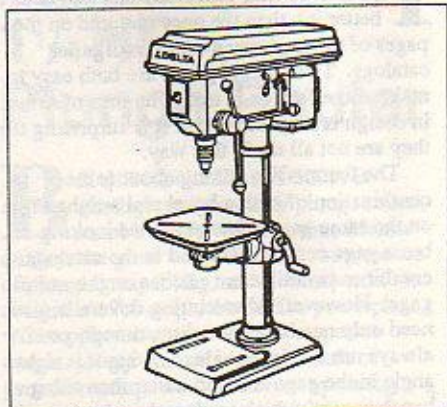
Delta 1 HP Shaper \$499

Another limited-time offer, this Delta shaper's price includes a 1 HP motor and a steel stand. It features a 1/2" diameter ball bearing spindle assembly, stable 15-1/2" x 18" cast iron table, and a fully adjustable fence. Price is good through Dec. 31, 1987.



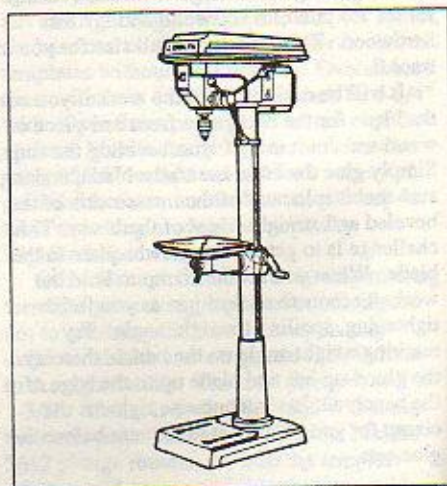
Delta 8" Bench Drill Press \$109.95

Features 5 spindle speeds, 1/4 HP motor, and tilting table. Model 11-950.



Delta 14" Bench Drill Press \$219.95

Features 1/2 HP motor, 5 spindle speeds, swivel-type tilting table with raising and lowering mechanism. Model 14-040.



Delta 16-1/2" Floor Drill Press \$289.95

This has become our single most popular Delta tool. Features 3/4 HP induction motor, 12 spindle speeds, and swivel-type tilting table with raising and lowering mechanism. Model 17-900.

More Tools

MAKITA 410 DUST COLLECTOR

We did a long review on this new item in the last *Wood News*, and suffice it to say that a lot of woodworkers were glad to learn about its availability. Close to a hundred of our customers have now bought a Makita 410 from us, and the response universally seems to be "How did I ever get along without one before?" Its compactness, portability, and particularly its high intake velocity and static pressure make it ideal for the small shop which wants to safely vent shavings from thickness planers, jointers, shapers, saws and sanders. It easily handles a heavy load from a 16" planer.

Its huge 8 cubic foot dustbag handles a large load of shavings, or if you prefer, the unit can be ducted into other collection containers as desired. Dusthoods for machines are easily fabricated out of plywood, sheet metal, or stovepipe fittings. We have a limited supply of a stovepipe tee fitting which can easily be adapted to fit planers from 10" up to 16" in width. (A plan is included with purchase of the tee).

The dust collector's specs include 6253 fpm intake velocity, 20" static pressure, 307 cfm air flow, 9 amp 1-1/2 hp 10,000 rpm motor, and 8 foot long 3" diameter vinyl flex hose. Features Makita's 1-year limited warranty.
08.10.40 Makita Dust Collector \$299.95
08.10.41 Stovepipe Tee for Dusthood \$9.95



RYOBI AP-10 PLANER SPECIAL

Acknowledged as the hottest new power tool of 1986, the AP-10 continues to grow in popularity as more woodworkers realize its tremendous value and outstanding performance. Featuring a rugged 2 HP motor, this 10" planer is amply powered (having sold several hundred AP-10's in the last year and a half, we have had not a single report of motor failure). Its high speed cutterhead produces superb, smooth results, and its knives are exceptionally easy to change and set accurately. If you've always wanted a planer but could not afford an expensive one, this unit will give you great satisfaction for the money.

We also offer a sturdy steel legstand (pictured above), which is ideal not only for supporting the AP-10, but also for miter saws, saw horses, etc.

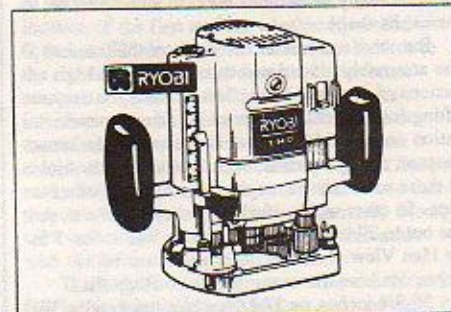
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03.33.02 Spare set of Knives \$48.00
03.33.05 Legstand \$35.00

RYOBI 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 degrees, or 1-3/4" at 45 degrees. 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, while the accessory spindle features a speed of 18,500 rpm for routing operations.

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. Also appealing is its very low price. An optional stand is available. Both can be shipped UPS.

08.33.01 RA200 Radial Arm Saw \$269.00
08.33.12 Stand \$55.00



R-150K 1 HP PLUNGE ROUTER KIT

This is a great buy on an outstanding small router. It features rugged but lightweight all ball bearing construction, 3-position depth stop, 0-2" plunge capacity, 1/4" collet capacity, and 24,000 rpm speed. Weighs 6 lbs. Carrying case and guide fence are included.

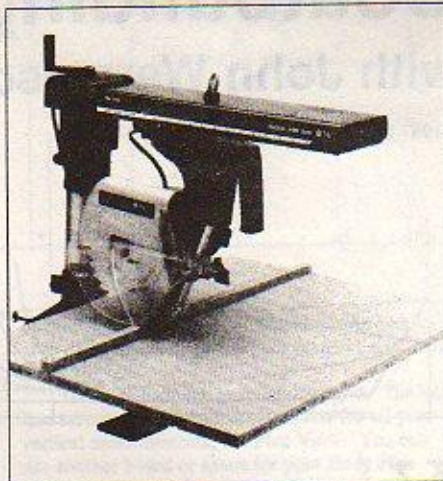
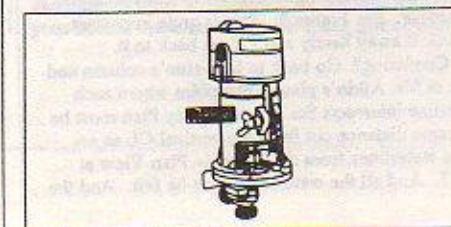
SALE \$79.95
10.33.01 1 HP Plunge Router \$89.95



SG-1000K 4" SANDER-GRINDER KIT

This is an unbeatable deal on a small industrial-duty grinder. Hardened steel gears, all ball bearing. Includes reversible side handle for extra control, spindle lock for easy changing of grinding wheels. 4.3 amp, 11,000 rpm. 9-1/4" long. Weighs 3.5 lbs. Kit includes backing pad for sandpaper, grinding wheel, & carrying case.

13.33.01 SG-1000K 4" Grinder \$9.95



L-120UK 3-5/8" PLANER

Easy-to-change blades make this little planer a real pleasure to use. 3-5/8" width surfaces 2x4s in one pass! Two-knife cutterhead rotates 15,000 rpm. Length is 10". Maximum depth of cut is 3/64". Maximum rabbeting depth is 1/4". All ball bearing construction. Standard equipment includes carrying case, fence, blade adjustment gauge, and blade sharpening holder.
03.33.11 L-120UK 3-5/8" Planer 89.95
03.33.12 Pair Repl. Steel Knives 12.95



S-500A ORBITAL SANDER

Despite its ultra-compact size, this pad sander is one of the most efficient on the market. Uses a sanding sheet 3" x 5-1/2" (1/6 of a full sheet). 1.5 amps, 12,000 rpm. 2.6 lbs. SALE \$34.95
15.33.01 S-500A Pad Sander \$39.95



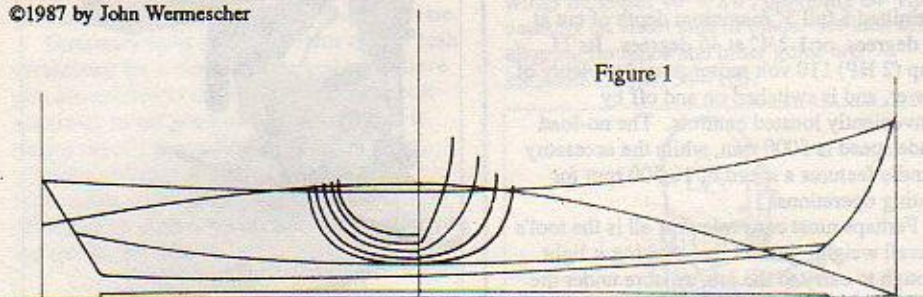
TR-30U LAMINATE TRIMMER

Heavily constructed 3/4 HP trimmer delivers 29,000 rpm. Cast aluminum housing with non-marring base. Weighs only 3 lbs. 1/4" collet. 3.8 amps. Includes straight guide, trimming guide, and bit.
10.33.31 Laminate Trimmer 79.95

Boatbuilding

with John Wermescher

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YOU HAVE OBTAINED a set of plans for the boat of your dreams, studied the plans carefully, and now, building in the traditional sequence, you are about to begin lofting. I alluded to this in the last issue. It would be a good time to review those words, especially the paragraphs on Lines and Offsets and how they are obtained. In lofting the boat, you will recreate, to full size, the lines the designer has created on paper.

Understand this most clearly: you will recreate the boat the designer intended as faithfully as possible — the main lines which determine the boat's looks and performance. These are the sheer line, the deck line in Plan, the keel and stem profile, the body section lines. Once you have done that as accurately as possible, you will forget about the designer and work toward making all the lines fair and in correlation to each other (Figure 1).

If you are building a round-bottom boat, you will need lots of lines and follow the procedure outlined here. If you are building a vee-bottom boat, the process will be somewhat simpler and, for a flat-bottom boat, simpler yet. Lofting can be a very involved subject and what I present here is an overview of the idea and process.

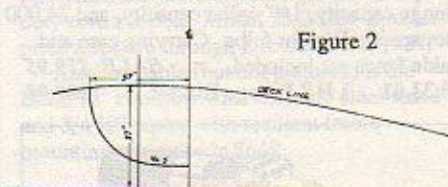
Last issue, from atop my soap box, I inveighed against trying to build a boat without lofting it full size. Take heed. There are, I admit, exceptions to this rule. Simple, slab-sided, flat-bottom skiffs may need no lofting. Bend a couple of long boards around a wedge-shaped mold and nail them to an upright stem at one end, and to a transom-shaped board at the other end. Trial and error.

Maybe this has already been done for you by the designer and he will tell you the exact shape of each of these members. He may even provide full-size templates for cutting. No need to loft. Kit boats, of course, come with the parts pre-cut and step-by-step instructions. Beware of kits. Some turn out well, others are a disaster. And finally, some boats come with patterns, full size, for the molds, so lofting is eliminated. However, think about this: the patterns are printed on paper. What happens to the size of pieces of paper when they are exposed to differences in moisture?

The whole idea of lofting will seem less arcane when you understand why it is done — the end product of the effort. A boat, of course. We're just talking about the hull now. What you stick on the hull in the way of decks, cabins, rigging, etc. is another matter. We are addressing the hull shape, the boat. The boat is a very special shape, the shape of the combined planking, stem, transom and keel. The planking — wood planks, strips, plywood, fabric, plastic, what have you — is

supported by frames, or "ribs" (animals have ribs, boats have frames). Obviously then, it is the shape of the frames, spaced evenly along the length of the hull, that really determines the boat's complex of curves, its shape.

But what determines the shape of the frames? The accurately plotted and thoroughly faired sections of the Body Plan. This is what you are lofting for: to get the shape of the frame at each station on the grid, and also, the shapes of the stem, transom, sheer in profile, deck line, and keel. And all these must relate to each other and to all other lines. In other words, if a fair curve takes the deck line out to 37 inches from the center line at Sta. 5 in the Plan View, then that deck point must be 37 inches out from the centerline in the Body Plan. Not 36-3/4 inches, or 37-1/8 inches, but exactly 37 inches. See Figure 2. If a faired buttock is 22 inches up at Sta. 7, in Profile, then the vertical line representing that buttock had better cross the Sta. 7 section at 22 inches up from the base. It's all got to work together or the boat can't be built.



When it does all work together, then you can saw your frames, or cut your molds, depending on building method, to the section lines in the Body Plan with complete confidence. The boat built will be fair, sweet and right.

Just a word here about exactly what these lines you will draw represent, to slightly amend what I said in the last paragraph. I will get into this more in the next issue, when you are ready to cut molds or frames. You will be drawing thin pencil or pen lines. They represent curves on a particular surface. That surface is the *paint film* of the boat: the outer surface of the finished planking: the surface that gets wet when the boat is launched. That is the surface these lines represent, and no other, unless the designer has specifically told you otherwise. See Figure 3. This is quite important, so tuck it away handy and I'll get back to it.

Confusing? Go back to last issue's column and look at Mr. Atkin's plans. The point where each waterline intersects Sta. 7 in the Body Plan must be the same distance out from the vertical CL as are those waterlines from the center in Plan View at Sta. 7. And all the waterlines must be fair. And the

section view of Sta. 7 in the Body Plan must be fair. Nice, smooth sweet curves.

"Well," you say, "They obviously are. Mr. Atkin has drawn them so."

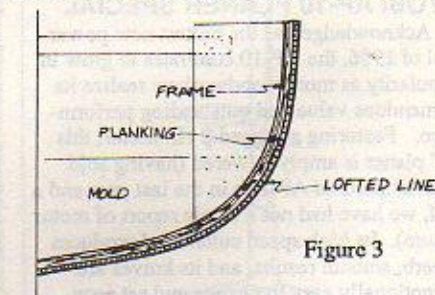
He has indeed. He's drawn them on a small (compared to actual size) piece of paper, with ink lines, which have thickness, and then he has scaled this off to get up a Table of Offsets. Lots of room for error here. What happens when you scale up a 30 footer from plans small enough to blue print? The errors get big, real big. The thickness of an ink line scales up to a crack big enough to let in a lot of water.

So you loft. You follow a logical procedure, using figures in the Table, to draw all the lines full size, correcting errors as you go . . . *fairing out* the errors with *battens* and *judgement*. The end product of the lofting is a full size set of lines which is completely fair and with all views in complete agreement. So will your boat be.

Enough said. Get a broom and sweep off the floor. Look for splinters, gobs of dried glue, nail heads sticking up, etc. Get rid of them. You'll need a space several feet longer than the overall length of the boat by the distance from base line to the highest sheer point, or by half the beam of the boat if she is broad and shallow. Add a couple or so feet to this. The more the better. You may want to superimpose Profile, Plan and Body Plan on top of each other to save space. If the boat is fairly simple, you can do this using different colors of ball point pens for the three views and not get too confused. Some people put the Body Plan on a separate piece of plywood or place on the floor to avoid confusion.

Speaking of plywood, you can, if the boat is under about 20 feet, do all your lofting on sheets of plywood. Just be sure they're cleated together in such a way that they cannot shift while you are lofting. Instead of crawling around on your hands and knees, you can support the sheets on saw horses and work much more comfortably standing. Just be sure the sheets have plenty of support so they don't flop around while you're working. I once lofted a boat on the plywood that was to be used for planking. Couldn't afford to buy extra plywood just for lofting and I figured that by the time I got to planking I wouldn't need the lines anymore. Worked out all right.

Whatever you use, get it clean and smooth. Get in a meticulous frame of mind now. Be fussy. Take time. Study. Ruminant. Fulminate if you like, but proceed with care and concern. If you're using the floor, or any old piece of plywood, give it a couple coats of cheap, light gray, flat latex paint.



Now gather up the tools you'll need. (See Figure 4). Get some No. 2 yellow pencils and keep them sharp. Ball point pens: black, red, blue, green. This gives you a different color for Body Plan, Plan, Profile and Diagonals. A good, really true straight edge, the longer the better. Battens. Brads and a small hammer, or better yet, ice picks. These are wonderful. I discussed battens and ice picks in the Fall '86 issue. Go back and read this.

If you are going to build more than one boat, invest in a couple dozen cheap ice picks. Your longest batten should be longer than your longest curved line by a couple feet. These are stiff battens, say 1 x 1 spruce or pine. You'll need light springy battens, say 1/4 x 1/4 or smaller for fairing sections in the Body Plan and maybe the stem and forefoot in Profile. Ash is good for these.

A reliable steel tape measure is a must, and metal yard sticks or steel rules are needed. Make sure these are accurate. By the way, never trust the ends of these things. If you want to measure 12 inches, start at the 1" mark and go to 13" and so on. It's a good habit to develop.

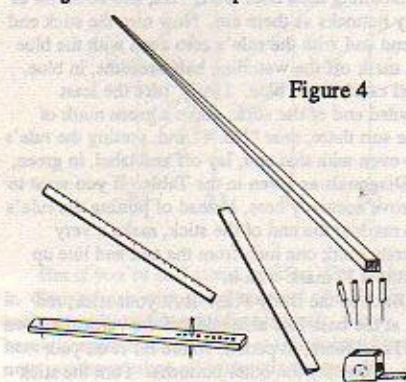


Figure 4

You'll need a thin strong string, not nylon, and some tacks. Get a beam compass, or if you're thrifty, get a set of tramlines to slide onto a stiff stick for a compass. If you're downright poor, drive a finishing nail through a long stick and drill some holes along its length of a diameter to give a push fit on a yellow pencil. Get up some stock for pick up sticks, a couple dozen or so. This can be pieces of lath, molding, or 1 x 1/4 inch stuff ripped from anything handy and cheap. It should be straight and light colored, since you'll be marking a lot on these. Cut the ends to good right angles and give each a thin edge. Lastly, if you're working directly on the floor, get a pair of knee pads.

Now begin. First, get up the grid, just as the designer did in his plans. Stretch the thin strong string the length of your lofting floor, about three inches in from the edge nearest you, whether that is the edge of your plywood "floor" or the floor area you have staked out. Stretch it as tight as it will go without breaking, between the two tacks, driven part way into the floor. Stout fishing line is good here, providing it does not stretch. Of course, the ideal is fine steel cable, if you can afford it or have some. The idea is to get an absolutely straight base line, for everything from now on will depend on the integrity of this line. The distance between the tacks should be 4 feet longer than the LOA of your boat.

Do not be tempted to snap a chalk line. In boatbuilding terms, such a line has no accuracy at all. It is fuzzy, fat and sloppy. Stretch the string or wire as tight as you dare, stretch the ends, then slide a small block of smooth hardwood up against it — just barely touching the string — then make a sharp pencil mark against the block. See Figure 5. Now take the block down a distance equal to a bit less than your longest true straight edge and make another mark the same way. Continue to the end. Now connect the marks with your straight edge,



Figure 5

using a fine tip black ball point pen. Sight down directly from above and be sure the straight edge just touches your marks.

Now you have a Base Line for offsets in Profile and, at the same time, a CL for offsets in Plan. It's an important line. That's why you went to all that trouble.

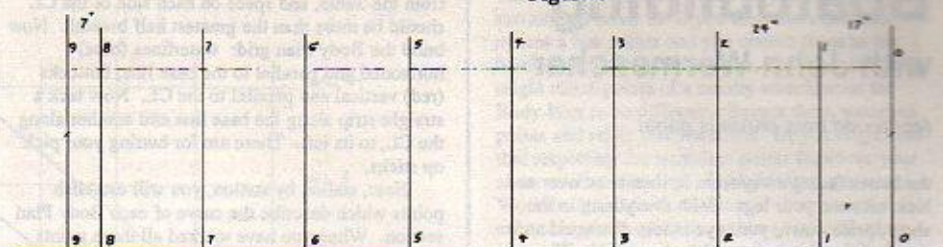
Now you are ready to erect the perpendiculars, or "perps" for short. See Figure 6. These are the station lines. About two feet in from the right end of your base line, make a small mark. This is the location of the first station, whether it's called No. 0, or 1, or FP, or whatever. Boats usually face to the right on plans. Put the point of your beam compass into the intersection and swing arcs intersecting the base line at about 20 inches or more from the point. Now extend your beam compass to its fullest length and swing arcs from each of the two points you just established so that they cross up above your first station mark. Now, with the straight edge, connect this intersection with the first station mark.

The length of this first station line should be a few inches longer than the highest point of the boat. If you have worked very accurately, this line should be exactly perpendicular to the base line. Now, for each station line in the plans, you have to erect as perp at that distance along the base line. Measure off your first station distance. Let's say you have ten stations and the first right end distance is 17 inches. All the rest are 24 inches except the last one, which is 7 inches. You are building a 16 foot boat. Right? Draw it out roughly on a piece of paper.

Put the 1 inch mark of your steel rule at the first station mark, along the base line, and make a fine mark in pencil at 18 inches. That's your second station. Now put the rule's 1 inch mark on that second station mark and tick off at 25 inches. To now simplify things, slide the rule to the 24 inch mark at that point and tick off 48, 72, 96 and so on until you reach the second from the last station. Make the last interval 7 inches. Now just above the base line and just to the right of each mark, label each station in black ink, with its proper station number.

At the last station mark, erect a perpendicular, just as you did originally. Measure up a good way, almost to the end, of these two perps. Make sure your measurements are exactly the same. Now stretch your string between these two points and measure the distance between them. Is the distance here exactly the same as the distance between the perps at the base? That would be just 16 feet in our example. It must be the same. When it is, lay off your station distances along the string just as you

Figure 6



did along the base line. Now connect the points above and below to get all your perps. Label them at the top also.

You now have the basis of your grid. The base line serves two purposes: a base line for all your vertical measurements, i.e. Plan View. You can use another board or space for your Body Plan View, or you can pick a central perp and call it the CL of your Body Plan, when the time comes for this.

Rip a long piece of thin straight stock, or some strips of plywood. One edge must be straight and true. Tack these pieces down so that the true edge lays exactly along the base line. This is going to make the process easier, for you will use this base piece to butt pick up sticks. You can then be sure the stick's end is exactly on the base line without having to crawl down and look at it.

Work on the Profile View first, getting in the main outlines of the boat. Notice in the Table of Offsets that there are figures given for heights to sheer or deck edge. Most likely these figures will look something like 2-4-5. Offsets are traditionally given in feet-inches-eighths. Thus the figure in the example would be two feet, four and five-eighths inches. A + or — mark after the last number means add or subtract a sixteenth. You'll get used to it.

Measure up at each station the distance given in the offsets for sheer at that station. Make a mark. When all stations are marked, in pencil, you have a curved line of points extending from bow to stern. Now you must connect them in a smooth fair line. This is where you use a batten. Get out a batten that is at least two feet longer than the sheer line and bend it in place trying to touch each mark. Use ice picks, ideally, or brads driven into the floor. Drive these next to the batten, never through it.

You will probably find that the batten just will not touch some of the marks. So be it. Come as close as you can to all of them. Try to average things out. If some marks are way out, check your measurements. Now sight down the batten to see if there are any signs of kinks, humps, valleys, waves... Or is it a perfectly smooth, fair sweet line? Of course, you have chosen a fine, straight-grained piece of wood for your batten and you trust it not to have any irregularities. So some of your picks must be off. Pull them. Put 'em back, fiddle and fuss around, letting the batten take more and more of a natural curve, without straying much from your marks.

If one mark gives you particular trouble, go back and check your measurement. If it still persists, there may be a design error. It happens. How do you sight along a batten? Every which way! Look at it from above. Stand at one end, then the other. Get down on your belly and look along it with your eye just a foot or so above the floor. One very good way is to stand at one end of

(continued on next page)

Boatbuilding

with John Wermescher

(continued from previous page)

the batten facing away from it, then bend over and look between your legs. With everything in the shop upside down, your eye is less distracted and your mind concentrates on the line itself. When you are finally satisfied that you have come as close to the designed distances as possible and still have a fair line, ink it in. That's it. You have just faired your first line.

Now do the same for the stem profile, the keel line, rabbet line, if any, transom line and any other major lines the designer gives you. In a flat or vee bottom boat, you will have heights to the chine.

With this done, carefully and patiently, you have a good picture of what your boat will look like in profile. These lines are the major design lines and are inked in. They are inviolable.

You have been using your base line as a base line for heights. Now let it be your CL for half breadths and measure up from it to get one side, the port side, of your deck line, keel half siding and any other major lines your designer has given. You aren't dealing with waterlines, buttocks or diagonals yet, just the main design lines.

Now take a break. Stand up and look at your boat to be. This is full size. You can sit down on the center line about midway from bow to stern and see how far it is up to the bow or aft to the transom. You can get a feel now for how roomy your boat will be. The fun is beginning.

This is a good time to complete the grid you began when you erected perps at station lines. Up to now you have laid all lines with black ball point. Take a blue ball point and put the grid waterlines in. These are horizontal lines, parallel to the base line, and at specified distances from it. Measure up from the base line for each WL, stretch a string and lay it off just as you did the base line. Best to lay such lines off in pencil first, double check, then ink them in.

Once you have the waterlines in with blue ink, use your base line as a CL and lay the buttock grid lines in, using red ball point. The buttocks, in Plan View, are straight lines parallel to the CL and at specified distances from it. If they happen to fall on some waterlines, just ink the red right beside the blue.

Confusing? Doesn't need to be. Remember: when you are looking at red lines, you are seeing buttocks, straight lines in Plan View, curves in Profile. When you look at blue lines, they are WL's, straight in Profile, curved in Plan. The diagonals have no grid here. They are just curves on the floor. Make them green.

Now for the Body Plan grid. The Body Plan, remember, is a view of all the sections of the boat, one at each station, looking from each end of the boat. It is the outline of the hull at each station. Tradition has it that sections for the forward half of the boat go on the right side of the CL, those for the after half on the left, including the transom. Now choose that central perp to use as a CL for the Body Plan. If your designer has put a lot of lines in the boat, or if you are a beginner and this is a bit confusing, or if the boat is under, say, 24 feet, use a separate board or a separate part of the floor for the Body Plan. I know that all these lines can end up looking like a platter or spaghetti.

If you go to a separate view, again strike a perfect base line, and with bar compass, erect a perfect perp in the middle of it. The CL should be

longer than your greatest height from base, taken from the Table, and space on each side of the CL should be more than the greatest half breadth. Now build the Body Plan grid: waterlines (blue) horizontal and parallel to the base line, buttocks (red) vertical and parallel to the CL. Now tack a straight strip along the base line and another along the CL, to its left. These are for butting your pick up sticks.

Next, station by station, you will establish points which describe the curve of each Body Plan section. When you have marked all these points with a small "+", you will take a thin, very flexible batten and connect them in a fair curve, hopefully. To make things easy to see, choose the station just forward of the boat's center, or the centermost station, if there is one, and lay it out on the right side of the Body Plan CL. Then do all the other forward stations, in order.

In our example of the 16 foot boat, let's say that the stations from the bow are numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The middle of the boat, fore and aft, is midway between 4 and 5. Thus, begin with 4 and then do 3, 2, 1, 0, all on the right side of the CL.

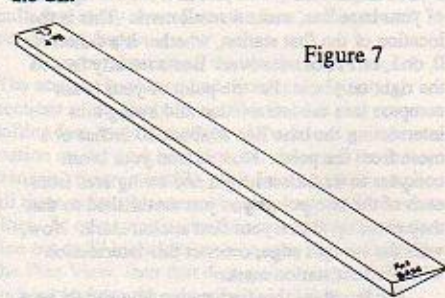


Figure 7

Take one of your pick up sticks and, in red ink, label one end No. 4/BASE. Label the other end, in blue, No. 4/CL. See Figure 7. Take the stick to Sta. 4 in Profile, where you have inked in the sheer line, keel, and other major design lines, such as rabbet or chine, on a vee or flat bottom boat. Lay the stick along side No. 4 perp, with the thin edge touching the perp and, on the stick, make a tick mark in red where these lines cross Sta. 4. Label them SHEER, KEEL, RABBIT, etc. in red.

Take the stick to the Body Plan grid, butt the end of the stick against the base, with the stick held against the CL and mark these points onto the Body Plan in pencil, lightly. Move the stick out to the right of the CL, as far as space allows, make sure it is still perpendicular to the base (use a framing square), and tick these points onto the Body Plan again, lightly in pencil. You now have pairs of tick marks: one pair for sheer, one pair for keel height, etc. Connect each pair with a light pencil line. These are the heights of those hull lines at Sta. 4.

Return to your long lines views, turn the stick to the blue end marked No. 4/CL and butt that against the Plan View CL (your old base line). Mark the stick edge in blue where your faired deck line crosses No. 4 perp, then keel line, rabbet, etc. These are half breadths: label them in blue. Go back to the Body Plan with these and lay the stick along the light pencil line for sheer, with the blue end of the stick butted against the CL. Make a mark on the light pencil line by the deck line mark on the stick. Where these two measurements cross — sheer height and deck half breadth — is the point of your sheer/deck line intersection at Sta. 4. Mark it * in black ink. It is a fixed point, irrevocable. So, too, are the keel height and siding point, the rabbet height and half breadth, and any other major design lines you faired in and inked. Find these points the same way you did the sheer/deck line and ink them *.

Now, at Sta. 4, you have the permanent points. Time for the other, *less permanent* points of Sta. 4. Remember, this whole process is for a round bottom boat. At the end of the discussion, you will see how much simpler it all is for a flat or vee bottom.

Sit down with your No. 4 stick, Table of Offsets, and an accurate steel rule. Put the rule's zero mark even with the red end of your stick and find, in the Table, under Sta. 4, the Heights. There will be the heights you have already dealt with, plus the buttocks. Read these figures and mark their measurements in red on your stick, ticking and labelling each one: OB1, LB2, and so on for as many buttocks as there are. Now turn the stick end for end and with the rule's zero even with the blue end, mark off the waterline half breadths, in blue. Label carefully in blue. Lastly, take the least crowded end of the stick, make a green mark of some sort there, near "No. 4" and, putting the rule's zero even with that end, lay off and label, in green, the Diagonals as given in the Table. If you want to improve accuracy here, instead of putting the rule's zero mark at the end of the stick, make a very accurate mark one inch from the end and line up the rule's 1" mark with it.

Back to the Body Plan. Butt your stick, red end, at the base line alongside of the vertical known as B1 and mark, in pencil, where B1 is on your stick. Same for the other buttocks. Turn the stick and butt the blue end against the CL and alongside your first WL. Mark, in pencil, where WL1 is on the stick. Same for the other WL's.

You have to complete your Body Plan grid for diagonals by laying them in as shown, or described, in your plans. They will usually start, inboard, where some WL crosses the CL. Generally, somewhere along their length they cross the intersection of a WL and a buttock vertical. This makes it easy to draw them into the Body Plan. See Figure 8. Now put the green marked end of your stick at the very inboard end of each diagonal, carefully, and tick off, in pencil, that diagonal's length.

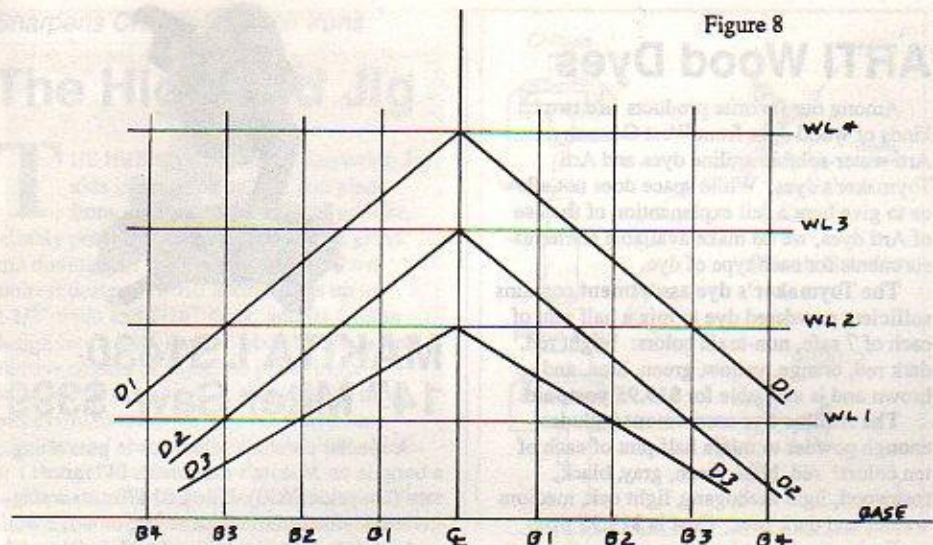
You now have a series of points which describes the section shape of Sta. 4. Bend your most flexible batten around these points, as you did before for the long lines, using ice picks, etc. Fiddle, fuss and fair until you get a perfectly smooth line. The batten *must touch* the points inked as *. It may or may not touch your pencilled points. Get as close as you can, but go for the fair lines. Draw the curve in light pencil and label it "4" at the top.

That's Sta. 4. Now go through the same process for the rest of the stations, switching to the left side of the CL for those aft of the mid point. This done, you should have a Body Plan that looks something like the uppermost drawing on page 22 of the last issue of *Wood News* (No. 19). Be sure to label everything carefully.

Take a break, have a cool one, and ponder the imponderable... Hmmm. The deck line is fair. The sheer line is fair; so are the keel, stem, rabbet and all the station sections. Well then, that should be it, shouldn't it? Think a minute. Life just isn't that easy.

How do you know that all those fair sections, set up at proper heights and intervals along a base, with keel and sheer points forming fair lines, will have fair lines at all points along them? For instance, how do you know that all the points on the sections for WL1 will form a fair line? How do you know that all the points for B1, when plotted out, will form a fair line? You don't. And they must. Your work has just begun. If you're tuckered at this point, go back to making croquet sets. This ain't for you.

Figure 8



But if you're still game, terrific! Get on with it. Grab a fresh stick, label one end of it B1, in red, and get ready to fair your first buttock. Now, here's something to get clear at this point. Up until now you have taken all instructions from the designer, using his Table of Offsets to establish all points, fairing most accurately his major design lines, and inking them in as permanent, fixed, immovable. The rest of the points, in Body Plan, you have pencilled in as carefully as possible from the Table. Now put away the Table and forget about the designer. You're on your own. The only reason to refer to the Table henceforth is where something looks really wrong and you need to see if you read the offset correctly.

To fair buttock 1, lay your stick alongside the vertical B1 line in the Body Plan, labelled end butted against the base line, and mark on the stick, in red, where each station, 0 through 9 (or whatever you have), crosses that buttock. Label them in red. Take the stick back to the Profile View and transfer these distances along each perp, in pencil. Now connect the marks with a long batten, in pencil. Since the buttocks often sweep up at the ends, you may need a special batten, evenly tapered at each end so it is more flexible there. Or use a stiff batten where the curve is easy and a flexible one where it is sharp, blending the lines into each other smoothly. Use the ice picks and fuss around with this line just as you did the others. If your batten touches all points, you are lucky! If not, then those station points that are out must also be out on the Body Plan. Don't despair yet. Lay in the other buttocks and see how things go. You'll analyze later.

Now, using the same method, fair the waterlines in Plan View. This is all still in pencil, but you won't get confused because the waterlines and buttocks run such different ways you can easily distinguish them. Besides, you are carefully labelling each as you go. The diagonals can get confused with the waterlines, so if you have room, lay them out below the base line. If not, fair them in green pencil right over your other lines.

These are all your "long lines". If they are fair, then the boat will be fair. It will look right and will go through the water with the least disturbance, giving you the best performance.

But if you mis-plotted points with your faired long lines, that means that the corresponding points on the Body Plan sections are off. You must go back and change the Body Plan points accordingly and refair them.

Wait now! I hear you moaning. I see the look of misery in your eye. I know: this could go on forever and end in a fit of frustration. I've been there. But there are some short cuts. The secret is knowing what to worry about and what to ignore, and to what extent. The key is understanding. Boatbuilding is just like life.

Chances are you will have this situation: All of your long lines are fair, but not all of the points are on the lines. Most are. A number are a wee bit off, a few are more than a bit off, and one or two are way off. That's pretty normal. First, check out the ones that are way off. There has to be some reason why they are so bad. Go back to the Table and see if you read the offsets correctly, marked the stick correctly, and transferred the distances accurately. If you find the error, that answers that. If everything checks out and the point is still way off, assume design error and don't worry about it for now.

Understand that you must have more faith in some lines than others. Up high on the hull, the waterlines, in Plan, wrap around the hull shape and their measurements are taken at something close to 90 degrees (normal) to the hull skin. These should be pretty reliable. Down where the curve of the hull turns, the waterline half breadths measure out at a sharper angle and aren't as reliable. On the other hand, the buttocks are reliable in close to the CL, where they are more normal to the hull surface, and less reliable outboard. Notice in Mr. Atkin's design of last issue, he didn't even bother with offsets for B3 and B4. Here now is the reason for diagonals. They meet the hull skin most normal in their position around the turn of the bilge and just below where waterlines and buttocks are not so good. They are pretty reliable here.

Thus, if a very low waterline misses spots here and there (we're talking about small misses now) that is not as serious as if a high waterline does. A very outboard buttock missing a few spots is not a concern, but a mid diagonal is.

Now observe, on your faired long lines, what points are out and by how much, and how these points correspond to nearby points of the long lines. For instance, if two or three waterline spots fall inside your faired line and the same thing happens on a nearby waterline, that would seem to be evidence that the boat is supposed to be a bit fatter in that area. Gather evidence. Cross-check things. Understand what is going on.

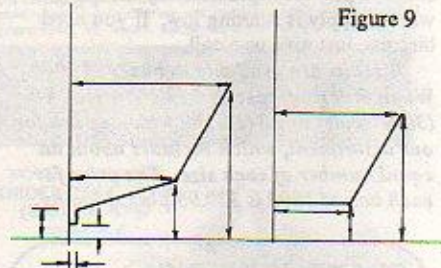
Pick the long line with the most "off" points and see if it can be improved with refairing.

perhaps to bring it more in line with nearby points. This done, correct the points on your Body Plan section and refair it. If you find that a diagonal misses a few points and you correct these to the faired points on the Body Plan, and refair that, this might cause points of a nearby waterline on the Body Plan to be different. Respot these waterline points and refair that waterline. Or you might find that respotting the waterline points improves your score on that waterline. Look for such situations. Work back and forth, closer and closer, until everything is in synch to within a sixteenth of an inch or less. This is work, no doubt about it. But it is the essence of the fairing process and guarantees a hull that is easy to plank and easy to look at.

Once everything is fair and in complete correspondence, ink in the lines: waterlines blue, buttocks red, diagonals green. Miller time!

That's it, then. Your lines are lofted. There remain a few gritty details that are best left to more extensive treatments of the subject, such as development of hull components, stem shape, transom development, etc. If you are building a more complex round bottom boat and if your designer has not given you some pretty thorough details on these items, do read the books on lofting referenced at the end of this column.

Figure 9



Obviously, if you are building a flat bottom boat, things are quite easy. All you need is the sheer and chine heights, transom rake, and stem shape, and the deck line and chine half breadths. Everything in between these is a straight line. The vee bottom is only slightly more complex to loft, needing heights to keel and keel/bottom intersection, unless the boat has curves in it. See Figure 9.

Have fun. Take your time. Work with diligence and patience. An extra hour spent at this stage will save many more, maybe a disaster or two, later on.

References:

The Gougeon Brothers on Boat Construction, Chapter 13. Available from The Gougeon Brothers, PO Box X-908, Bay City, MI 48707.

Lofting by Allan H. Vaites. Available from Woodenboat, PO Box 78, Brooklin, ME 04626.

John Wermescher is a boatbuilder, woodworker, and commercial artist living in Atlanta, Georgia.

Please pass the butter

Highland Joins the "Million Biscuit Club"

AS WE PREDICTED in our 1987 catalog, the past year has been "The Year of the Biscuit Joiner" in the U.S. Countless thousands of American woodworkers purchased their first biscuit joiners and began jamming wood together in ways they'd never before imagined. Though we began selling Lamello plate joiners near the beginning of the decade, and have replenished the biscuit supply of many a woodworker along the way, never before has the demand for biscuits approached what it has been this year.

For the first time in our history, more than a million biscuits passed through the doors of Highland Hardware in a year's time. While we can't imagine that anyone keeps track of such events, we felt it was worth noting, perhaps as nothing more than a means of showing that we stockpile the product, and strive to provide rapid delivery for those whose supply is running low. If you need biscuits, just give us a call.

Biscuits are available in boxes of 1000. When ordering, specify 0 (9/16" wide), 10 (3/16" wide) or 20 (15/16" wide), or ask for our assortment, which includes about an equal number of each size. The price for each box of 1000 is \$29.95 plus shipping.

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ARTI Wood Dyes

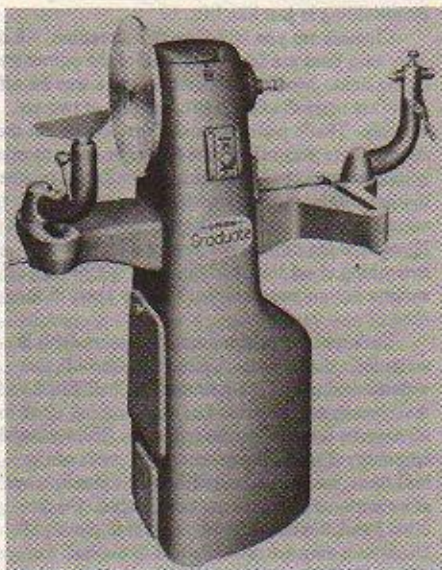
Among our favorite products are two kinds of wood dyes from West Germany: Arti water-soluble aniline dyes and Arti Toymaker's dyes. While space does not allow us to give here a full explanation of the use of Arti dyes, we do make available starter assortments for each type of dye.

The Toymaker's dye assortment contains sufficient powdered dye to mix a half pint of each of 7 safe, non-toxic colors: bright red, dark red, orange, yellow, green, blue, and brown and is available for \$19.95 postpaid.

The Aniline dye assortment includes enough powder to mix a half pint of each of ten colors: red, blue, green, gray, black, rosewood, light mahogany, light oak, medium walnut and dark pear. Cost is \$19.95 ppd.

Each assortment includes a color chart, mixing directions, and pricelist for ordering additional quantities.

For just the color chart (shows 36 colors) and pricelist, send \$1.00 with your name and address.



Harrison Graduate Bowl Lathe

One of our most unique woodworking machines is the Harrison Graduate shortbed bowl turning lathe. Weighing in at 375 lbs. (not including motor), the Graduate is a quiet, stable, vibration-free lathe well-suited to handle oversized work. Its main appeal is to those woodturners who have grown tired of making do with smaller, lighter machines, and wish to concentrate on serious faceplate work. The Graduate features a maximum swing between centers of 14", & an outboard swing of up to 19-1/2". Maximum distance between centers is 15-3/4". Optional long beds are available in lengths of 30", 42", or 54".

To receive a brochure on the Graduate, send us a self-addressed stamped envelope.



MAKITA LS1430 14" Miter Saw \$399

A special purchase allows us to pass along a bargain on Makita's mammoth 14" miter saw (list price \$630). The LS1430 cuts a staggering 6" maximum width at 90°, or 4-1/2" wide at 45°. Comes equipped with quick-release vise for holding work securely, an automatic blade brake, a table slot insert to reduce tearout, and 9 positive angle stops.

While supply lasts, order the LS1430 from Highland Hardware for only \$399. Orders are shipped via truck freight collect.



Free Green Wheel with 9820-2 Sharpener

Over the years, one of the tools most associated with Highland Hardware has been the Makita 9820-2 blade sharpener. Well over a thousand woodworkers have purchased 9820-2's from us, and many have expressed their extreme satisfaction with the tool.

A common factor among those satisfied has been appreciation for the additional sheet of instructions on use of the 9820-2 (written by Zach Etheridge) which Highland Hardware provides with each sharpener it sells. Though it is a fairly low-tech machine, mastering its use involves understanding a few subtleties not mentioned in Makita's instruction manual.

In addition to the extra instructions, until December 31 we are including with each 9820-2 purchased a free Green wheel, a 120-grit coarse stone useful for re-shaping bevels or grinding out nicks from blades. The 9820-2 also comes equipped with a 1000-grit stone, ideal for routine sharpening of planer & jointer knives. With the Highland Jig (see next page), the 9820-2 is great for sharpening chisels and plane irons.

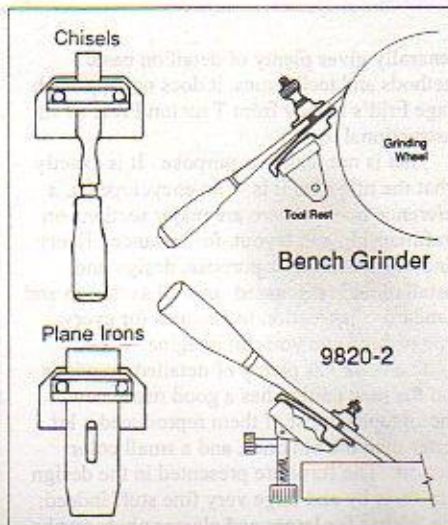
Order the 9820-2 with extra instructions and free Green wheel for \$195.00 plus \$6.00 shipping.

The Highland Jig

THE HIGHLAND Chisel Sharpening Jig aids in grinding chisels and plane irons on almost any kind of grinder, reliably providing consistent angle of grind and direction of tool travel on almost any toolrest design. It will accept tools up to 2-1/2" wide and 7/16" thick, and its unique design lets it hold tapered blades such as on mortise chisels or Japanese plane irons without loss of control. It provides the most successful method we've ever tested for grinding and sharpening 1/8" and 1/4" chisels to a straight, flat bevel.

Used on a bench grinder, the Highland Jig allows you to concentrate on the critical part of the grinding operation, which is controlling the amount of pressure (hence the amount of heat) you apply to the cutting edge without having to worry about keeping the bevel at the correct angle or moving it parallel to the face of the wheel. On most grinders, the toolrest can be set so that the jig lies flat on the rest, which is adjusted to the correct distance from the wheel and the proper grinding angle. The index lines on the jig help to line up the tool square to the wheel surface. If your grinder's toolrest doesn't offer adjustable angle, simply move it far enough out from the wheel so that hooking the jig over the outside edge of the rest presents the tool to the wheel at the desired angle.

Used on the Makita 9820-2 sharpener, the Highland Jig offers control fine enough to proceed from grinding to final polishing up to 6000 grit. Here again the jig is hooked over the rear edge of the toolrest with the clamp bar foremost. Grinding angle is set by



adjusting the toolrest angle in conjunction with the length of tool protruding beyond the clamp bar. Normal operation of the 9820-2 results in a flat, sloped wheel surface which is quite broad; to set the tool square simply lower it into contact with the stone and look at where the cutting edge touches the surface. Shift the back of the tool left or right as needed to put the edge into full-width contact with the stone, and off you go. If, on the other hand, the tool is out of square, just set it deliberately askew in the jig so that by the time the cutting edge grinds its way into full contact with the stone, it will have squared itself in the process.

The Highland Jig is manufactured by Highland Hardware, and we take pride in offering it as a practical accessory for the 9820-2 and conventional bench grinders.

The Highland Jig is available for only \$10.95 plus \$3.00 shipping and handling.

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Long a favorite of beginning carvers, Charles Marshall Sayers' *The Book of Woodcarving* is a clear, unimpeachable and thoroughly effective introduction to a rewarding craft. We've put the book together with the essential tools which Mr. Sayers specifically recommends in his book: **Acorn brand chisels from Henry Taylor Tools of Sheffield, England.** The five-tool set includes a 1/2" #39 paring tool (V chisel), along with 3/8" #3, 3/8" #7, 5/8" #5, and 1" #3 gauges, complete with a custom denim tool roll for convenient storage.

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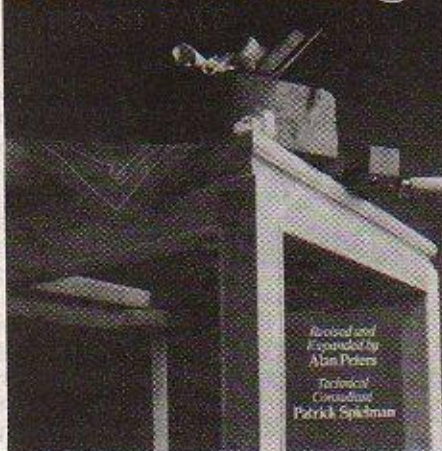
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Encyclopedia of Furniture Making



THE *Encyclopedia of Furniture Making*, for more than 15 years the finest single-volume reference on woodworking, has received a welcome refurbishing and updating.

Encyclopedia, written by the British designer-woodworker Ernest Joyce and first published in Great Britain in 1970, is brought out in the United States by Sterling.

The new edition credits the well-known British craftsman Alan Peters with revisions and expansions. The remarkable American Patrick Spielman, who is either two people or can type with his toes as well as his fingers, is listed as technical consultant.

The expansions are fairly minor, bringing the book up to date on new tools and techniques and advances in man-made materials, but in all they amount to an addition of about 20 pages, taking the book over the 500-page mark.

At \$29.95 *Encyclopedia* is about a third more than its predecessor but it is still a very fair price. I can think of no corner of woodworking it leaves unexplored. There is even a section on church work, which in England is considered a highly specialized field.

This is not a book I would recommend to the beginner for instruction. While it

generally gives plenty of detail on basic methods and techniques, it does not approach Tage Frid's trilogy from Taunton Press as an instructional tool.

That is not really its purpose. It is exactly what the title says it is — an encyclopedia, a reference book. There are major sections on draftsmanship and layout, for instance. Every kind of hardware, its purpose, design and installation, is discussed, as well as design and standard construction techniques for every type of furniture you can imagine.

The book has plenty of detailed drawings and the new edition has a good many new photographs, most of them reproduced a lot better than the old ones, and a small color section. The furniture presented in the design section is by and large very fine stuff indeed; one wishes for larger and clearer photographs of many of the pieces.

I know of no other book, with the possible exception of Feirer's grim vocational school textbook *Cabinetmaking and Millwork* that even attempts to cover this much ground, and none that succeeds half so well. —Reviewed by Jack Warner. Reprinted courtesy of UPI.

The new Encyclopedia of Furniture Making is available from Highland Hardware for \$29.95 plus \$3.00 shipping.

Charlotte Show Oct. 30 - Nov. 1

The Woodworking World Show returns to Charlotte, North Carolina for its third straight year, and all indications are that this year's show will be bigger and better than ever.

Traveling to Charlotte has become an annual event for Highland Hardware as well, and our large exhibit at Booth 32 will offer a close-up look at a sizable portion of our growing tool product lines.

The show opens in the Charlotte Convention Center on S. College Street Friday, October 30 from noon to 6 pm. Saturday hours are 10 am to 6 pm. Sunday from 10 am to 5 pm. Workshops will be offered on routers, scroll saws, band saws, chip carving, and other topics.

The Workbench Book

Scott Landis



A craftsman's guide from the publishers of Fine Woodworking

NEW THIS FALL from Taunton Press is the first book we know of to focus exclusively on benches for woodworking. Author Scott Landis starts at the beginning with a history of workbench evolution from Egyptian times onward, and proceeds to examine virtually every kind of bench known to woodworking. There are traditional Shaker benches and Workmates; there are benches for cabinetmakers, carvers, luthiers, boatbuilders, perfectionists and utilitarians. Drawings and photos abound, showing not only the benches themselves but also details of particular interest in their construction and use. Along with the benches come all their accessories, from leg, shoulder and tail vises (one chapter on store-bought and another on shop-built vises) to dogs and hold-downs. The book closes with 19 pages of measured drawings of four distinct contemporary workbenches. Landis says his goal is to offer the reader as much information as possible without prescribing the "right" kind of bench. Figuring out the kind of bench that's right for you will be a lot easier after you've learned what *The Workbench Book* has to offer. Hardcover, 256 pages.

Available from Highland Hardware beginning around October 15 for \$24.95 plus \$3.00 shipping.



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