Popular Woodworking

DECEMBER 2023 | #275

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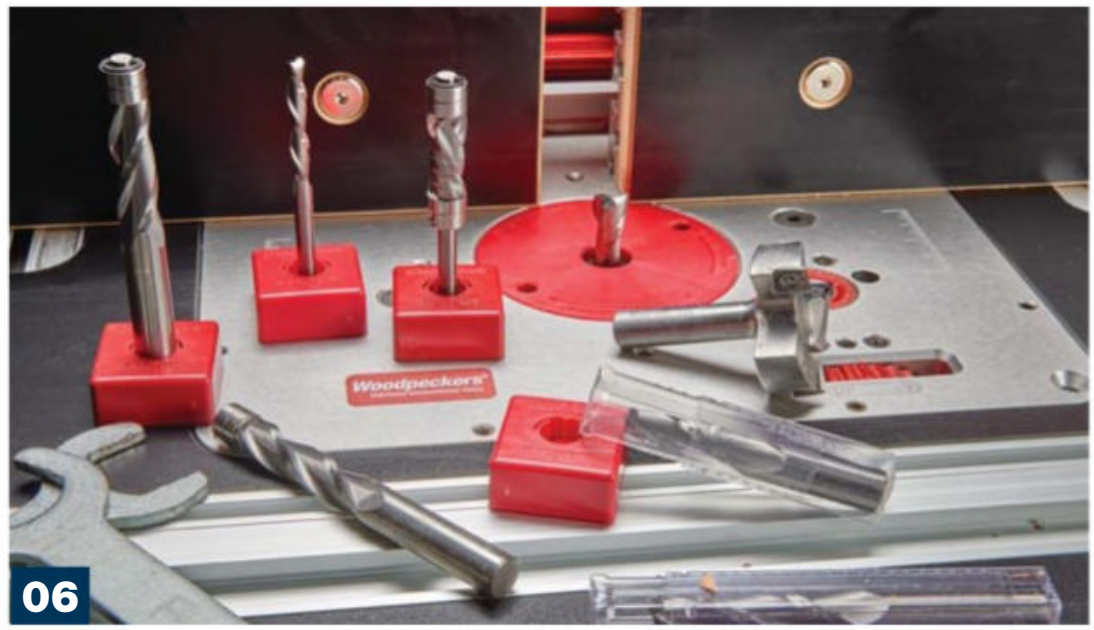

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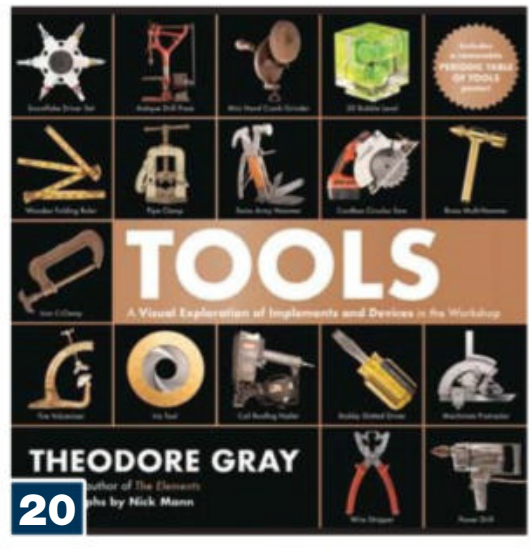

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FROM THE EDITOR

The Bucket List

By Logan Wittmer

As I sit here typing this, the weather has cooled down and football season just kicked off (go Fins!). That also means that we're heading into woodworking season—the time of the year that it's cool enough to be in the shop, but will get too cold to be outside doing much else. We also just wrapped up a great weekend at the hand-tool event, *Handworks* (held in the Amana Colonies here in Iowa). There were many of you that I had the pleasure of meeting while I wandered around, and I also (told my wife) I got away without spending a ton of money.

In the week leading up to *Handworks,* I had the chance to spend time in our new shop building a Democratic chair with a friend of mine. (No, it's not a political name, it simply implies it was a chair designed to be made with limited tools and used by the masses). Building a set of traditional chairs has always been on my "bucket list" of projects, but that made me think about what were some of the others on the list:

- Cedar Strip Canoe
- Laminated Recurve Bow
- Fly Rod with Case
- High-Back Windsor
- Prairie Style Sofa
- Grand Father Clock
- Large, Shaker-style Workbench
- Grandiose Tool Cabinet

I have a love of the outdoors, and clearly that transmits into some of the projects that I want to build. With that said, I think you will probably see some of these projects in the magazine at some point (some sooner than others). Hopefully you find them enjoyable, but if you don't, I hope you at least pick up some useful techniques or idea from them. But that does beg the question — What's on your bucket list for building? I'd love to hear what you've dreamed of building, as you may plant the seed of a project in my mind. Let me know your thoughts, and if you'd like to see any of these projects in the magazine —Lwittmer@aimmedia.com. Until next time — Cheers!

ABOUT THE AUTHORS

RALPH BAGNALL: *Stacking Burger Toy* – pg. 38

Ralph Bagnall is a long time professional woodworker. He's published several woodworking books, and has traveled the country giving presentations on various aspects of woodworking. Ralph's most recent book, "A Beginner's Guide to CNC Machining in Wood," is available from *Fox Chapel Publishing* and on *Amazon*. Apart from his professional career in woodworking, Ralph is also the founder of the website woodacademy.com. The focus of *Wood Academy* is to help woodworkers build their skills through instructional plans, articles, and video. Ralph resides in Florida with his wife.

CHARLES MAK: *Folding Wall-Mounted Valet* – pg. 44

A self-taught woodworker in Canada, Charles has been a writer and teacher for some 15 years. His key interest lies in furniture and cabinet making, and producing one-of-a-kind pieces like the stylish valet featured in the current issue. He uses hand tools whenever they are the best tools for the job, while leaving the heavy milling tasks for the power tools. Charles is also a prolific tipster, sharing his shop tricks and solutions in various magazines, including *Popular Woodworking*. He published "Woodworking Tips and Tricks" (Algrove Publishing) in 2022, a collection of some of his unorthodox shop wisdom.

PHOTOS PROVIDED BY LOGAN WITTMER

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NEW TOOLS

WoodPeckers Ultra-Shear Router Bits

For the last several months, I've had the oppotunity to use the new Ultra-Shear router bits from *Woodpeckers*. They are some of the nicest router bits that I've used. What makes the Ultra-Shear bits different, in my mind, is that each one is ground out of a solid piece of fine-grained carbide. If you're familiar with standard carbide, it has a fairly large grain structure. This means that the edge can only be sharpened to a certain point before the grain size of the carbide is the limiting factor. Woodpeckers has used a much finer carbide in the Ultra-Shear bits, and they are *sharp*!

Being ground from a solid piece of carbide also has another benefit—the router bits can have a variety of flute numbers, and patterns. With standard straight bits, the carbide cutter is usually a flat piece of stock braised on the bit. With the Ultra-Shear bits, the flutes are in a spiral pattern, allowing better chip extraction and a shearing cut. Some of the bits have a compression pattern as well, where the top and the bottom of the bit converge in the center, allowing a smooth cut on both faces of the workpiece.

ULTRA-SHEAR
Woodpeckers
Woodpeck.com
Price: $18.99+

The Ultra-Shear router bits are being offered in several styles. A mixture of pattern, template, straight and rabbet bits are among the current offering, though I expect that the selection of bits will continue to expand. As with all the *Woodpeckers* items, they're manufactured in the USA. —*Logan Wittmer*

Knew Concepts Marquetry Saw

Known for their jeweler and fret saws, *Knew Concepts* has released a compact version of their marquetry saw. The saw, shown to the right, consists of one of their 8" fret saws attached to a guide tower. The guide tower allows the saw to travel up and down (as well as pivot), turning the fret saw into a hand-held scroll saw. The idea is that you're simply sawing up and down while your opposite hand turns and steers the workpiece.

The beautiful thing about the compact marquetry saw is that the guide tower is adjustable. You can tilt the tower (as well as the attached saw) for double-bevel marquetry. The linear bearings in the saw guide make the operation very smooth and fluid, and the adjustable tension mechanism that assists the saw means that you can dial in the saw to operate just how you'd like it.

The marquetry saw has a dovetail on the back that you can attach into option clamps, so that you can clamp it on your bench. The sawing table supports the workpiece and utilizes the same dovetail system to mount it to your bench. —*Collin Knoff*

COMPACT SAW
Knew Concepts
knewconcepts.com
Price: $615+

PHOTOS BY LOGAN WITTMER

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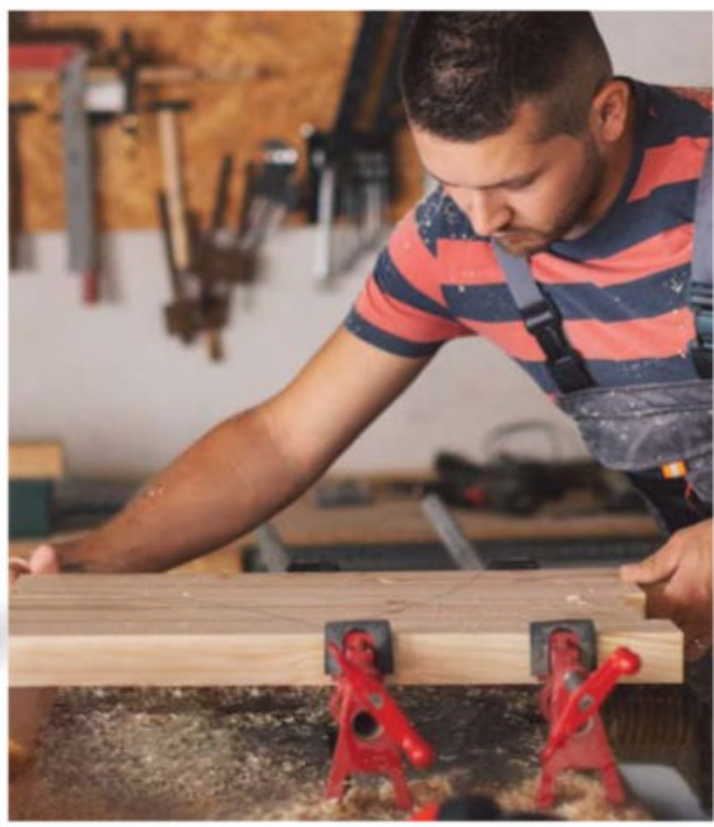

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NEW TOOLS

Infinity Tools VRS-200 Vertical Sled

Infinity Tools, out of Florida, has been known to design and manufacture some of the highest quality tools around. Their VRS-200 Vertical Router Sled is no exception. The milled aluminum base and tilting table scream quality as well as versatility. The sled is designed to hold workpieces at angles from 90° down to 45°. The ability to hold workpieces in this orientation unlocks a world of possibilities, not only at the router table, but at the table saw as well (see the photo to the right).

In my mind, a few things really set the Infinity Tools VRS-200 apart from others (especially my shop-made versions). First and foremost, it has a spring-loaded pin on the front of the sled that registers the table at 5 different locations (90°, 45°, 33.3°, 22.5°, and 11.25°).

Next, the adjustable fences on the table slide in slots — you can easily change the angle of the fences to hold parts for compound cuts at the router table or table saw. The fences are pre-drilled for toggle style clamps, and the kit includes one (you can purchase a second, but I found it unnecessary).

VRS-200
Infinity Tools
InfinityTools.com
Price: $319

Finally, an included miter bar can be attached to the bottom of the sled. The ability to lock the sled to the table saw is a huge benefit. You can easily cut extremely acute angles on the ends of parts, such as this angle on a triangular flag case. The VRS-200 unlocks a new world of possibility and options at both the router table and table saw. —*Logan Wittmer*

Stryi 5 Piece Spoon Carving Set

For several years, I've seen tools coming out of Western Ukraine, and they've always appeared to be high-quality. One company caught my eye in particular named *Stryi*. Sharing a name with the town where they're located, *Stryi* is hand-forging tools that rival some of the top names in the industry.

The particular set that I have here is their "5 Piece Spoon Carving Set." Aside from a foam-lined case and spoon carving blank, the kit includes a hook knife, a Slyod-style knife, two #9 bent gouges (10mm and 20mm), and a #7 gouge in 20mm size. When compared to other brands that average around $75 per tool, the five piece set at $249 is a great value. The steel (which is a high-carbon W1-7 steel) is razor sharp out of the package and is easy to keep an edge on. All of the tool handles are comfortable and fit into the hand well. The only thing that I took care to do before putting blade to wood was quickly go over the sides (non-cutting edges) with a file, as they're a bit sharp out of the box.

5PC SPOON SET
Stryi Tools
woodcarving-tools.com
Price: $249

Of course, if you're looking for other edge carving tools, *Styri* has a lot more to offer than just a spoon carving kit. Browsing their website (woodworking-tools.com) reveals a large assortment of carving tools, chip carving knifes, green woodworking tools, and more. Building up a set of carving tools can be expensive, but starting your set with some quality tools *Stryi* makes it a bit more affordable. — *Danielle Lowery*

PHOTOS BY LOGAN WITTMER

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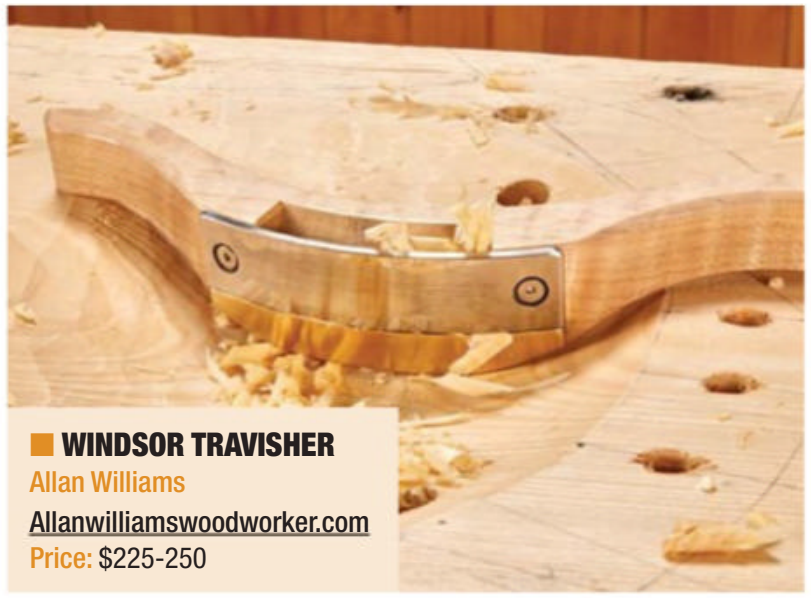
NEW TOOLS

Allan Williams Windsor Travisher

Chairmaking is one of those things that I've avoided for several years. Not that I wasn't interested in it—actually quite the opposite. I know myself well enough to realize that I would probably hyper-fixate on it and go down a rabbit hole. Well, down the rabbet hole I went. This journey included ordering a few chair making tools. I'll tell you about my scorp in the next issue, but one of the other tools was this travisher by woodworker and chairmaker Alan Williams.

Admittedly, I'm a sucker for a pretty tool, but it's worthless if that tool doesn't work. Not only does Allan's travisher look great, but holy cow does it work. Each of Allan's travishers are sent out sharpened and ready to be put to a chair seat. They are razorblades. Allan offers the travishers in cherry, walnut, and curly maple. When ordering the travishers, you can pick one of three radii. The 4 1/2" radius is a general purpose size, and the one that I ordered. A 3" is available for tighter curves (such as small chairs or tight areas on seats). The 12" radius is a much flatter sole and works well for transitioning the areas between the seat pan and thigh area.



WINDSOR TRAVISHER
Allan Williams
Allanwilliamswoodworker.com
Price: $225-250

The thing to remember is when you order a tool from a bespoke maker such as Allan, you're not ordering a mass produced commodity. You're ordering a tool that's been custom made for you. It has been made with skill and care. A tool such as this is a joy to use. —*Logan Wittmer*

Ridgid 18v Brushless Jigsaw

A thought occurred to me the other day — is the jigsaw the most versatile power tool? It can crosscut and rip. Make straight cuts or curved. It can even cut bevels and compound miters if used correctly. This mental exercise was playing out in my head while testing the new 18v brushless model from *Ridgid*, and while I never did come to a conclusive answer, I did find that I really liked this new saw.

Ridgid did their homework with the new R86344. It features variable cutting speed up to 3,450 SPM, with a 4-mode speed selector and variable speed trigger. There are 4 different orbital modes for choosing between clean cuts (less orbital action) and speed (more orbital action). The blade change mechanism and bevel adjuster are both tool-free. Ridgid also claims 20% reduced vibration vs their prior model, which was noticeable in testing.

The real runaway success is in the ergonomics. The design of the handle is just perfect, tapering slightly as it goes down, which allows a comfortable grip for a wide range of hand sizes. The speed adjustment button is right by your thumb, so you can make adjustments mid-cut without having to stretch awkwardly or use your off hand. Even the vacuum attachment is well thought out and stays out of the way when cutting. All of this adds up to a saw that's a real joy to use, no matter which of the many tasks (crosscut, rip, strait cuts, curved cuts, etc) I use it for. —*Collin Knoff*

18V Brushless Jigsaw R86344
Ridgid
Ridgid.com
Price: $179 (Bare Tool)

PHOTOS BY COLLIN KNOFF

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NOV 30 | Drill Doctor

750X Drill Bit Sharpener

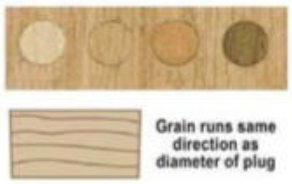
DrillDoctor.com

Drill Doctor

DEC 1 | McFeely's

Face Grain Wood Plug Kit

McFeelys.com



McFeely's

DEC 2 | Tailspin

Tailspin Tools Complete Set

TailSpinTools.com

DEC 3 | Leather by Dragonfly

Sedgeley Utility Pouch

LeatherbyDragonfly.com

DEC 4 | Titebond

Titebond III Ultimate Wood Glue

Titebond.com

DEC 5 | Woodpeckers®

DelVe Square® SS Inch Set with Rack-Its™

Woodpeck.com

DEC 6 | Senco

PC1010N One-Gallon Compressor

Senco.com

DEC 7 | Grizzly

T33819 23" 9-Drawer Oak Chest

Grizzly.com

DEC 8 | BORA

Tempest Forstner Bit 16pc set

BoraTool.com

DEC 9 | Duluth Trading Co.

Fire Hose Triple Threat

DuluthTrading.com

DEC 10 | Kutzall

Extreme Shaping Dish (Coarse)

Kutzall.com

DEC 11 | Harvey Woodworking

COMPASS RT-S Router Table Stand

HarveyWoodworking.com

DEC 12 | Woodpeckers®

1281 Precision Woodworking Square 12" x 8"

Woodpeck.com

DEC 13 | Titebond

Speed Set Wood Glue

Titebond.com

DEC 14 | Steve Wall Lumber

15 Bd. Ft. of Ambrosia Maple

WallLumber.com

DEC 15 | Wagner Meters

Orion® 930 Dual Depth Pinless Wood Moisture Meter Kit

WagnerMeters.com

DEC 16 | Drill Doctor

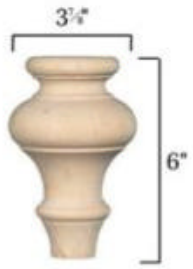
X2 Drill Bit & Knife Sharpener

DrillDoctor.com

DEC 17 | Osborne Wood Products

Jekyll Tall Bun Feet (set of 4)

OsborneWood.com



DEC 18 | M-Power Tools

Side by Side 3 Grade Diamond Stone

M-PowerTools.com

DEC 19 | Kreg

Pocket-Hole Jig® 720PRO

KregTool.com

DEC 20 | Duluth Trading Co.

Fire Hose Large Tote Bag

DuluthTrading.com

DEC 21 | Knew Concepts

5" MK IV Deluxe Fret Saw with Swiveling Blade Clamps

KnewConcepts.com

DEC 22 | Woodpeckers®

Spline Jig

Woodpeck.com

DEC 23 | Shop Fox

SF W1870 18" VS Scroll Saw

Grizzly.com

DEC 24 | Ultra-Shear™ by Woodpeckers®

Ultra-Shear™ Router Bits

Woodpeck.com

DEC 25 | Senco

TN21L1 2" 21 Gauge Pinner

Senco.com

DEC 26 | Bridge City Tools

HP-10 Foxtail Convertible Plane

BridgeCityTools.com

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BlueSpruceToolWorks.com

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BesseyTools.com

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3M.com

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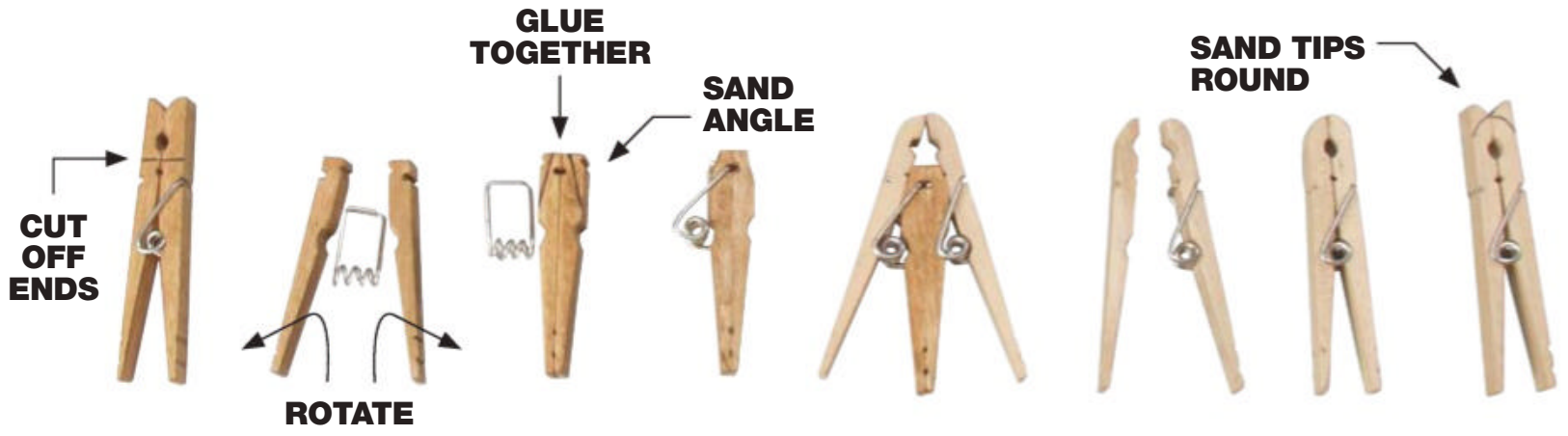
WORKSHOP TIPS

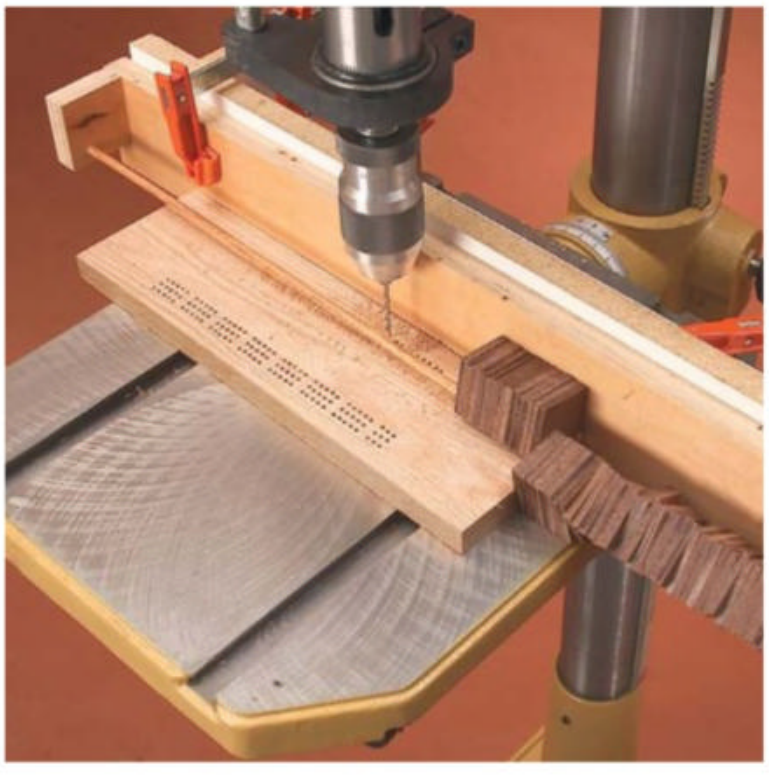
Double-Decker Mini Clamp

Here's a great little clamp for those light-duty hobby or craft jobs. Start with two ordinary clothespins, then modify and combine them as shown here. You now have a clamp with triple the capacity of a single clothespin. – *Alan Dooley*



Drill a Million Evenly Spaced Holes

Drill a series of equally spaced holes using a set of flip stops. For the cribbage board shown here, each stop is made of 1/4" hardboard. Flip one stop for individual hole spacing, two for the large space between group of holes.



Match Colors on Glass

Replacing missing color usually involves color matching, which most people find difficult. To make it easier, do the color matching on a small piece of glass or rigid, clear plastic place on a part of the surface you're matching. Use an artist's brush to mix several colors until the blend matches the color underneath the glass or plastic. Brush the colorant onto the damage and protect it by applying a finish.

For the colorant, you can use concentrated oil, acrylic, universal or Japan colors, available from woodworking suppliers and paint and hobby stores. Or you can blend ready-made stains.

Connect

WORKSHOP TIPS

Make Surface Checks Disappear

Don't let small surface checks keep you from using an otherwise good board. Got a minute? You can make those checks disappear.

First, squeeze cyanoacrylate (CA) glue into the crack. CA glue works better than yellow glue because it dries very quickly. Any brand of gap-filling CA glue with a 5- to 15-second open time will work. Use a tip with a pin-sized hole (you can get replacement tips for cheap at hobby stores).

Next, immediately sand the area, mixing sanding dust with the glue and packing it in the cavity. Keep sanding until the crack is filled and the excess glue is removed. You may need to repeat the process. Under a finish, the sanding dust/glue mixture is almost invisible.

Waterstone Maintenance

Waterstones are renowned for cutting fast, but many require regular maintenance to stay flat. This is no small thing—a flat surface is essential for producing a straight edge and to properly remove a wire edge.

Flatting is a must-do, routine chore. How often do you have to do it? Well, ideally you'd flatten a stone each time before you use it, but that may strike you as obsessive. Flattening after a half-dozen uses is probably more realistic. But consider this: the longer you let it go, the more dished-out a stone may become and the more work you have to do to make it flat again.

The easiest and least expensive way to flatten a waterstone is to rub it on a piece of 220 grit wet-dry sandpaper mounted on a piece of 1/4" glass. The best source for this sandpaper is an automotive supply shop. Pick up a handful of sheets, because each one is only good for two or three uses.

When you flatten, use lots of water to keep the paper from loading. You don't have to adhere the paper to the glass—the water will cause the paper to stick by itself.

If you really want to get the job done in a hurry, lap your stones on a fine diamond stone under running water in a utility sink. You'll be done before you know it. If you're really nuts about this, like I am, build a support so you don't have to lean over too far. – *Tom Casper*

PHOTO BY FRANK ROHBACH

Use a Pen on Dark Wood

Use a blue ballpoint pen to mark dark woods, such as walnut. Its ink is far easier to read than a pencil line.

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Connect

WORKSHOP TIPS

Cornstarch Lube

Cornstarch makes an excellent lubricant. Now and then, I shake a little onto the table and fence of my tablesaw, and volia! The heaviest, roughest boards glide smoothly across the surface. Baby powder works well, too.

Write with Chalk

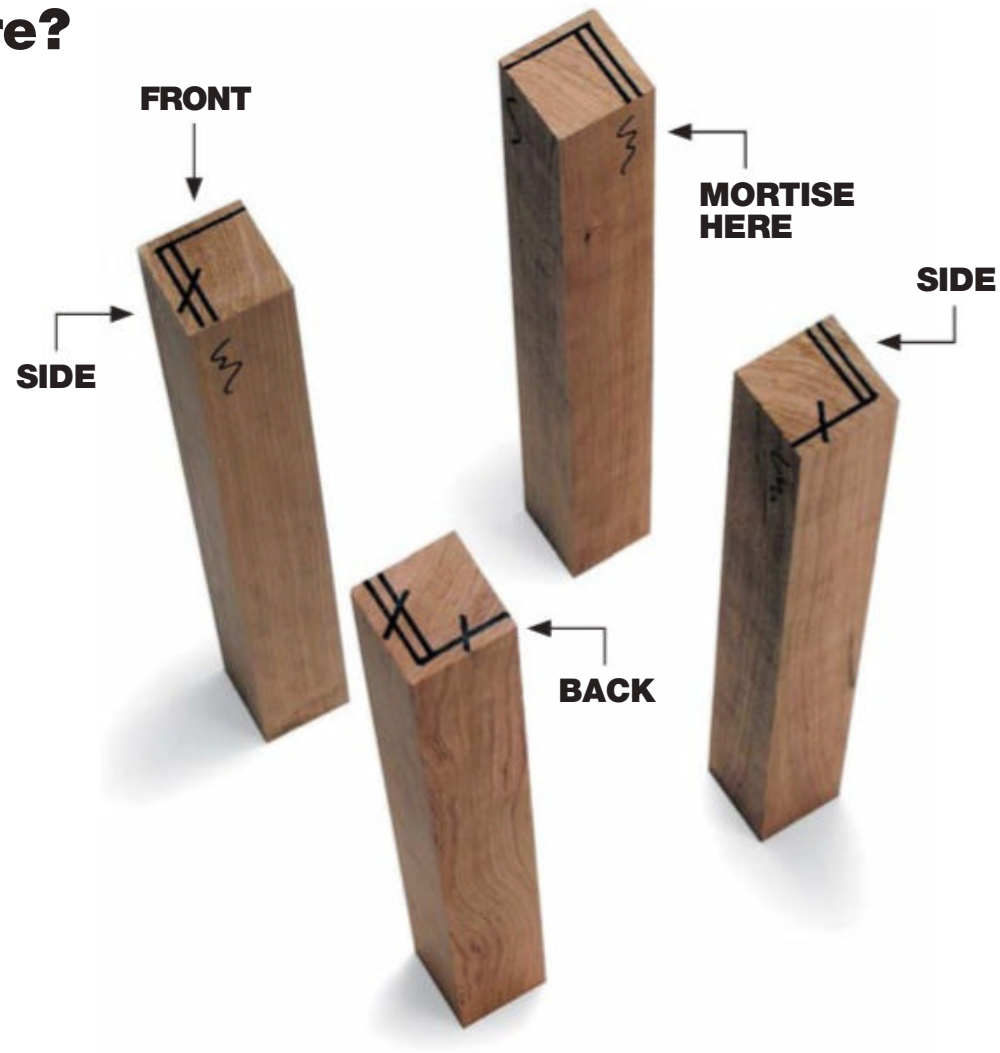
Lay out marks on rough lumber with chalk. It is easy to read, even on the scruffiest surfaces. Unlike ink, pencil, or crayon, chalk marks are easy to erase if you change your mind. Just scrub the marks with a stiff brush.

Which Leg Goes Where?

This marking system might look as complicated as ancient hieroglyphics, but its logic is quite simple. Ultimately, it gives you this fair warning, "Don't make a mortise on the wrong side of the leg!"

This method of marking four legs to identify once and for all which leg goes where. Indicate the outside faces of your legs by marking them on the top. (The marks are easy to draw. Just hold your pencil like a marking gauge.) You won't touch this surface again, so there's no danger of losing your bearings by removing the marks in tapering or bandsawing the legs. Once you've laid out the marks, you can jumble up the four legs to your heart's content and still be able to return them to their correct positions in seconds.

Stand the legs up on your bench and with a bold, squiggly line, mark where all the mortises go. When it comes time to actually make the mortises, if you're not staring directly at one of those squiggles, something's wrong.

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Book Club

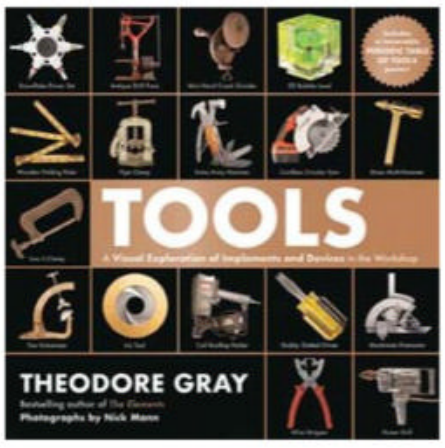
New Book

Excerpt from the author

If there's one thing to be said about woodworkers, it's that we're old school and prefer to pick up a book (or a magazine). With that in mind, I'm thankful for the community of master woodworkers that put forth a great effort to put some of their knowledge down into the pages of a book to share with all. Here is a small sample of a recently published book that I believe you will enjoy as much as I did.

TOOLS

A Visual Exploration of Implements & Devices in the Workshop



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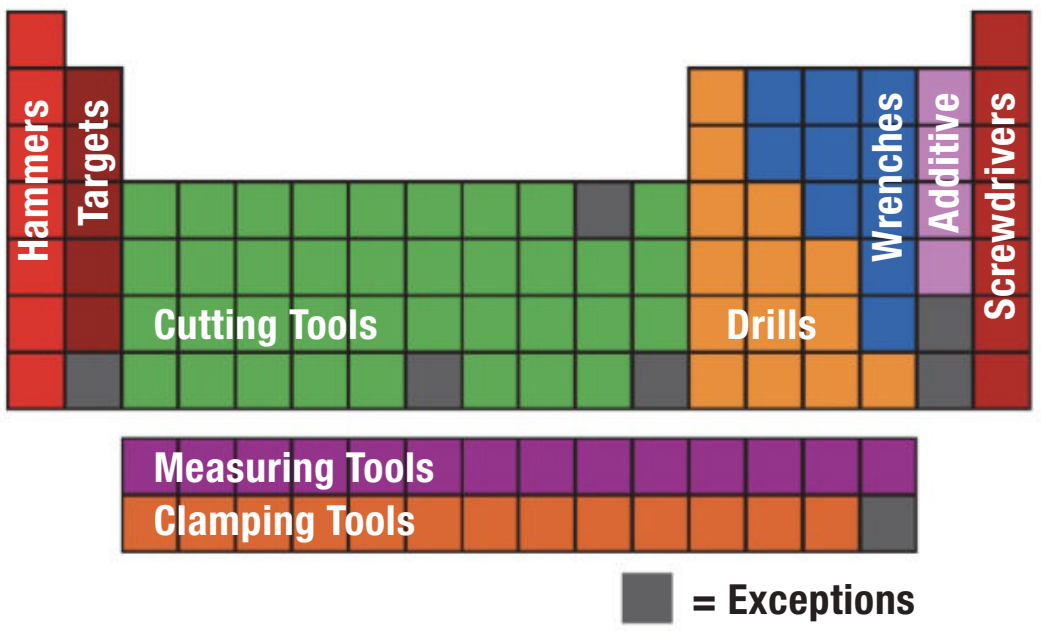
WHAT IS A TOOL?

The concept of a "tool" is one of the oldest, most universal, and most foundational of all ideas. It's right up there with "language" and "chartered accountancy" in defining who we are as a species.

Depending on how broadly you define the terms, we use tools to do nearly everything in our lives, from getting out of the tool we use to sleep better (a bed), to using a small pressure washer on our teeth at night (a water flosser). I like this definition to separate tools in the broadest possible sense from things that are not tools:

A Tool is a *Catalyst*.

In chemistry a catalyst is a substance that makes a chemical reaction happen faster than it otherwise would, while itself remaining unchanged. Because it is not consumed by the reaction, a catalyst can keep working as long as you keep feeding it more reactants. Similarly, a tool can keep working as long as you keep giving it material to work on. Wood is a reactant, and the chisel is a catalyst that makes the carving go faster than if you used your teeth...



HOW THIS BOOK IS ORGANIZED

To create this book I started with my own tools: the ones I grew up with, built my house and farm with, and use today. To those I added many more I found... I took a snapshot of each one with a ruler for scale, give it a catalog number, and recorded where it was, whether at home, at my farm, or, in most cases, in a numbered crate stacked on shelves in my studio. In all enumerated about twenty-five hundred tools, of which only about a quarter fit on the pages of this book...

You might notice that the table of contents of this book looks just like a periodic table. This may seen like a silly concept—and maybe it was when I first started toying with the idea of how to arrange the tools in this book... I wanted to highlight one type of tool on each two-page spread, and cover around a hundred types of tools, which coincidentally is about as many elements as there are (118)...

In arranging this book, I have followed the basic properties of the table of elements. Within each column of the periodic table the elements share similar properties, and they get heavier the father down you go. So, in my periodic table of tools, each column contains related tools, which get bigger, stronger, and heavier as you go down the column... Just for fun I tried to make a few analogies between tool and element properties. For example, column 17 of the periodic table is the halogens, fiery dangerous elements that burn anything they touch. So column 17 of the table of tools contains those that use heat: welders, soldering irons, casting furnaces, and laser cutters...

I hope you have as much fun romping through this periodic table as I did organizing it and populating each of the 118 squares.

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MEASURING TOOLS

TAPE MEASURES

Prior to the invention of steel measuring tapes, the most accurate way of measuring medium distances was with a tremendously inconvenient iron measuring chains. Flat steel tapes were revolutionary, but the real revolution came in 1922 with the invention of the automatic retracting, covex-concave pocket tape measure, surely one of the most useful inventions of all time. A pocket tape that literally fits in an average pocket can measure distances up to 30 feet (10m) quickly and easily with 1/32", far longer than any practical chain.

Among the multiple clever features in a modern tape measure is the clip on the end. It always feels like it's loose, but this is not a flaw, it's a feature! The amount by which the clip can slide is equal to the thickness of the bent-over tab of the clip. That way you can push the end up against a wall, or pull it against the end of a board, and either way the measurement will start in the right place.

Steel is the superior material for tape measures because it's nearly impossible to stretch, but fiberglass is lighter, softer, and more durable. I have a 300-foot (91m) fiberglass tape that I can stretch several inches over its whole length by pulling moderately hard, but that's fine, I don't expect it to be accurate beyond an inch or two. For nonlinear or curved measurements, like measuring on the body for tailoring, fiberglass or even cloth tapes are much preferred for their softness.

Possibly the most useful measuring tool ever invented, the common pocket tape measure.

► Ultrasonic distance meters exist but aren't as good as laser models, except underwater where lasers cannot penetrate. This depth finder told me how deep my lake is, more expensively than using a rope and a brick.

► The distance marks on this beautiful old 100-foot (30m) steel tape are individual bits of engraved metal soldered onto the sturdy tape! It must have taken forever to make.

◄ A laser rangefinder is a good tool for medium distances; up to 130 feet (40 m) for this one but much farther for fancy models.

► This is a modern reproduction of a Gunter's chain similar to those used in the 1700s. The only measurement it can make is the full length between two marks at opposite ends of the chain. I have no idea why someone is making modern Gunter's chains, but I appreciate the effort.

▲ Both these tapes are about the same length (300 feet/100 m respectively). The stainless steel one at left is smaller and stiffer, but the tape is easy to kink and kind of sharp along the edges

► The mark in the window shows the measurement starting from the back of the case.

►These specialized tape measures are used progressively farther out along a human arm, starting with the upper arm (for fitness), wrist (for sizing bracelets), and finger (for fitting rings).

CUTTING TOOLS

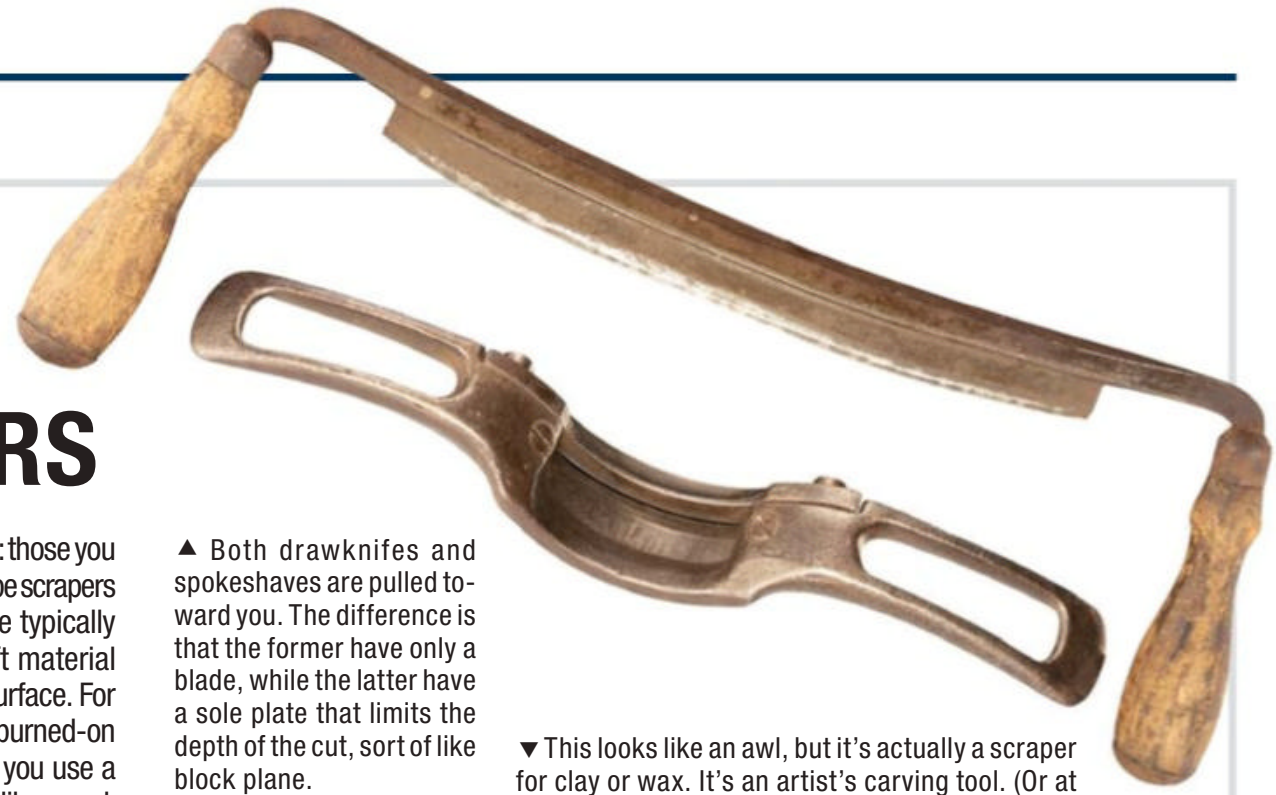
SCRAPERS

There are two kinds of scrapers: those you push and those you pull. Push-type scrapers are almost like chisels and are typically used to remove relatively soft material from a smoother and harder surface. For example, paint from metal, or burned-on food from a glass stove top. If you use a push scraper on a soft surface like wood, it just digs in, which is rarely what you want, and if it is, you should probably be using a chisel.

Pull-type scrapers are used to smooth, shape, or fine-tune softer surfaces. The classic drawknife is used to cut away large amount of wood or bark each time you pull it toward you. A spokeshave is similar, but more refined because of its depth stop.

Surprisingly, scrapers are also used to shave down metal surfaces, including steel. It might seem like you can't possibly cut away much steel just scraping it by hand, and that's true, you can't. But with careful and repeated checking against a granite flat, you can hand-scrape a milled or ground surface to be flatter than by any other method except lapping.

Scrapers have a single blade, but what if that's not enough? What if the job calls for a hundred scraping blades all in a row? Read on.



▲ Both drawknifes and spokeshaves are pulled toward you. The difference is that the former have only a blade, while the latter have a sole plate that limits the depth of the cut, sort of like block plane.

▼ This looks like an awl, but it's actually a scraper for clay or wax. It's an artist's carving tool. (Or at least that's what I've used it for — it may have some other official purpose I'm unaware of.)

▲ This is scraping tool for smoothing and refining the insides of holes and hard-to-reach areas in machine parts.

◄ A nice old-cast iron wood scraper I got from the shop room of an abandoned high school.

▲ A tungsten carbide blade makes this scraper last nearly forever without needing to be sharpened.

◄ Sometimes the job requires an intentionally soft scraper. This nylon version avoids scratching delicate surfaces.

▲ This delicate finger-worn scraper is used by model makers to round over the edges of tiny parts.

► Every one of the Mechanical GIFs model kits I sell comes with one of these plastic scrapers. It's used to remove the protective film from acrylic parts without scratching the surface.

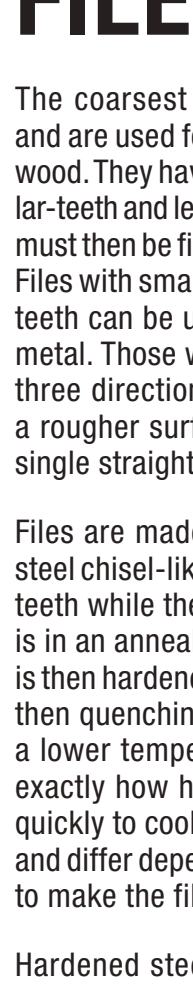
CUTTING TOOLS

FILES

The coarsest files are called rasps and are used for free-form shaping of wood. They have large, sharp, triangular-teeth and leave a rough surface that must then be filed and sanded smooth. Files with smaller, more closely space teeth can be used on both wood and metal. Those with teeth cut in two or three directions cut faster but leave a rougher surface than those with a single straight row of teeth.

Files are made by using a hardened steel chisel-like tool to cut or raise the teeth while the metal of the file itself is in an annealed (soft) state. The file is then hardened by heating it red-hot, then quenching (cooling) it rapidly to a lower temperature. (The details of exactly how hot to make it and how quickly to cool it are rich with history and differ depending on the alloy used to make the file.)

Hardened steel files are among the hardest common tools. They can cut almost any other tool in the shop, including those made of lesser hardened steels. This of course means that they are brittle: a chisel made as hard as a file would soon have a ragged, chipped edge. Files can be so hard because they have a lot of sturdy thick teeth. Over time, if used on hard materials, some of the teeth will break off, but the file will keep working just fine with a fair number of broken teeth.



◄ You could use this rasp on wood or cheese, but it's designed for feet.

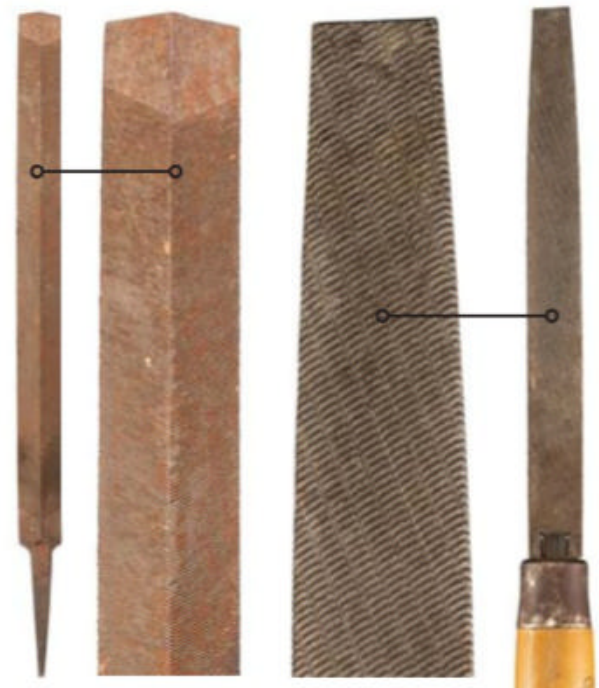
► Mini Files sets are nice for detail work.

► Top: Wood rasps have big, widely space, aggressive teeth to rapidly shape wood.

► Middle: A "float" is a type of file that can be used almost like a plane to smooth surfaces, round edges, or aggressively remove material.

► Bottom: These rasps are made a lot like cheese graters — and the same company sells those too.

▼ By cutting lines in two directions, this file is made more aggressive for either wood or metal filling.



Files come in a lot of different shape and sizes. ▲ Flat and curved files are for filing outside edges, ► while round, square, and triangular files are for inside curves and holes.

▼ If you have a lot of filling to do on metal parts, a pneumatic power filer can save your arm.

▼ Some files are a bit like permanent, reusable sandpaper, with a fine random pattern rather than defined teeth. This nail file, for example. (Human nails, not steel ones.)

Shave Horse

PROJECT #2318

Skill Level: Intermediate
Time: 2 Days
Cost: $100

This traditional-style shave horse is the perfect tool to get outside the shop and do some work.

By Logan Wittmer

PHOTOS BY LOGAN WITTMER & COLLIN KNOFF

A shave horse has been on my "to-build" list for years. I've always made due by holding spindles or legs in my leg vise as I work on them. However, a friend of mine was coming up to do a chair build with me, so I knew that at some point I needed to build a shave horse for use in chair-making. The shave horse here is what my brain came up with.

In its simplest form, a shave horse is something to hold round parts as you work on them. This horse does just that without any fancy adjustment mechanisms. This shave horse utilizes an adjustable table so that you can fine-tune the table angle for the task at hand. A pair of pegs are the pivot points of the head, and a series of holes allows you to adjust the angle and height of the head above your workpiece. The leather-clad table and head offer better grip than the wood itself, and is a non-marring surface. And of course, a long base on the shave horse allows both short (such as myself) and tall (not me) people to comfortably sit at it and work.

Breaking Down Parts

The material that you use to build your shave horse doesn't really matter. I've had these random pieces of elm that I had sawn several summers back. There were several pieces, but not enough for a larger project. So, I figured this shave horse was a great use of it. Breaking down a big, live edge piece of lumber can be done many ways. I prefer to use my saw benches and simply make cross cuts with a handsaw (photo 1, below).

Removing the curved, sculpted live edge is done with a rip saw. A 3TPI saw makes quick work of it. Using "the meat clamp" to hold the piece down, I ripped the edge off. An overhand sawing technique helps avoid any elbow or arm strain.

Any rough-sawn material will have some form of cup or twist that needs removed. Elm is even worse (it likes to turn into a potato chip as it dries). When flattening a board, using something like a low-angle jack can make quick work of it. By opening the mouth up a bit, you can take a heavy cut to quickly hog away material, but also tighten the mouth to smooth it out afterwards.


1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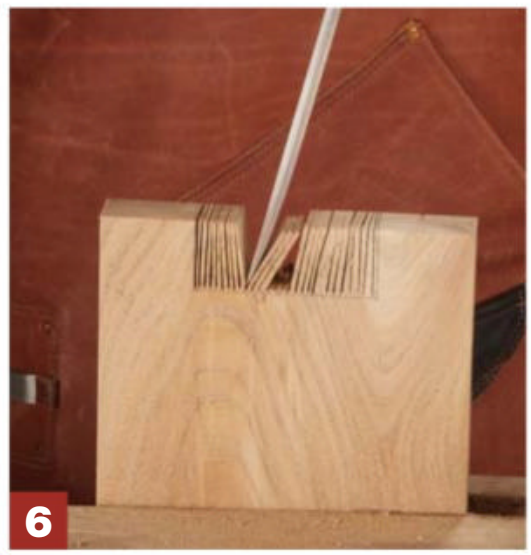
1 A pair of saw benches holds the workpiece while I'm cutting it to rough length.

2 An overhand rip helps reduce arm and elbow strain, while letting you see the line.

3-4 Straighten the edge of the board and address the faces. Working cross-grain will quickly remove material.



Creating the pivot for the table is the next piece to work on. A knuckle will be glued into a notch on the end of the base, and this will tie into the adjustable table with a pair of dowels. Both the table and base will need to be notched in the same way. In photos 5-7 above, I'm working on the end of the adjustable table. The base is long, so it's a little more awkward to work on, but it's doable.

Start the notches with a backsaw. I create a series of vertical cuts in each waste area. Space these out just a little bit. The next thing you'll do is grab your largest chisel and break away the waste. At this point, I'd like to send a note to my past self—the interlocking grain on elm does not split. This means that the waste will not break away cleanly. It was a struggle (tears were not shed, though aggressive words were uttered), but I got through it. After the waste is broken out, you can pare down to the base line, as you see in photo 7.

Fitting and sizing the knuckle is next. This block is pounded into place and I used the table to scribe the height of the knuckle. I ended up using a spacer between the table and the base, just for a little wiggle room. You can see this if you fast-forward to photo 12. Rounding over the knuckle (and the hinge end of the table) allows the table to smoothly raise and lower without binding on the corners. The majority of the rounding is done with a block plane. If I had the proper sized roundover bit for my router, that's how I would have tackled it. But alas, a blockplane will do. I skewed the plane so that the blade was shearing the fibers, especially since most of this was end grain. Once I got it close with the block plane, I switched over to a pattern maker's rasp. This allowed me to smooth out the curves and blend the shape into a continuous roundover.

Now comes the time to drill the pivot point for the table. After putting the knuckle in place, the table gets dropped on. I used my rule as a spacer (see photo 12, again). This allows a bit of breathing room in the joint. Then, stand the pieces on edge and drill through the table into the knuckle. Here, I'm not going all the way through. Rather, I'm simply creating a pivot point from each side.

5 Create a series of kerfs in the waste area of the base and table.

6-7 Use a large chisel to break away the waste, then pare down to the base line.

8-9 Test the knuckle's fit. Mark the final height of the knuckle.

10 Begin the roundover with a block plane.

11 A cabinet maker's rasp is the perfect tool to refine the curve from the block plane into a smooth roundover.

12 Test fit all of the parts together using a spacer between the table and the base.

13 From each side, drill in a pivot hole that will accept dowels.

Shape the Base

The base of the shave horse is also the seat. The base steps down in width from 8" at the ends to 6" in the center. This makes it a bit more comfortable to sit on. To create this, I started by defining the two ends of the notch with a brace and bit. Next, drop a kerf straight down into the edge of those holes (see photo 15 below). Now comes the trick—getting rid of all of that waste. Using a drawknife to make the shave horse is rather poetic.

As you can see in photo 16, I took light cuts, slicing the fibers as much as I could. Again, the elm fought me here— something like ash or oak would work much easier for this technique. Once I was fairly close to my line (along the entire notch), I swapped over to my jack plane for the areas I could reach, and the cabinet maker's rasp for the areas the plane wouldn't. Getting close to the line is the biggest thing—this is a shop tool after all, and doesn't need to be perfect.

14 Define the ends of the notches with a drill (or brace) bit.

15 The straight down cut is done with a backsaw.

16 A drawknife will quickly work away the waste. A bevel up cut will take big chunks, while a bevel-down cut will take a more controlled shaving.

17 Smooth out the lines from the drawknife using a plane and rasp.

18+

WHAT IS AVAXHOME?

AVAXHOME-

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Create the Legs

I chose to use three staked legs for this shave horse. Two at the back, and one at the front. The simply turned legs look nice, and are plenty strong to support a user. The quickest route for me to get to finished legs are to stick them on the lathe and turn them to shape.

Simple tapered legs such as these are deceptive—a smooth even taper that's even across three legs can trip a lot of people up. What I do is give myself targets. First, I get the blank round with a spindle roughing gouge. Then, I use a parting tool to create three targets—a finished diameter at the top, middle and bottom of the leg. Then, with those in place, it's a simple matter of turning the legs down until those marks blend together with the leg. Of course, I'll make the tenon as well, but it's left oversized, as it will be cut to fit in a moment.

Staked Construction

The legs fit into the base with a staked construction—that is, the tenon on the leg is tapered to match a tapered mortise on the base. This is a self-tightening joint, and is great practice for "actual" chair-making.

Starting with the turned leg, I use a tenon taper cutter to shape the tenon to the proper taper. This is basically a giant pencil sharpener, tapering the tenon.

The mortises for the legs have two angles to deal with—one is the rake angle (the angle of the legs looking at it from the side), and the other is the splay (the angle of the legs when viewed from the front/back). This is shown in photo 23—the legs are tilted towards you, but also splayed outwards. This splay allows the legs to add stability to the base (though, I purposefully left them fairly narrow, so you aren't tripping over the legs and it could be pushed tight against a wall).


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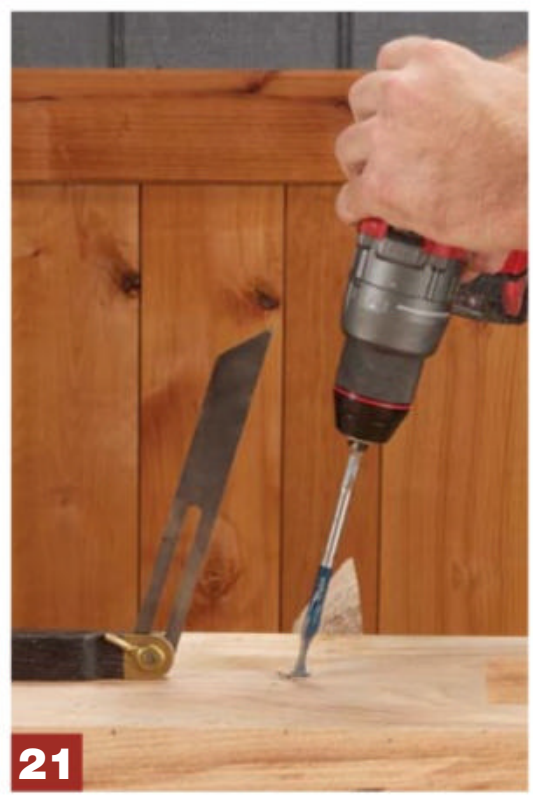
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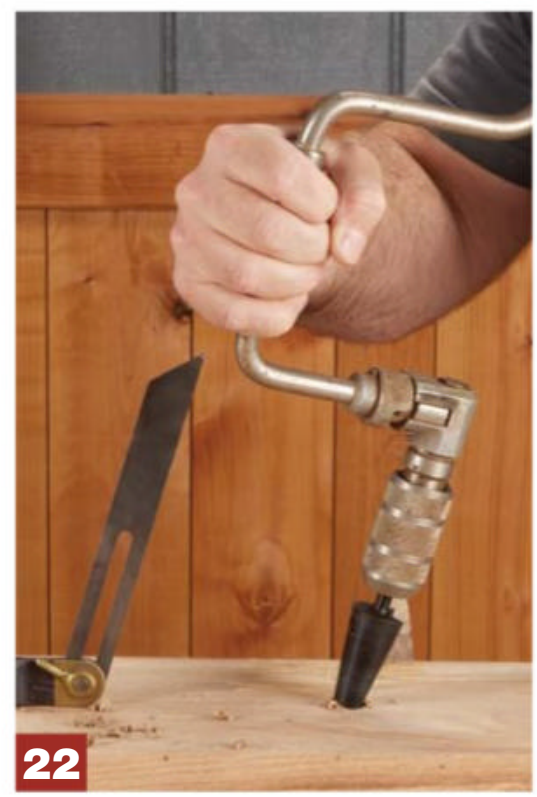
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18-19 Use a drive center to turn the blank. Use parting tool marks as guides as you shape the leg.

20 The tenon cutter trims the tenon into the tapered shape.

21-22 The drill and reamer are angled to match the bevel gauge, making sure the lean is in-line with the sight-lines drawn on the bottom of the base.

23 The legs have outward lean from both the front and side view.

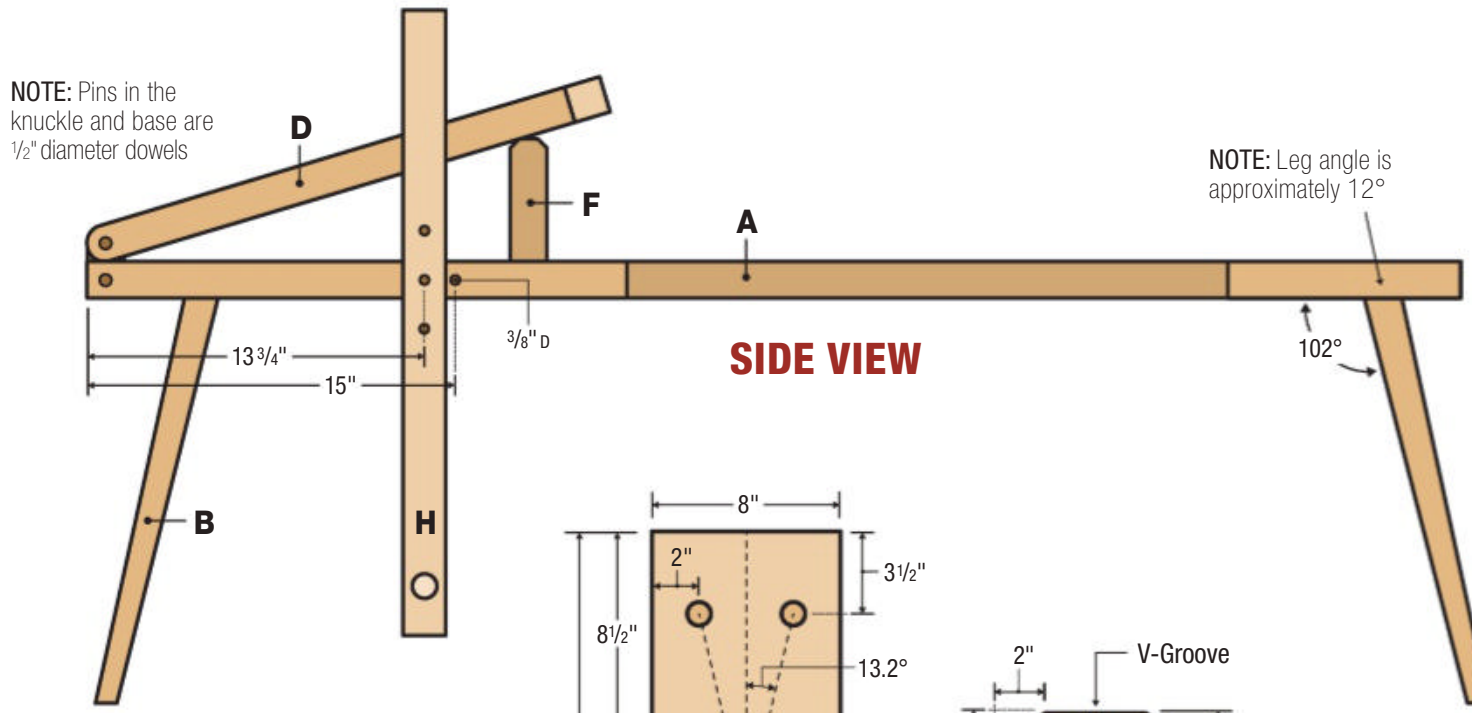
24-25 A cross wedge in each tenon locks it in place.

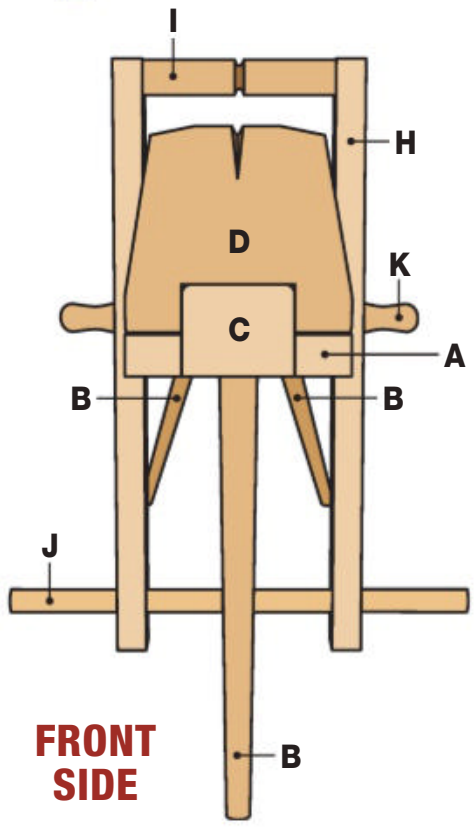
26-28 Level the shave horse with shims. A scribe block referenced off the bench allows you to mark a cut line around each leg. A pull saw and a careful aim creates the perfect bottom to each leg.

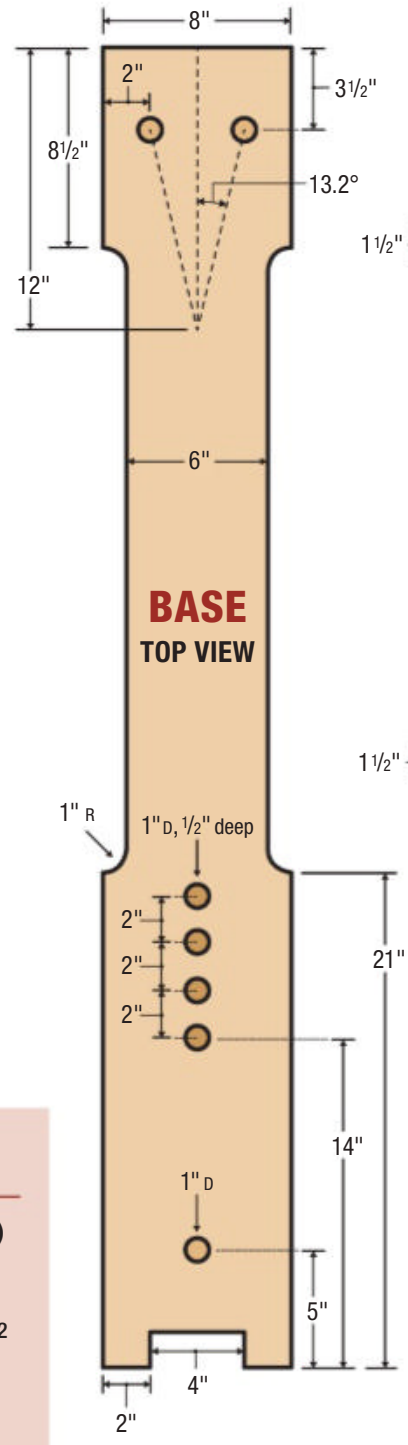
Set a bevel gauge to the appropriate rake angle, and draw sight-lines on the bottom of your blank (dimensions are shown on page 34). Align your drill angle with the bevel gauge (Photo 21), making sure the drill is leaned back inline with your sight-line. Drill through the base. Then, use a tapered reamer to ream out the hole (maintaining the angles) until the legs seat fully. You can buy expensive handmade tenon cutters and reamers — the ones I used were a more affordable option from *Veritas*.

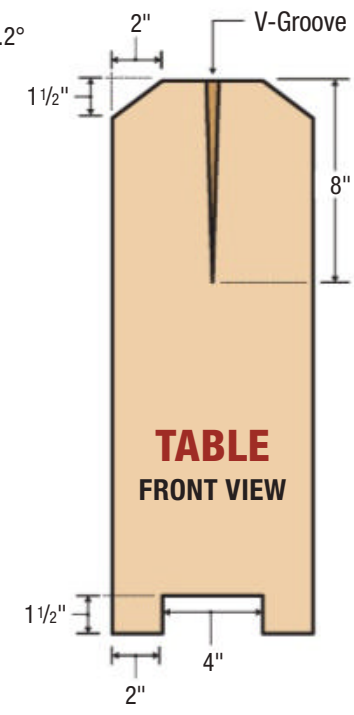
With the holes cut, I cut a kerf on each of the tenons for a wedge and glued them in place. The wedges are driven in to lock everything together. As the glue cured, I used a level to make sure that the shave horse was sitting level, shimming the legs as necessary. With it level, I used a pencil on a scribe block to mark a trim line on each of the legs and a pull saw to cut them off.

Shave Horse









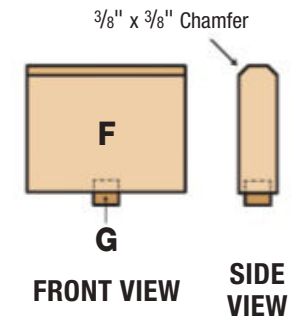
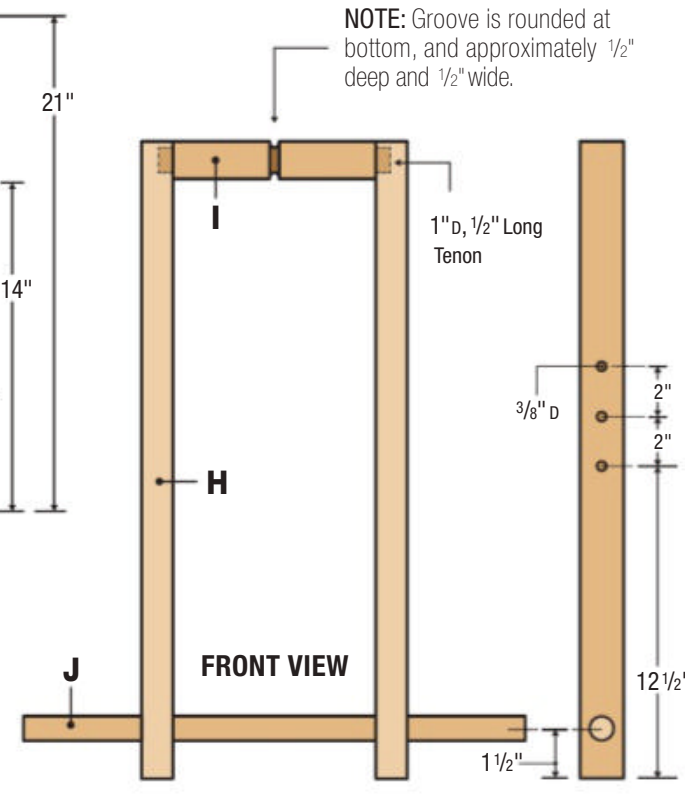


TABLE SUPPORT

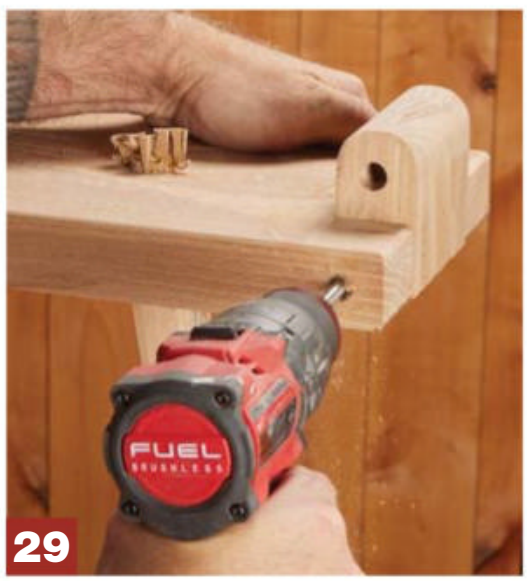
PIN



CLAMPING MECHANISM

Cutlist

No.	Items	Dimensions (inches) T	W	L
1	A Base	1 1/2	8	56
3	B Legs	1 1/2	1 1/2	18 1/2
1	C Knuckle	1 1/2	4	3
1	D Table	1 1/2	8	22
2	E Connection pins	1/2	1/2	8
1	F Table support	1 1/2	6 1/4	5
1	G Table support tenon	1	1	1
2	H Clamping arms	1 3/4	1 1/4	25 1/2
1	I Head	1 1/2	1 1/2	8 1/8
1	J Pedal	1	1	20
2	K Pin heads	1 1/4	1 1/4	2 3/8
2	L Pin dowels	3/8	3/8	3 5/8
1	M Leather for table	8oz.	8	7
1	N Leather for head	8oz.	8	~4 3/4



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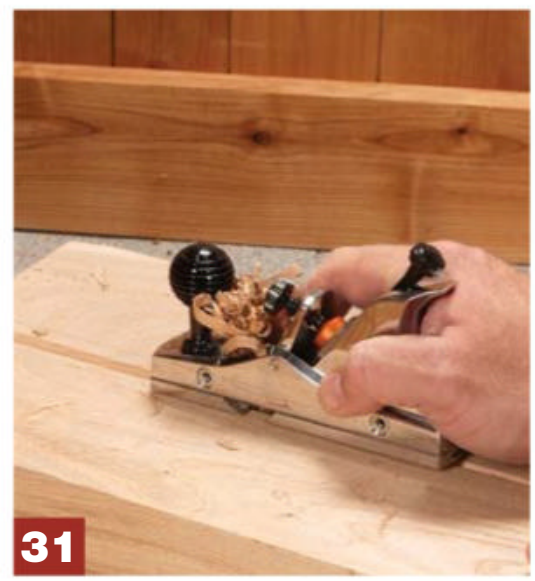
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32


33

Assembly and The Head

At this point, a few things can get glued up. The knuckle can be glued in the notch on the base. A hole is drilled from the side of the base and the knuckle is pinned with a dowel on each side. I took a moment to make a head support block as well. This is a chamfered block with a dowel on the bottom. The dowel registers in stopped holes under the head (photo 30) that are drilled with a Forstner bit. Some shave horse designs simply use a split log for this support.

The table needs a little more work before it gets pinned to the knuckle. First, I knocked off the corners to allow a bit better access with a drawknife or spokeshave. Finally, a V-groove in the head helps trap round workpieces. I clamped on a fence to the head and used a combination plane with a V-sole to create the V-groove (see photo 31).

The pivoting mechanism of the shave horse is the last thing to knock together. It consists of two long arms with a head and foot pedal. By putting your feet on the foot pedals and pushing, the head pivots on a center point, and traps the workpiece between the head and the table.

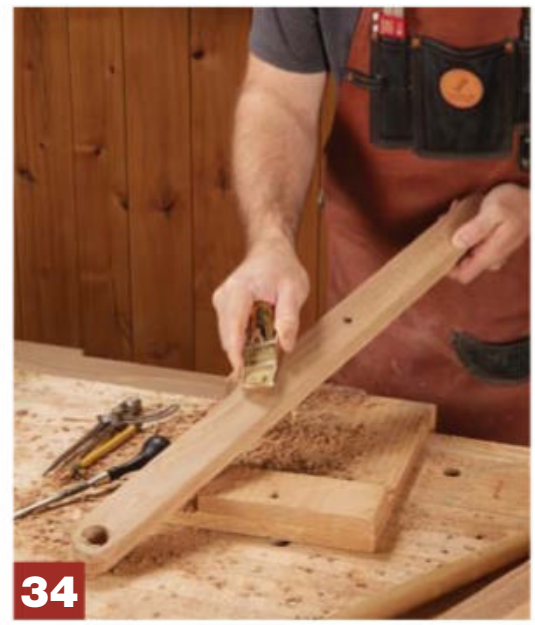
The head on the arms is a large, turned cylinder that I put a groove in (to match the V-groove in the base). A stub tenon on the end of the cylinder fits into stopped holes on the ends of the arms (photo 32). While I had the arms separate, I drilled the pivot hole at once, as well as the hole for the foot pedal. I rounded over the ends of the arms with a rasp, much like I did earlier on the knuckle. A few swipes of a block plane takes off sharp corners.

29 Pin the knuckle in place.

30 The head support adjusts the angle of the head.

31 A V-groove in the head will allow round workpieces to be registered and held firm.

32-34 The head consists of two arms with a stopped hole for the head, a through hole for the foot pedal, and a through hole for the pivot pins.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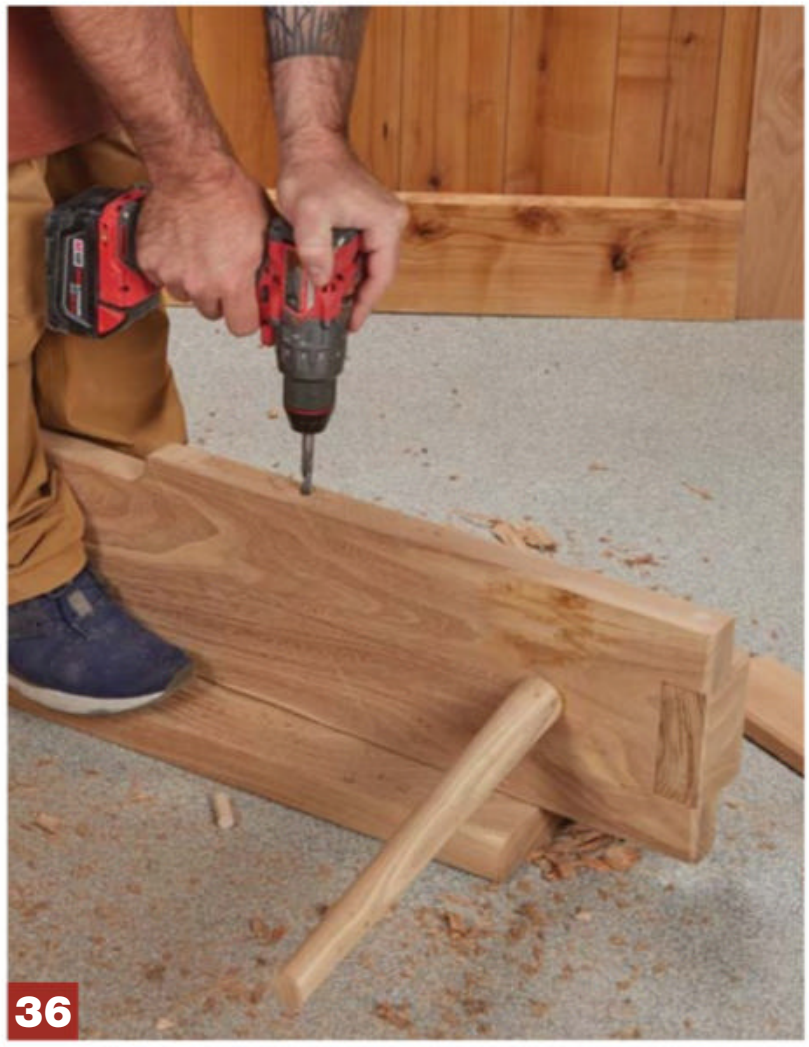

Final Details

Gluing up the mechanism is straight forward. As you can see in the photo above, I made sure to install the foot pedal before I glued the head into the arms. This ensured that everything was aligned and nothing twisted (again, I'm still bitter that this elm didn't behave).

As the glue was curing on the head, I drilled the pivot location on the base. I actually drilled several holes here, just so that I had options for pivoting. The arms have 3 holes, and the base has 2. This allows you to move the head up and down, forward and back, depending on what you're clamping. I added a coat of Danish oil, simply to add some color for photos, but you could also leave it raw. The final thing I added was an after-thought, and that's a layer of leather around the head and the table. Not only does it grip better, but it also doesn't mar the workpiece.

PW – *Logan Wittmer*

35 The clamping mechanism is glued together with all pieces in place. The head is turned roughly the same diameter as the arms are wide.

36 Lay the shave horse on its side and drill the pivot holes for the clamping mechanism. You can drill one, or several, locations.

37 While unnecessary, I added a pad of leather on the table and around the clamping head. The leather is laced together with waxed thread and provides a bit of extra grip.

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Stacking Burger Toy

PHOTOS BY THE AUTHOR

This educational toy will teach toddlers problem solving and fine motor skills, while teaching you a few tricks as you build it.

By Ralph Bagnall

PROJECT #2319
Skill Level: Beginner
Time: 1 Day
Cost: $20

I have always enjoyed making wooden toys, from rattles to hobby horses to log cabin building sets. So, when I saw a homemade version of this stacking toy at an antique store, I knew I wanted to build one. This is an educational toy in more than one sense; it certainly will teach toddlers problem solving and fine motor skills, but it can also teach you a few tricks as you build it. It features templates, pattern drilling, dowel making, and food coloring as stain and kid-safe oil finishing. It's a lot to pack into a small project, so let's get started.

Forming the Dowels

While you can buy pre-made dowels, making your own allows for many size and species options that may not be available commercially. I chose beech for our burger because it is strong and will take color well. All you need is some squared up stock, a router table, and a selection of round over bits.

Prepare dowel stocks of 3/4", 5/8", 1/2", 3/8", and 1/4" square from straight grained stock that is clear of knots and defects. They should be a little longer than half the

width of your router tabletop. For best results they need to be as accurate as possible in dimension to match the router bits.

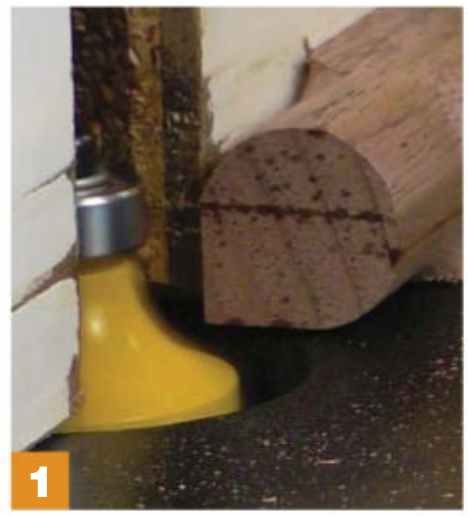
To make them round from square stock take four cuts with a quarter round router bit, one pass along each edge of the stick. It is easy, but there are a couple of tricks to be safe and get the best results.

Starting with a 3/8" bit in the router table, position the fence face even with the bearing and raise the bit until the bottom of the radius is flush with the table. You need to take the full quarter round cut the bit can make. Check the set up by cutting just the first 1/2" or so of the 3/4" stick. The end should be perfectly round. Flat spots on the face mean that the bit is not set right or the stock is too big.

With the router table set properly, you can mill the dowel. Start the cut an inch or two back from the front and stop an inch or two before the end. These square ends prevent the stock from rolling as you cut, which can be dangerous, and allows you to hold the dowels away from the cutter. Push blocks can be very useful here, but the ends still need to stay square.

Make the larger dowels first. They are easier to manage while learning and can be re-cut to smaller dowels if needed. If the small stock flexes away from the bit as the middle is cut just take another pass to clean it up. Keep your fingers at the ends only.

Finally, cut all the dowels to length according to the cut list, and ease over one end of each dowel. Because these are short pieces, I find a hand saw and sanding block ideal for cutting and sanding them quickly and safely.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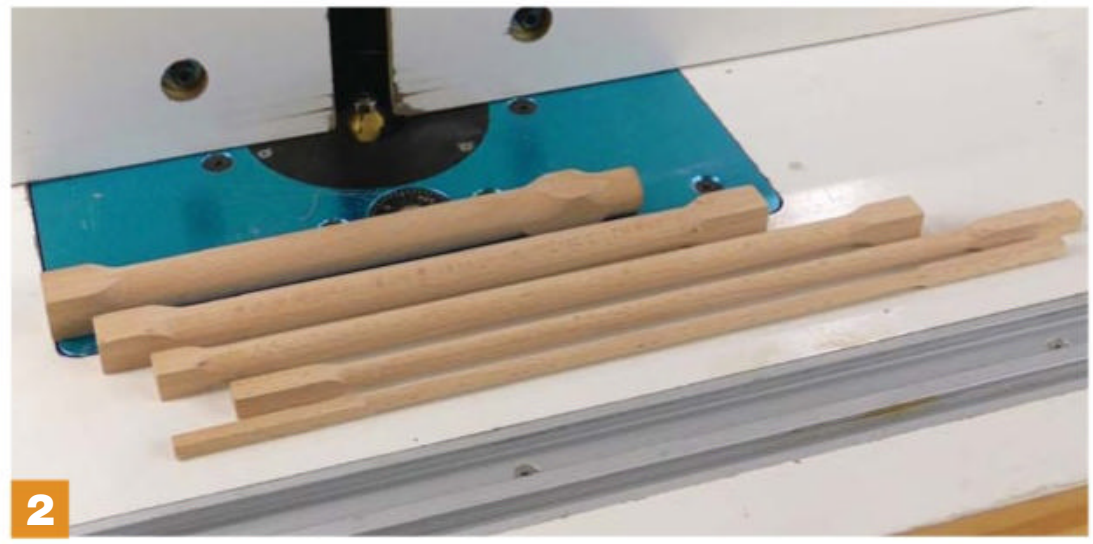
1 A properly set up round over bit in the router table can make perfect dowels from square stock.

2 Each size round over bit creates a different diameter dowel.

3 A hand miter box allows for very precise cuts.

4 Buying pre-milled stock means you can make this project in most any shop.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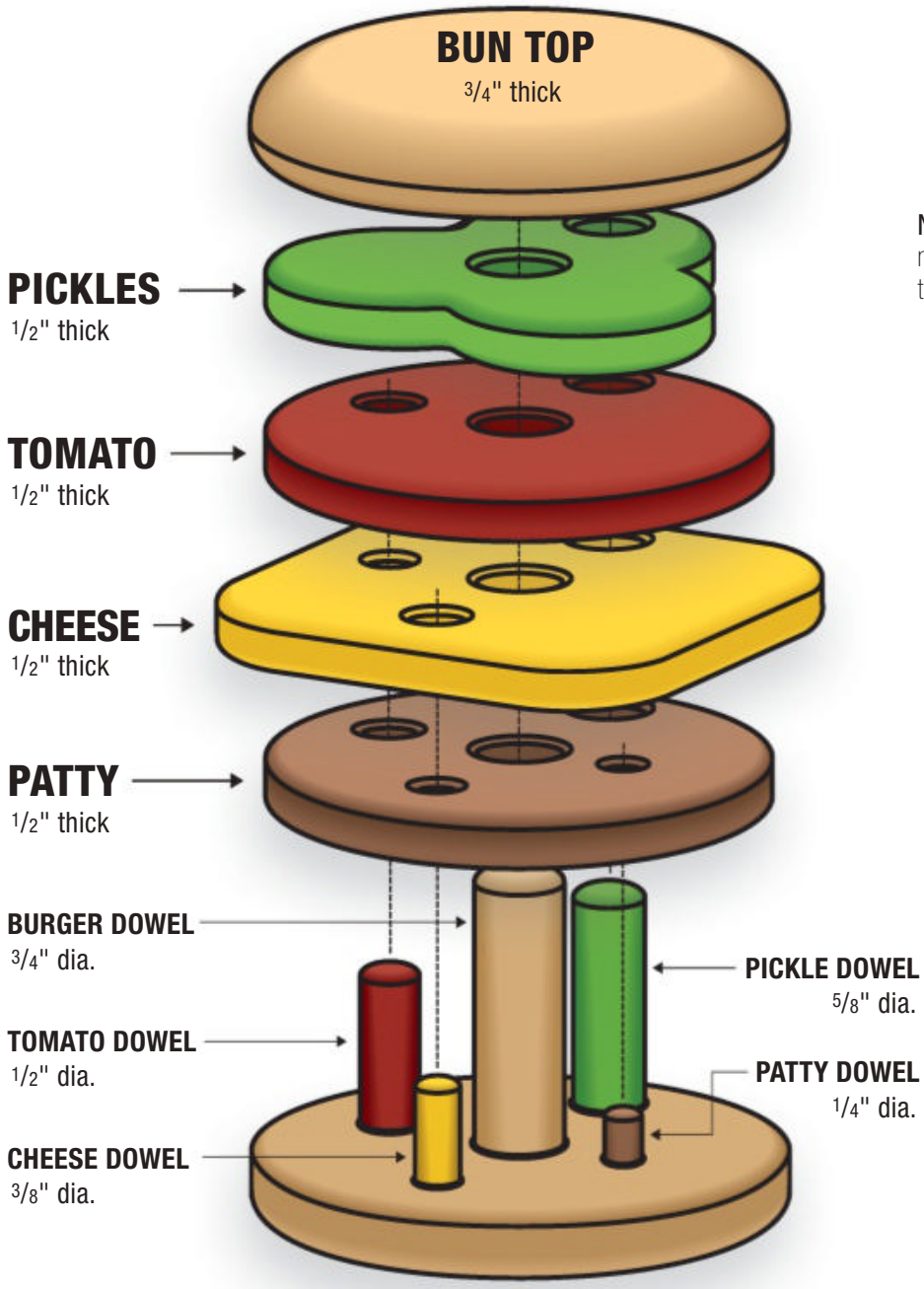
Preparing the Stock

If you have the equipment, you can, of course, prepare your own stock as needed for our burger toy. But the plan was designed to use commonly available stock. In fact, if you buy the dowels needed, this entire project can be made using only hand tools. Home centers and woodworking and craft stores carry poplar in "craft" or "hobby" sizes that only need to be crosscut to begin this project. Choose light tan pieces so they can be dyed the colors we want.

The bun halves are made from 3/4" thick stock and the inside parts from 1/2". Prepare all your stock to 3 1/2" square. You'll need two at 3/4" thick and four at 1/2" thick for each burger toy you want to make.

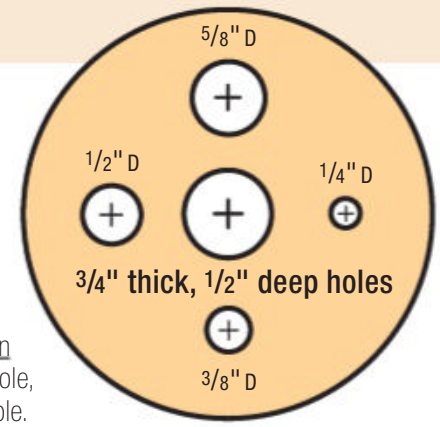
Print out the templates at 1:1 on your printer. I have included a ruler to verify the print size. Cut the templates into their individual squares, then paste them onto the stock pieces. Paste each label onto the appropriate thickness of stock.

Stacking Burger Toy



BUN BOTTOM

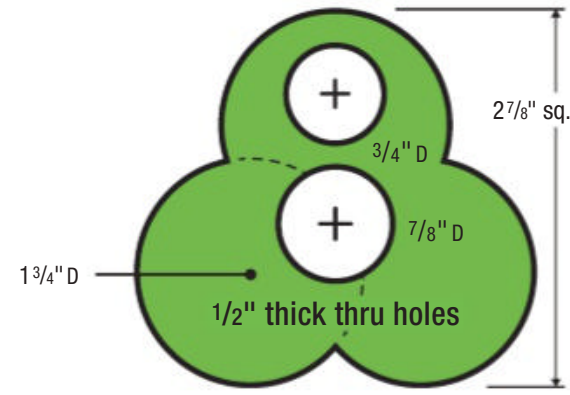
3/4" thick



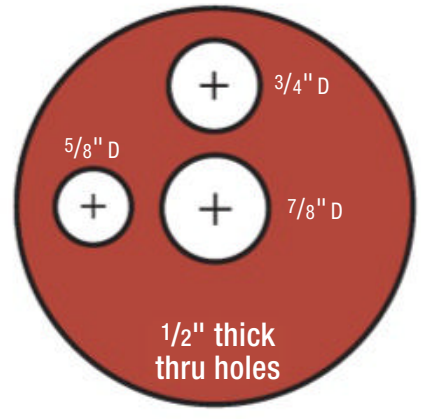
NOTE: Top Bun needs just 1 hole, the 3/4" dia. hole.

BURGER BUNS

3 1/2" dia.



PICKLES



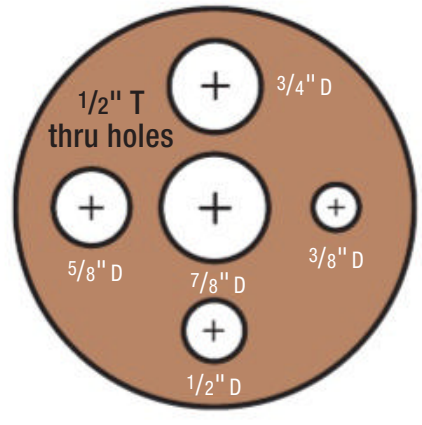
TOMATO

3 1/4" dia.

For full size templates, visit *PopularWoodworking.com*

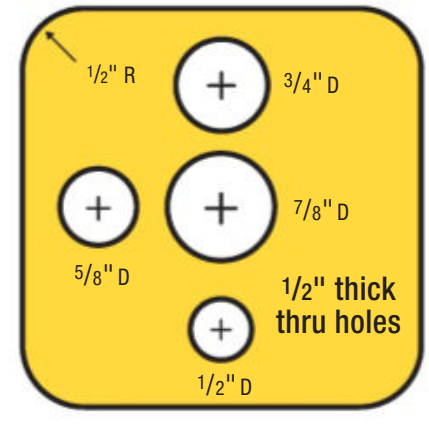
Cutlist

No.	Items	Dimensions (inches) T	W	L
2	**A** Burger buns	3/4	3 1/2	3 1/2
1	**B** Burger contents	1/2	3 1/2	3 1/2
2	**C** Dowel: *bun*	3/4	3/4	3
2	**D** Dowel: *burger*	5/8	5/8	2 1/2
1	**E** Dowel: *cheese*	1/2	1/2	2
1	**F** Dowel: *tomato*	3/8	3/8	1 1/2
2	**G** Dowel: *pickle*	1/4	1/4	1



BURGER PATTY

3 1/4" dia.



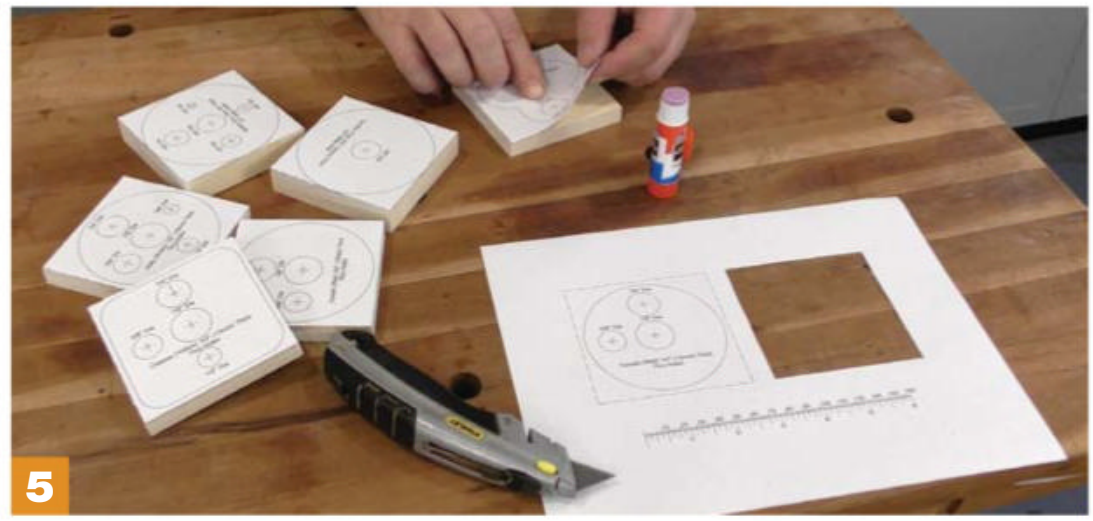
CHEESE

3 1/4" sq.

Drilling the Holes

Drilling all the parts is the key to this project. The holes all line up on the templates but note that the holes in the bottom bun are the same diameter as your dowels while the holes in the other parts are 1/8" larger. Also, while the 1/2" thick inner parts are drilled through, the bun top and bottom holes are only drilled 1/2" deep. The templates are fully marked and using the following sequence of steps helps.

Every piece needs to be drilled with a center hole even though all the holes are not the same. Set your drill press fence and stop for the center hole and drill a 1/2" deep hole in the bottom bun using a 3/4" Forstner bit. Then switch to a 7/8" bit and drill through all four of the 1/2" thick parts just like the bottom bun. Set the top bun aside as it only gets this first hole.



Reset your drill press fence to align with the 5/8" hole in the bottom bun template. Use a 5/8" Forstner bit and drill the bottom bun to 1/2" deep. Just like before, switch to a 3/4" Forstner bit and drill through all four inside sections. Set the pickle section aside; it is done with drilling. Work your way through the rest of the hole locations from the largest to smallest in this same fashion.

5 Pasting the templates onto your stock helps ensure the hole patterns get drilled properly in each part.

6 Drilling all the parts before cutting them to size and shape means fewer set ups at the drill press.

7-9 The various sized holes, when drilled accurately, will end up lining up. These series of holes will only allow the burger to go together in the correct order.

Shaping the Parts

We are making a toy hamburger; perfection is not required. Trim the parts to the outlines on the templates using a bandsaw, scroll saw, or even a coping saw. Once cut to shape, the edges will need to be sanded smooth. There should be no sharp point left to catch little fingers.

The edges of all the sections need to be rounded over. The bun top gets a 1/2" radius round over at the top edge. It is a small part and a big cut, so cut it in a couple of steps using a start pin and a push block to hold the part safely. The bottom edge of the bun gets a 1/4" radius. Cut all the rest with a 1/8" roundover bit. Round over all the hole edges as well, except the holes in the bun bottom.

With all the parts shaped and edges eased, give each part a thorough finish sanding on all faces, edges, and holes using whatever methods you have available. Everything must be smooth to the touch so no one gets scratched when playing and learning.

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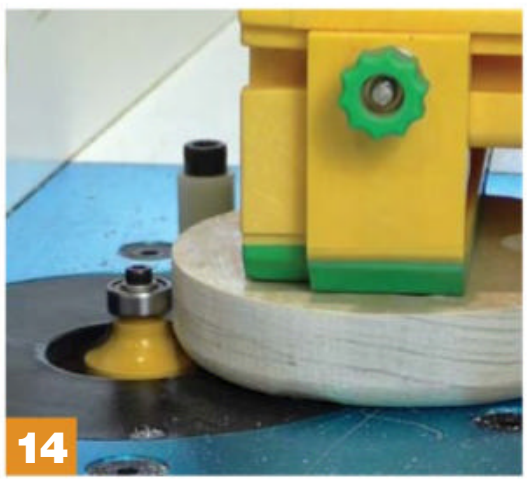
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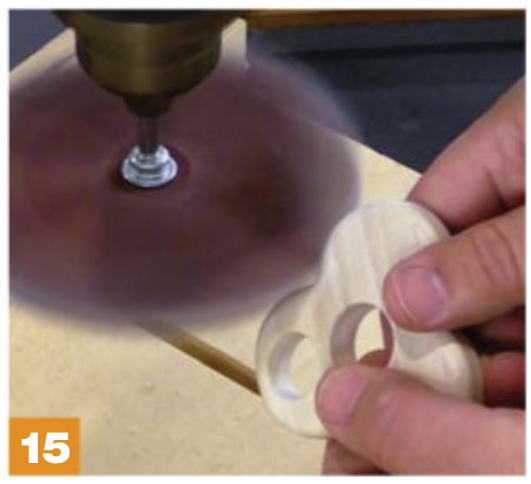
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Coloring the Sections

We want the color and finish for this project to be safe for children, so we will be using food coloring as our dye. Food coloring is inexpensive, easy to get, and easy to use. Just make sure to get the colors you need: dark brown for the patty, yellow for the cheese, red for the tomato, and green for the pickles.

The ratio of food coloring to water will vary by brand, so you will want to test your colors before dying the parts. Mix some food coloring into warm water and test the color on some of the scraps cut off during the shaping before dying your actual parts. Keep adding food coloring into the water until your test pieces look the way you like.

Color the dowels to match the sections if you like. The dowel color should match the last piece the dowel goes into, so the 3/4" dowel is the same color as the buns, the 5/8" dowel is green, etc.

You can leave the buns without color or try a light brown dye. The patty needed brown with some black to get the color I desired. Once satisfied with the colors, dip

10 If your shop does not have a band saw, these parts can be cut nearly as quickly with a coping saw.

11 A small radius or chamfer on all the holes make the parts assemble easily in little hands.

12-15 Sanding the parts smooth and rounding over the edges give the parts a soft, finished feel. The parts don't need to be perfectly symmetrical, as it's a burger after all!

16 Food dye is a chemical-free way to color your parts.

17 The only real assembly is gluing the dowels into the bottom bun.

18 Mineral oil is a great, food safe layer of protection.

the parts into the dyes and use a brush to get the parts completely colored. Set them aside on wax paper to let them dry completely.

Sand all the parts thoroughly again; the water will have raised the grain. Then stain them all again, let them dry, and lightly sand everything one more time.

Glue Dowels

Test the fit of each dowel with the holes in the bun bottom. There may well have been some swelling as the parts were dyed and some sanding may be needed at the bottom of the dowels. Glue each of the dowels into its proper hole in the bun bottom and wipe off any excess glue around them. Water resistant glue is best for this project since it is likely to be cleaned on a regular basis.

Finishing

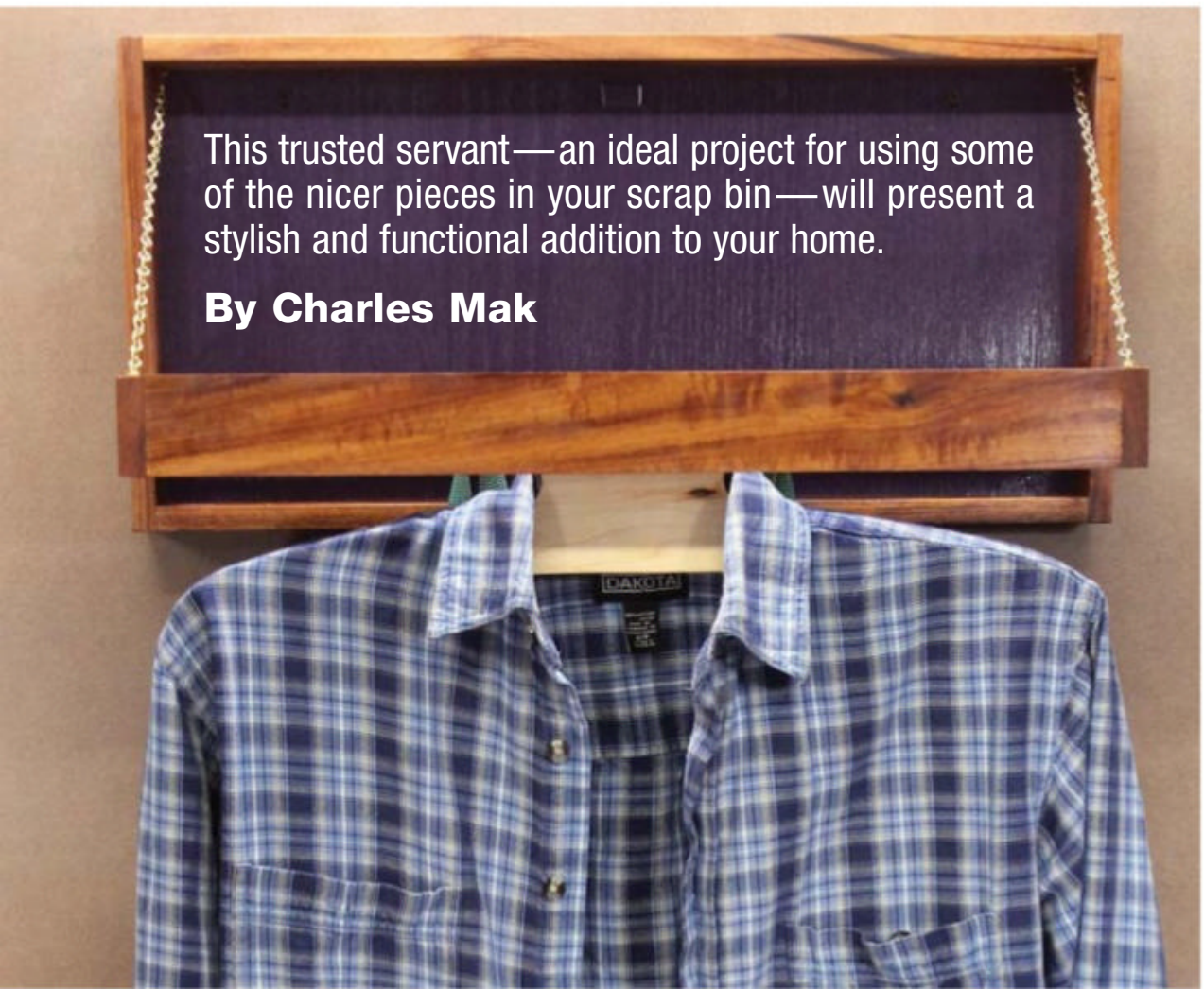
Wipe a generous coating of mineral oil onto the parts. It is food safe and will soak deep into the parts for long lasting protection. Before beginning, crinkle up a sheet of aluminum foil, then partially smooth it out again. This is where the parts will sit as the mineral oil soaks in. The wrinkles in the foil act like tiny painter's points and lets air circulate under them. Use a brush to coat all surfaces, especially inside the holes. Let the oil absorb into the wood for a half hour, then apply another coat, wiping off any excess after about 15 minutes. Let dry for 24 hours.

This fun toy will help teach the kids in your life some valuable skills while providing plenty of entertainment. And hopefully you have learned a few things as well.

PW – *Ralph Bagnall*

A Stylish Folding Wall-Mounted Valet

PHOTOS BY THE AUTHOR



This trusted servant—an ideal project for using some of the nicer pieces in your scrap bin—will present a stylish and functional addition to your home.

By Charles Mak

PROJECT #2320

Skill Level: Beginner
Time: 2 Days
Cost: $65

A long-time admirer of Tage Frid's work, I have an attraction to Danish furniture style and design. So, when I came across some pictures in the public domain of an antique valet made in the 60s by Adam Hoff and Paul Ostergaard for Virum Mobelsnedkeri, Denmark, I knew I wanted one for my shop to handle my work clothes and aprons. Unlike the usual run-of-the-mill valets with a large footprint, this eye-catching piece — with a price tag of over $1,000 — is wall-mounted and has a folding feature that allows it to be closed when not in use. The smaller footprint fits the bill for my modest workshop.

Working from the photos, I set out to build a similar valet for my shop. While retaining the original dimensions of the piece, I made a few minor cosmetic changes to the original design. They included using two species of wood rather than one for a contrasting look and replacing the leather straps with maintenance-free chains. I used lumber (tiger wood and maple) leftover from previous projects and found the chains at a big box hardware store.

Choose Your Joinery

The folding valet is essentially two rectangular frames hinged together, with the inner, smaller one fitted with a coat hanger and pegs. Let's break down this project into two main components: the outer frame and the inner frame. You can use any joinery of your choice such as dovetail, dowel, or finger joints for the frames. I like to use the loose-tenon joint to build things used in my shop because I find it quick-and-easy to accomplish with the Domino Joiner.

Domino Machine Settings

For the thickness of stock used in this project (9/16" or about 14mm), 5x30mm tenons are recommended.

1

Throughout the whole project, the 5mm cutter is used with the narrow width and 7mm fence height settings. The cutting depth for mortising the sides is set at 12mm, while the depth for milling the top and bottom pieces is set at 18mm.

Outer Frame

To minimize blow-out mistakes, I always try to finish the components that have the shallower mortises first. That means for both frames, we will first mill the 12mm deep mortises on the side pieces, then change the cutting depth to 18mm to mill the top and bottom. I'll explain later how you can cut mortises 18mm deep, even though the machine has a 20mm cutting depth setting.

Gather the workpieces for the outer frame and mark out the placement lines as usual. However, if you install the support bracket to the machine, you don't need the placement lines and you can mortise the two sides, referencing the work with the bracket's paddles. After finishing the mortises, cut a 1/4" x 5/8" stopped rabbet on each side piece with a 1/4" straight bit on the router table.

1 The fence height is set at 7mm for the whole project, with the starting plunge depth at 12mm.

2 Mark out the stopped rabbet clearly so you don't cut a through rabbet by mistake.

3 Make multiple passes with a 1/4" router bit instead of one heavy cut to mill the rabbet.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4 To reduce the cutting depth from 20mm to 18mm, insert a 10 mm sleeve on the rail.

5 With the sleeve installed, double check the plunge depth.

6 The back panel is to be housed in rabbets cut on the outer frame.

7 The trim stop allows the machine to mill center mortises precisely without marking placement lines.

7

The Domino machine I use has five cutting depths, including 20mm. To mortise the top and bottom pieces at a depth of 18mm, I used a special plunge cut technique. First, set the cutting depth to 20mm, and then insert a 10mm long sleeve over the steel linear rail to reduce the actual plunge depth by 2mm. The formula to determine the length of the sleeve required is straightforward: length of sleeve = 28mm – the desired cutting depth.

After the mortising operation, cut a 1/4" x 5/8" through rabbet on the top and bottom pieces on the router table.

Inner Frame

The inner frame is made slightly smaller than the outer frame. The amount of clearance I chose on each side, as well as the bottom, is about 1/8", while the amount of clearance on the top is roughly 5/16". Mortise the inner frame with the same settings and procedures employed for the outer frame. If you use the machine with the trim stop, it will eliminate the need for the marking pencil lines. With the two frames constructed, we can now work on hinging the frames together.

Hinge Frames Together

The inner frame is connected to the outer frame with a 3/8" diameter dowel on each side. To locate the dowel holes on the sides, I made a copy of the side piece of the inner frame out of cardboard, and through trial and error, figured out the center points for the dowel holes on the outer frame. Using the marking on the cardboard, I transferred the center points to the inner frame. Now, chuck a 3/8" diameter brad point bit in the drill press and bore the holes on all the side pieces. Lastly, dry-assemble the two frames and insert the dowels and washers to connect them together. Check

8 Mock-ups are helpful in solving design or placement challenges.

9 The center points on the outer side and inner side are offset by 1/8", the clearance amount between the bottoms of the frames.

10 Use a stop block on the drill press fence to guide the drilling.

the swinging movement, looking for an even spacing on the sides between the frames.

Make the Coat Hanger

The coat hanger and pegs provide the hanging elements for the valet. Lay out the coat hanger pattern on the maple stock. You can easily adapt the hanger design to suit your needs. For a cleaner result, I did the straight cuts on the table saw and finished the stopped cuts with a bandsaw.

The coat hanger is doweled to the center of the sides and about 2 1/2" from the underside of the top of the inner frame. To drill the dowel holes on the hanger, mark the center points on the ends, and drill the holes 3/4" deep with a 3/8" diameter bit. Cut two 3/8" diameter by 1 3/8" long dowels and glue them in the holes just bored in the hanger. (Alternatively, if you have a tenon cutter, you can cut round

11 Lay out your coat hanger pattern on the maple blank.

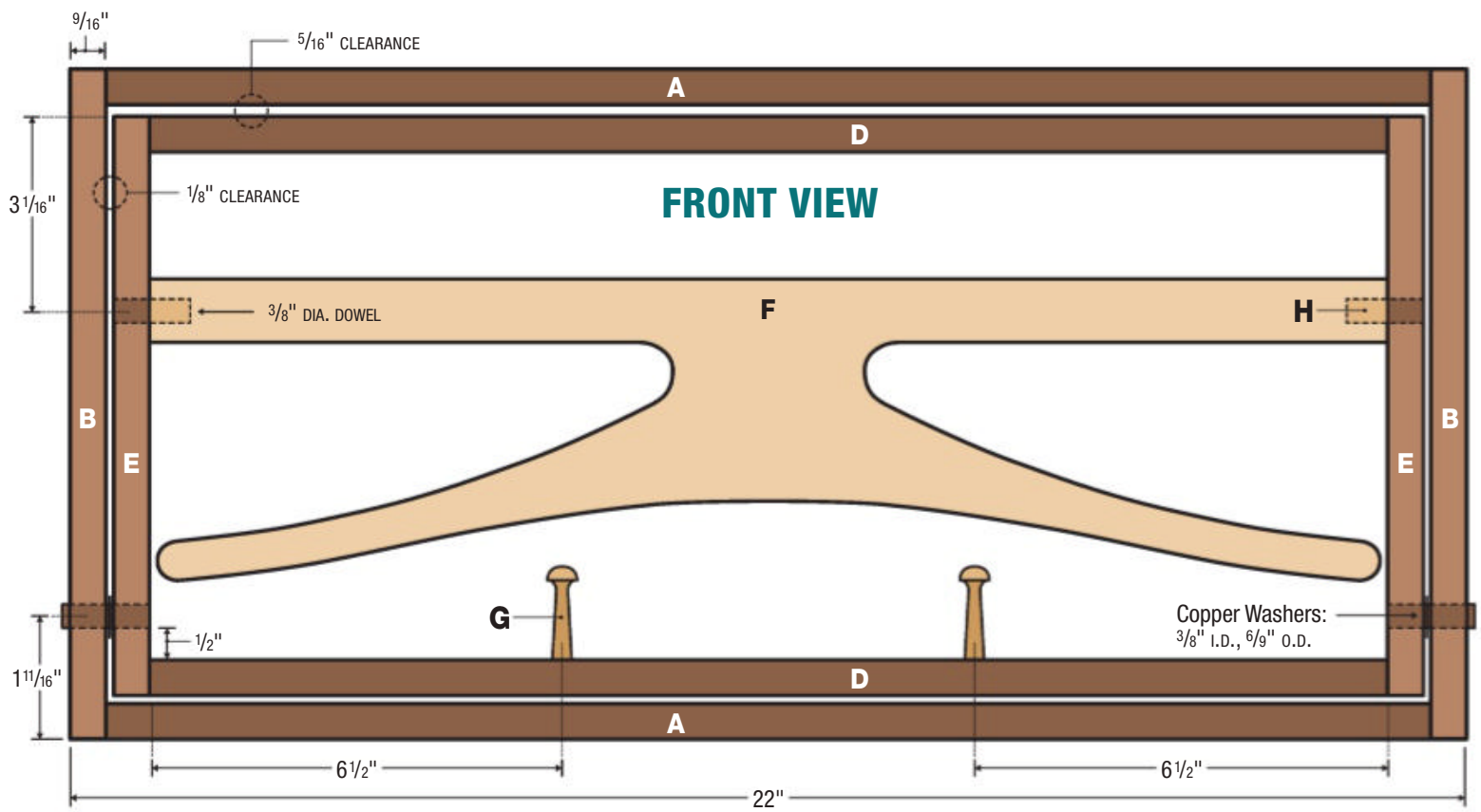
12 Make the stopped cuts for the hanger on the table saw and finish them with a bandsaw.

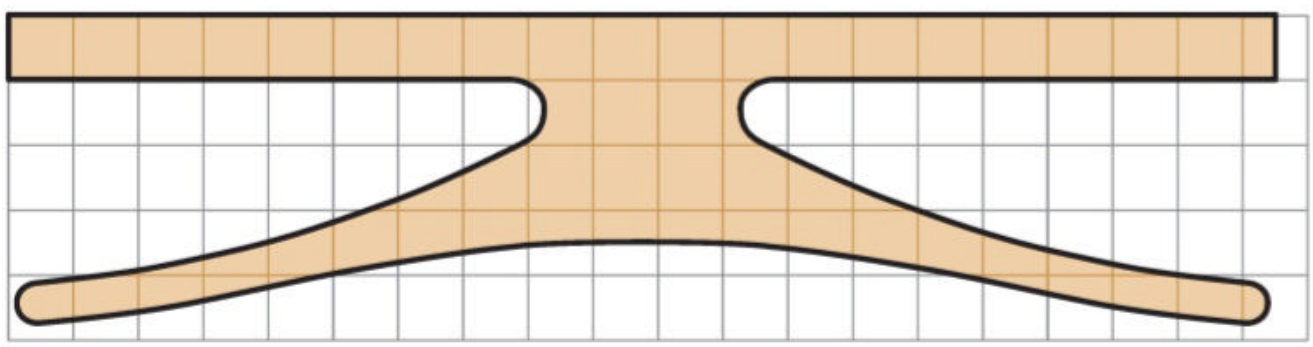
tenons on the hanger, but the hanger will need to be 9/16" wider.)

We all learn to draw one line and bandsaw on the waste side of the line. But some people may struggle with following a cut line and staying on the waste side of the line at the same time. Try the trick of marking two parallel lines, about 1/16" apart, and using the white space between the lines to guide your cuts when you saw the hanger to shape. Lastly, finish the concave curve with a spokeshave and sand the rest smooth on a spindle sander.

13 Mark two lines and shoot between them, making it less likely to drift past the waste line.

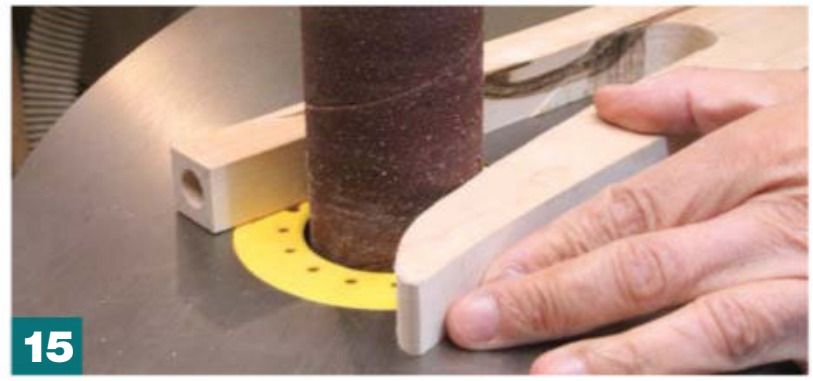
Folding Wall-Mounted Valet





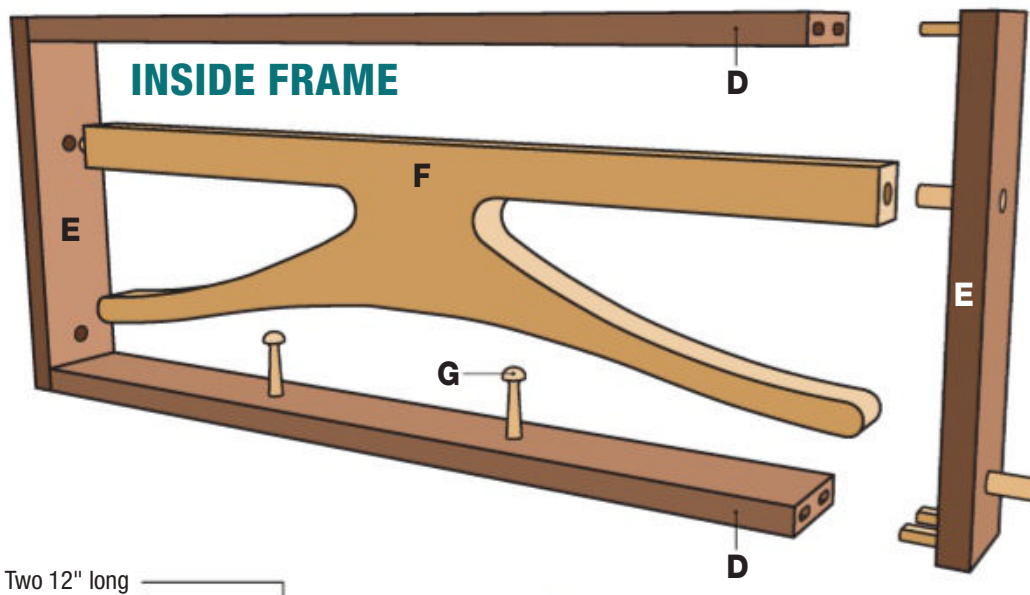
COAT HANGER
FRONT VIEW

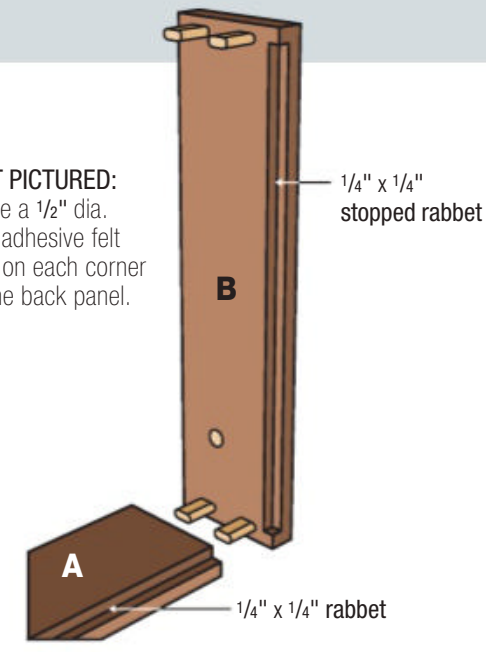
1 square = 1"



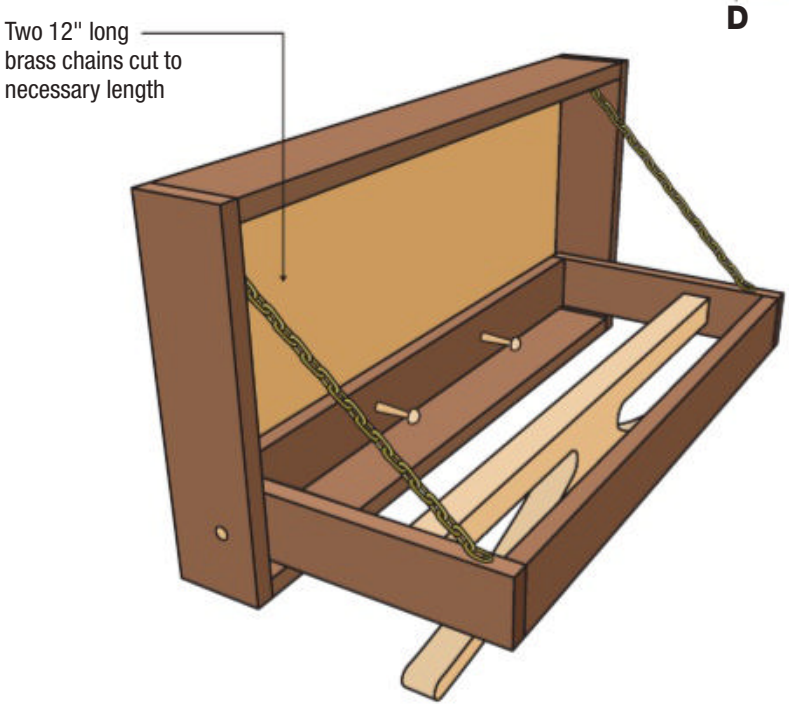
14 The spokeshave is the ideal tool to produce a clean curve on the hanger.

15 Use sanding spindles to remove the saw marks and sand to the line.





OUTER FRAME
BACK VIEW



Cutlist

No.	Items	Dimensions (inches) T	W	L
2	**A** Outer frame: *top & bottom*	9/16	2 5/8	20 7/8
2	**B** Outer frame: *sides*	9/16	2 5/8	10 9/16
1	**C** Outer frame: *back panel*	3/8	9 15/16	21 3/8
2	**D** Inner frame: *top & bottom*	9/16	2	19 1/2
2	**E** Inner frame: *sides*	9/16	2	9 1/8
1	**F** Coat hanger	1	4 3/4	19 1/2
2	**G** Shaker Pegs	1/2	1/2	1 3/4
4	**H** Dowels	3/8	3/8	1 3/8
1	**I** Small block	1/4	1/2	1

Frames are *tiger wood*. Coat hanger and pegs are *maple*.

16 Run a centerline down the hanger for the self-centering drilling guide.

17 Use a drilling guide to bore the center hole 3/4" deep on the hanger with a 3/8" diameter bit.

18 Glue a dowel or make a round tenon using a tenon cutter to work as the hinge.

To drill the mating dowel holes on the inner frame for the coat hanger, mark the center point, 3 1/16" from the top edge on each side piece. Install a 3/8" diameter drill bit on the drill press and bore the holes. Lastly, locate the center points for the two pegs, about 6 1/2" apart, on the bottom piece of the inner frame, and drill two 1/4" diameter, 1/4" deep stopped holes.

Sand & Dry Fit All Pieces

With all the main components made, it is time for some light sanding. Also, ease all the sharp edges and finish all the small tasks that demonstrate your workmanship, such as trimming all the dowels, and planing flush all mating surfaces. When satisfied, send the piece to the finishing room.

19 Sand flat surfaces up to 220-grit with a random orbital sander.

20 To prevent rounding the edges, support the sanding block with a square stop underneath.

21 Plane all mating joints flush or tape off the adjacent edge to avoid cross marks if using a sanding block.

Apply Finish & Assemble

It is a little easier to pre-finish the components before the valet is glued up. Give each component a few coats of the desired finish, with light sanding between coats. The valet isn't a high-wear project, but wanted to keep it looking good. I applied three coats of varnish, giving protection and bringing out the beauty of the tiger wood. After the finish is dried, first glue up the inner frame with the coat hanger and pegs in place. Then complete the outer frame with the inner frame in position and let the glue dry. By pre-finishing the parts, and glue squeeze-out should clean up easily once the glue is dry.

Attach the Chains

Leather straps tend to wrinkle and sag over time, requiring maintenance and adjustments (not to mention that they can dry out and crack if you don't condition them). As an alternative, I used a brass chain to hold the inner frame.

With the valet temporarily mounted in an upright position, swing the inner frame down, and hold it level or slightly above level to measure the required length of the chains. Cut the chains to length, predrill screw holes on the inner frame, and install the chains with the brass screws. A good trick to avoid breaking brass screws is to first install a steel screw in place to "cut threads" in the hole before installing the brass screw.

22 Tape off the dowels and holes to keep oil finish from them.

23 Check diagonals to ensure the glue-up is square.

24-25 Cards are used as spacers to keep the even spacing between the frames in the final clamping stage.

Install the Back

Cut a 3/8" plywood sheet to size to form the back and glue a small block on the inside face of the panel in line with the top piece of the inner frame as a rest block. Lastly, drill two properly spaced mounting holes on the back and spray paint the back panel with a color of your choice. Once the paint is dried, screw or nail the back to the rebated outer frame and attach a felt pad on each corner. Now, mount your masterpiece at a spot in the shop where your visitors won't fail to notice it when they enter your sanctuary! **PW** – *Charles Mak*

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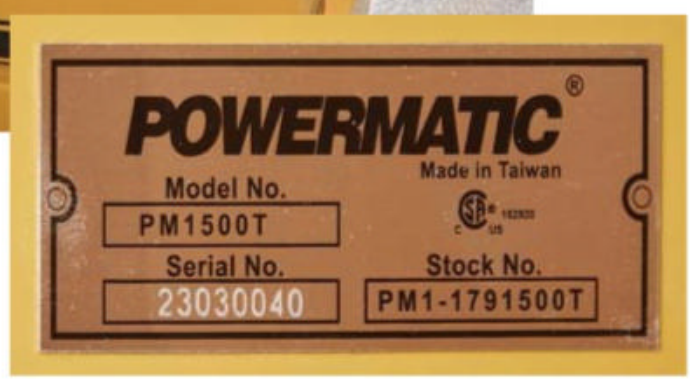
Powermatic's ARMORGLIDE

By Logan Wittmer

A look at Powermatic's latest innovation—*ArmorGlide*, a low-friction coating.



At AWFS in Las Vegas, *Powermatic* unveiled their latest innovation — a coating on the tables of their core woodworking tools. They've labeled this coating their *ArmorGlide* Technology. Now, I've been aware of this upcoming release for several months prior to the show. In fact, we had one of the first PM1500T bandsaws shipped to our shop to try and put *ArmorGlide* through the paces. When I visited the *Powermatic* office earlier this year, there was a buzz around the place and you could tell they were excited about the possibility of this new coating. We wanted to see if it met our expectations as well. You'll get our opinions in a bit.

What Is ArmorGlide?

To lay the playing field—the photo to the left is of the PM1500T we got in for testing. It's identical in every way to the PM1500, with the exception of the *ArmorGlide* coated table. So that begs the question, what is *ArmorGlide*? In a nutshell, *ArmorGlide* is a type of PTFE (polytetrafluoroethylene) coating that is applied to the cast iron table. Currently, *ArmorGlide* is available on bandsaws, several jointers, and the table saws produced by *Powermatic*. The idea behind *ArmorGlide* is simple: to reduce friction and add a layer of protection to the table. It sounds so simple and obvious, so why hasn't anyone produced a coating like this on their tables before?

The Complex Problem of PTFE Coating

As it turns out, getting a PTFE coating onto a cast iron surface is a bit trickier than it sounds. As cast iron tables (for any tool) are produced, they're first cast at a foundry. These castings need to be milled to the flatness tolerances that we expect from a company such as *Powermatic*. After the flattening process, they are ready to be coated. Here's where some of the issue comes in—and it's actually more of a logistical issue than anything. The large, heavy tables need to be shipped to a facility where they can be prepared (without distorting the tables), primed, coated, and cured (again, all without distorting the table). It's not an impossible task, but it is a series of processes that require extra effort. And, in this day and age, it's refreshing to see a company take those extra steps to produce a product that they believe to be superior, for the customer's sake.

PHOTOS BY LOGAN WITTMER

1


2

Why ArmorGlide?

As I mentioned before, *ArmorGlide* helps reduce friction and add a layer of protection to the cast iron table. This is beneficial for several reasons. First, any time you can reduce friction, the work that you're doing requires less effort on your part. Sure, on a bandsaw it's not that noticeable. But try and face-joint a long piece of 10"-wide hardwood. The odds are that you'll notice that the wood slides much more easily across the surface.

The secondary benefit of *ArmorGlide* is the protection that it adds to the surface. How many times have you seen a rust ring on a table saw wing or jointer bed left by an errant drink can sat down and forgot about? Or the humid summers start a bloom of fine rust on every metal surface. As an avid turner, the bane of my existence is cutting green wood at the bandsaw. Numerous times, I've cut a wet blank on the bandsaw only to come back the next morning to a layer of rust. This is not the case with *Armorglide*.


3

1 The protection from *ArmorGlide* keeps the table free from rust, whether it's a splash of coffee or a piece of wet wood.

2 A newly designed miter gauge with a POM (polyoxymethylene) bottom avoids metal-on-metal contact.

3 The matte-black surface has noticeably less glare than a cast iron table, which leads to less eye-strain.

Our Observations

At the time of this publishing, I've ran a lot of lumber through the PM1500T. I'm on the third blade on the saw, most of it being resawing alder for the paneling in our shop. I have to say, I'm impressed. *Powermatic* has samples of tables with 250,000 passes with no signs of wear, and after my four months of using the *ArmorGlide* table, I believe it. Would dragging metal across the surface scratch it? Maybe, though—nothing I've seen would indicate that it would. I've also been pleasantly surprised by how much I like the matte black surface of *ArmorGlide*. There's much less glare than from a cast iron surface, especially where the saw sits in our shop—close to the bright window.

I'll certainly be interested to see how *ArmorGlide* stands up to years of use (more specifically, abuse in our shop), but if the initial indications are accurate, I expect that PTFE coatings, such as *ArmorGlide*, will become the new standard on woodworking machinery. However, that may take a while, since *Powermatic* has pending patents on this application. In the meantime, I hope (and believe) that *Powermatic* will find success in the industry with *ArmorGlide* and continue to expand their offerings. My plan is to add several additional *ArmorGlide* pieces to the shop. **PW** - ***Logan Wittmer***

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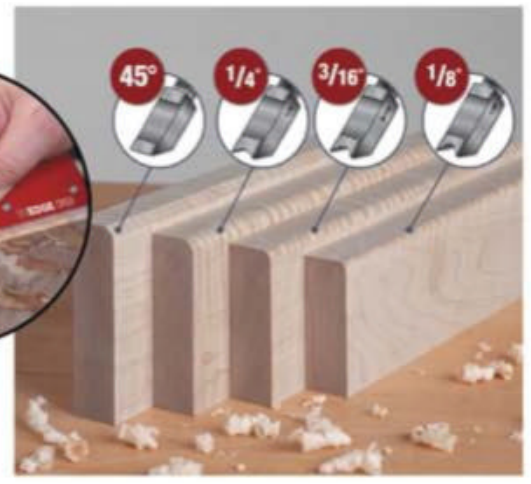

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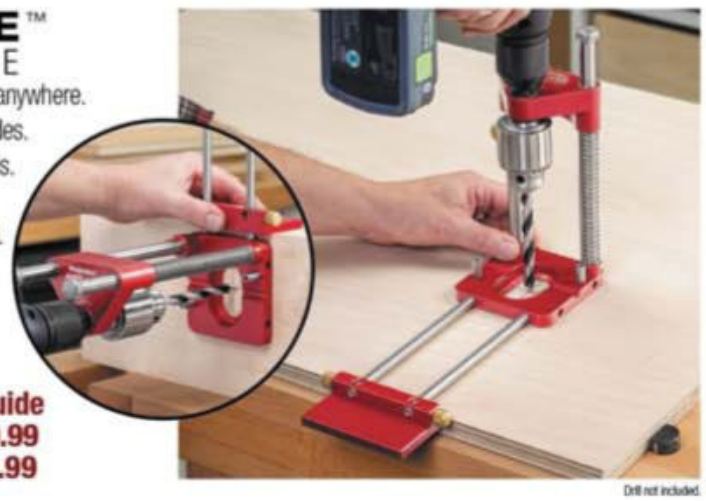

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