CLASSIC DESIGN REVISITED: Lyre-Legged Table

Popular Woodworking

JUNE 2021 | #259

Modern Maker's Workstation

HIGH-TECH DOVETAILS
Cutting Joinery with Shaper Origin

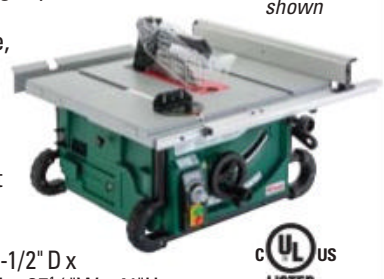
TURNING LARGE PLATTERS
Tips & Techniques for Success

Grizzly Industrial®

PURVEYORS OF FINE MACHINERY® SINCE 1983

Quality Machines, Great Prices!

10" 2 HP BENCHTOP TABLE SAWS



- Motor: 2 HP, 120V, single-phase, 15A
- Table size: 22" x 26⅜"
- Arbor speed: Variable, 2000-4000 RPM
- Blade tilt: Left, 45°;
- Max depth of cut: 3⅛" @ 90°, 2⅛" @ 45°
- Rip capacity: 28" right
- Dado capacity: 13/16"
- Dust port: 2½"
- Overall size: 28" W x 37-1/2" D x 20-1/2" H (G0869); 41½"L x 37½"W x 41"H (G0870)
- Approximate shipping weight: 72 lbs. (G0869); 106 lbs. (G0870)

c UL us LISTED Table Saw 93K7 E98714

MADE IN AN ISO 9001 FACTORY

⚠WARNING! †1

WITH RIVING KNIFE
G0869 ONLY $410.00

$49 SHIPPING

WITH ROLLER STAND
G0870 ONLY $495.00

$125 SHIPPING

10" CABINET TABLE SAW

NEW!

MADE IN AN ISO 9001 FACTORY

- Motor: 3 HP, 220V, single-phase, 13A
- Rip capacity: 36" right, 18" left of blade
- Max. depth of cut @ 90°: 3 3/16"
- Max. depth of cut @ 45°: 2 3/16"
- Table size with extension wings: 48¼" W x 30¾" D
- Distance from front of table to center of blade: 14⅞"
- Floor-to-table height: 35"
- Arbor diameter: ⅝"
- Arbor speed: 4000 RPM
- Footprint: 23" L x 21" W
- Overall dimensions: 75" W x 44" D x 42½" H
- Approximate shipping weight: 587 lbs.

EXTREME SERIES

SA C US 175370

⚠WARNING! †1

G0941 ONLY $1895.00

$249 SHIPPING

22" X 42" VARIABLE-SPEED WOOD LATHE

- Motor: 3 HP, 220V, 3-phase, 8A
- Required power supply: 220V, single-phase, 20A
- Swing over bed: 22"
- Swing over tool rest base (banjo): 18"
- Swing over tool rest: 16"
- Distance between centers: 42"
- 1-1/4" x 8 TPI RH headstock spindle
- MT#2 headstock and tailstock tapers
- Variable-speed: 100-3200 RPM
- Tool rest width: 14"
- Overall dimensions: 81" x W 23" D x 49-1/2" H
- Approximate shipping weight: 584 lbs.

MADE IN AN ISO 9001 FACTORY!

ETL C US 4000909

⚠WARNING! †1

G0766 ONLY $2350.00

$199 SHIPPING

14" RESAW BANDSAW

EXTREME SERIES

- Motor: 1.75 HP, 110V/220V, (prewired 110V), single phase, 15A / 7.5A
- Table size: 16⅛" x 21¾" x 1½"
- Table tilt: 5° left, 45° right
- Floor-to-table height: 44⅝"
- Cutting capacity/throat: 13½"
- Max. cutting height: 12"
- Blade size: 104" to 105" (⅛" to ¾"W)
- Blade speed: 3000 FPM
- Overall size: 26"W x 31"D x 78"H
- Footprint: 16"L x 18"W
- Approximate shipping weight: 337 lbs.

MADE IN AN ISO 9001 FACTORY

SA C US 181721

⚠WARNING! †1

G0555XH ONLY $1225.00

$149 SHIPPING

17" HEAVY-DUTY EXTREME BANDSAWS

EXTREME SERIES

- Motor: 2 HP, 110V/220V (prewired 220V), single-phase, 19A/9.5A
- Table size: 23⅝" x 17¼" x 1½"
- Table tilt: 5° left, 45° right
- Max. cutting height: 12"
- Blade size: 131½" L (⅛"–1" W)
- Blade speeds: 1700 & 3500 FPM
- Overall size: 32" W x 32" D x 73" H
- Approx. shipping weight: 418 lbs. *(G0513X2)*

MADE IN AN ISO 9001 FACTORY!

SA C US 181721

⚠WARNING! †1

WITH CAST-IRON WHEELS
G0513X2 ONLY $1370.00

$149 SHIPPING

3 HP SHAPER

- Maximum cutter height: 2-1/2"
- Maximum cutter diameter: 5-1/2"
- Spindle diameters: 1/2", 3/4", 1"
- Spindle lengths: 2-3/4", 3", 3-1/2"
- Spindle capacity under nut: 2", 2-1/4", 2-1/2"
- Spindle speeds: 7000 & 10,000 RPM
- Spindle travel: 3"
- Spindle openings: 1-1/2", 3", 4", 7"
- Table counterbore: 7" dia. x 5/8" deep
- Table size: 28-1/4" x 30-1/2"
- Floor-to-table height: 34"
- Footprint: 21" x 23-1/2"
- Overall dimensions: 30" W x 30-1/2" D x 39-1/2" H
- Approx. shipping weight: 392 lbs.

SA C US 177335

⚠WARNING! †1

G1026 ONLY $1400.00

$149 SHIPPING

6" JOINTERS WITH CABINET STAND

- Motor: 1 HP, 110V/220V, single-phase, 14A/7A
- Prewired voltage: 110V
- Table size: 47⅜" x 6⅝"
- Table type: precision ground cast iron
- Table adjustment: dovetailed ways
- Cutterhead diameter: 2½"
- Max depth of cut: ⅛"
- Fence size: 4" x 29⅛"
- Approx. shipping
- Weight: 260 lbs.

FREE PAIR OF SAFETY PUSH BLOCKS

⚠WARNING! †1

WITH STRAIGHT KNIVES
G0814 ONLY $825.00

WITH V-HELICAL CUTTERHEAD
G0814X ONLY $1250.00

$125 SHIPPING

6" X 48" BELT/9" DISC COMBO SANDER W/ CABINET STAND

- Motor: 3/4 HP, 110V/220V (prewired for 110V), single-phase, 12A/6A
- Sanding belt size: 6" x 48"
- Sanding belt speed: 2300 FPM
- Platen size: 6-1/4" x 17"
- Belt sanding head tilt: 0–90°
- Sanding disc diameter: 9"
- Sanding disc speed: 2450 RPM
- Sanding disc type: PSA
- Disc sanding table size: 6" W x 12-1/4" L
- Disc sanding table tilt: 0°–45°
- Dust port sizes: 2" and 2-1/2"
- Footprint: 15" x 16-1/2"
- Overall size: 30" W x 24" D x 56" H
- Approximate shipping weight: 158 lbs.

⚠WARNING! †1

G1014ZX ONLY $520.00

$125 SHIPPING

18" 1½ HP OPEN-END DRUM SANDER

- Motor: 1½ HP, 120V, single-phase, 13A
- Drum surface speed: 2600 FPM and 3400 FPM
- Conveyor feed rate: variable, 0-12 FPM
- Maximum stock dimensions: 36"W x 4½"H
- Minimum board length: 6"
- Minimum board thickness: ⅛"
- Sanding drum size: 4"
- Dust collection port: 4"
- Overall size: 35½" W x 22½" D x 50" H
- Approximate shipping weight: 235 lbs.

ETL C US Intertek 3092372

⚠WARNING! †1

G0458Z ONLY $945.00

$149 SHIPPING

***To maintain machine warranty, 440V operation requires additional conversion time and a $250 fee. Please contact technical service for complete information before ordering.**

1-800-523-4777

TECHNICAL SERVICE: 570-546-9663

⚠**WARNING! †1** : Cancer & Reproductive Harm

Some products we sell can expose you to chemicals known to the State of California to cause cancer and/or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov/product

21742

- Almost a million square feet packed to the rafters with machinery & tools
- 2 Overseas quality control offices staffed with qualified Grizzly engineers
- Huge parts facility with over 1 million parts in stock at all times
- Trained service technicians at both locations
- Most orders ship the same day

FREE 2021 CATALOG

OVER 736 PAGES OF HIGH QUALITY MACHINES & TOOLS AT INCREDIBLE PRICES

12" VARIABLE-SPEED BENCHTOP DRILL PRESS W/ LASER & DRO

MADE IN AN ISO 9001 FACTORY

- Motor: 1/3 HP, 120V, single-phase, 5.1A
- Swing: 12"
- Spindle taper: MT#2
- Spindle travel: 3-1/2"
- Spindle speeds: Variable, 400 - 2700 RPM
- Drill chuck: 1/32" - 5/8", JT3, keyless
- Drilling capacity: 5/8" mild steel
- Max. distance from spindle to table: 13-1/4"
- Table dimensions: 9-5/8" x 9-5/8"
- Table tilt: 45° left/right
- Table swivel around column: 360°
- T-slots: (x4) 1/2", X pattern
- Overall dimensions: 13" W x 22" D x 36" H
- Approx. shipping weight: 93 lbs.

⚠WARNING! †[1]

T31739 ONLY $394.95 $125 SHIPPING

14" FLOOR DRILL PRESS W/ LASER & DRO

- Motor: 3/4 HP, 110V, single-phase, 9A
- Swing: 14"
- Drill chuck: 1/64"-5/8"
- Drilling capacity: 3/4" steel
- Spindle travel: 3-1/4"
- Spindle taper: MT#2
- Number of speeds: 12 (140, 260, 320, 380, 480, 540, 980, 1160, 1510, 1650, 2180, and 3050 RPM)
- Precision-ground cast iron table
- Table size: 11-3/8" x 11-3/8"
- Table swing: 360°
- Table tilt: 90 degrees left and right
- T-slot width: 5/8"
- Footprint: 18" x 11"
- Overall height: 64"
- Approximate shipping weight: 171 lbs.

MADE IN AN ISO 9001 FACTORY!

⚠WARNING! †[1]

G0794 ONLY $600.00 $125 SHIPPING

KNIFE BELT SANDER / BUFFER

- Motor: 1 HP, 110V, single-phase, 14A
- Motor speed: 1725 RPM
- Belt size: 2" x 72"–76" range
- Belt speed: 3600 FPM
- 8" dia. sanding wheel
- Left arbor: 8-1/2" extension with 5/8" arbor
- Height with belt arm horizontal: 11-1/2"
- Height with belt arm vertical: 39"
- Overall width: 29-1/2"
- Approximate shipping weight: 113 lbs.

⚠WARNING! †[1]

G1015 ONLY $645.00 $125 SHIPPING

12½" 2 HP BENCHTOP PLANER

- Motor: 2 HP, 110V, single-phase, 15 A
- Maximum cutting width: 12-1/2"
- Minimum stock length: 6"
- Minimum stock thickness: 13/64"
- Maximum stock thickness: 6"
- Maximum cut depth full width: 1/32"
- Maximum cut depth 6" wide: 3/32"
- Cutterhead speed: 10,000 RPM
- Feed Rate: 32 FPM
- Overall dimensions: 21-3/4" W x 27-3/8" D x 18-3/4" H
- Approximate shipping weight: 78 lbs.

⚠WARNING! †[1]

G0505 ONLY $415.00 $49 SHIPPING

13" 2 HP BENCHTOP PLANER W/ HELICAL CUTTERHEAD

- Motor: 2 HP, 120V, single-phase, 15A
- Maximum cut width: 13"
- Minimum stock length: 6"
- Minimum stock thickness: 1/8"
- Maximum stock thickness: 6"
- Maximum cut depth full width: 1/32"
- Maximum cut depth 6" wide: 3/32"
- Cutterhead speed: 8500 RPM
- Feed rate: 25 FPM
- Table size with extensions: 13" x 28"
- Dust port size: 2" with 4" adaptor
- Overall dimensions: 25-1/2" W x 28" D x 19" H
- Approximate shipping weight: 82 lbs.

MADE IN AN ISO 9001 FACTORY

⚠WARNING! †[1]

G0940 ONLY $745.00 $59 SHIPPING

GRIZZLY GROWLER CYCLONE SEPARATOR

Add this cyclone separator to your 1.5 - 3 HP dust collection system to improve performance and reduce suction loss due to filter cake.

- Horsepower range: 1-1/2–3 HP
- Drum size: 20" diameter x 22" H
- Maximum drum capacity: 20 gallons
- Airflow rate: 750–2300 CFM @ 2.3–3.2" SP
- 7"–6" Outlet reducer
- 6" Inlet with 2 x 4" "Y" adapter
- 16-Gauge steel construction
- Overall dimensions: 25-1/2" W x 22" D x 67" H

⚠WARNING! †[1]

G0863 ONLY $314.95 $125 SHIPPING

2 HP CANISTER DUST COLLECTOR W/ ALUMINUM IMPELLER

- Motor: 2 HP, 240V, single-phase, 9A
- Airflow performance: 1700 CFM
- Maximum static pressure: 10"
- Main inlet size: 6"
- Inlet adapter: 3 x 4"
- Filtration rating: 1 micron
- Canister filter size: 19⅝" dia. x 23⅝" H
- Bag capacity: 4½ cubic feet
- Lower bags: Plastic
- Impeller: 12¾" aluminum, radial fin
- Sound rating: 83–85 dB
- Overall dimensions: 37⅜" W x 31½" D x 71"H
- Approximate shipping weight: 150 lbs.

CSA C US 247570

⚠WARNING! †[1]

G0548ZP ONLY $600.00 $125 SHIPPING

3 HP DUST COLLECTOR

MADE IN AN ISO 9001 FACTORY

- Motor: 3HP, 240V, single-phase, 12A
- Airflow performance: 2300 CFM
- Maximum static pressure: 16.7"
- Main inlet size: 7"
- Inlet adapter: 3 x 4"
- Filtration rating: 2.5 micron
- Bag capacity: 11.4 cubic feet
- Bag size (dia. x depth): 19½" x 33"
- Upper bags: Fabric
- Lower bags: Plastic
- Impeller: 12¾" cast-aluminum, radial fin
- Overall dimensions: 58" W x 33" D x 78" H
- Approximate shipping weight: 170 lbs.

CSA C US 247570

NOW WITH A 2.5 MICRON BAG

⚠WARNING! †[1]

G1030Z2P ONLY $600.00 $125 SHIPPING

2 HP PORTABLE CYCLONE DUST COLLECTOR

- Motor: 2 HP, 220V, single-phase, 9A
- Intake hole size: 7"
- Impeller: 13" welded steel
- Collection drum size: 20 gallons
- Airflow Performance: 1023 CFM @ 1.2" SP
- Max. static pressure: 10.9"
- Overall dimensions: 28-1/2" W x 52" D x 70" H
- Approx. shipping weight: 397 lbs.

LIFT HANDLE & ROLL DRUM EASILY FOR SAWDUST DISPOSAL!

MADE IN AN ISO 9001 FACTORY

⚠WARNING! †[1]

G0861 ONLY $1170.00 $149 SHIPPING

Due to rapidly changing market conditions, our advertised prices may be changed at any time without prior notice.

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Build

SHOP FOX® WOODSTOCK INTERNATIONAL

Innovative Products
SINCE 1989!

W1742H
15" 3 HP PLANER
W/ BUILT-IN MOBILE BASE AND HELICAL CUTTERHEAD

- Motor: 3 HP, 240V, single-phase, 15A
- Max. cutting width: 15"
- Max. cutting depth: 1/8"

⚠WARNING! †1

W1812
7" 2 HP PLANER MOULDER
W/ STAND

D3393
ELLIPTICAL JIG FOR CURVED MOULDING PRODUCTION

- Motor: 2 HP, single-phase, 240V, 10.8A
- Planing width: 7"
- Max. stock thickness: 7 1/2"

⚠WARNING! †1

PATENTED DESIGN
DOVETAIL-WAY CUTTERHEAD HOUSING

W1860
8" X 76" PARALLELOGRAM JOINTER
W/ HELICAL CUTTERHEAD & MOBILE BASE

- Motor: 3 HP, 230V, single-phase
- Table size: 9" x 76"
- Max. depth of cut: 1/8"

⚠WARNING! †1

W1852
22" X 42" VARIABLE-SPEED WOOD LATHE

- Motor: 3 HP, 240V, 3-phase (with inverter), 8A
- Distance between centers: 42"
- Spindle threads: 1 1/4" x 8 TPI RH

⚠WARNING! †1

Made in an ISO 9001 Factory

W1837
10" 2 HP HYBRID TABLE SAW
W/ CAST IRON WINGS & OPEN STAND

- Motor: 2 HP, 120V/240V (prewired for 120V), single-phase, 15A/7.5A
- Rip capacity: 30" to right, 15" to left
- Built-in mobile base

⚠WARNING! †1

Made in an ISO 9001 Factory

W1888
10" HYBRID TABLE SAW
W/ RIVING KNIFE

- Motor: 2 HP, 115V/230V (prewired 115V), single-phase, 16A/8A
- Rip capacity: 31 1/2" right, 11 3/8" left of blade
- Table size: 40 1/8" x 27"

⚠WARNING! †1

21508R

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⚠ **WARNING! †1** : Cancer & Reproductive Harm

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2 YEAR WARRANTY

SHOP FOX® machines are backed by a 2-Year Warranty!

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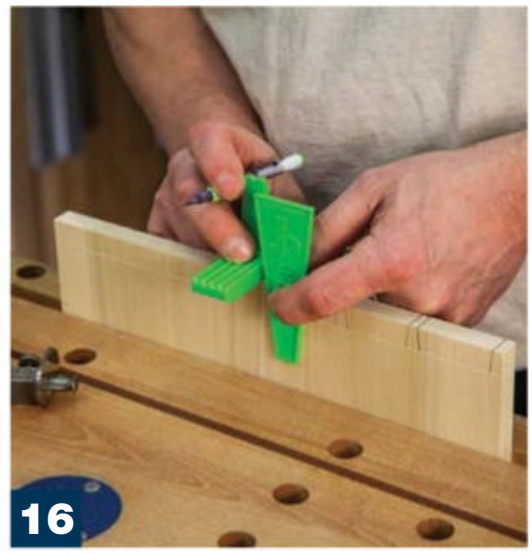

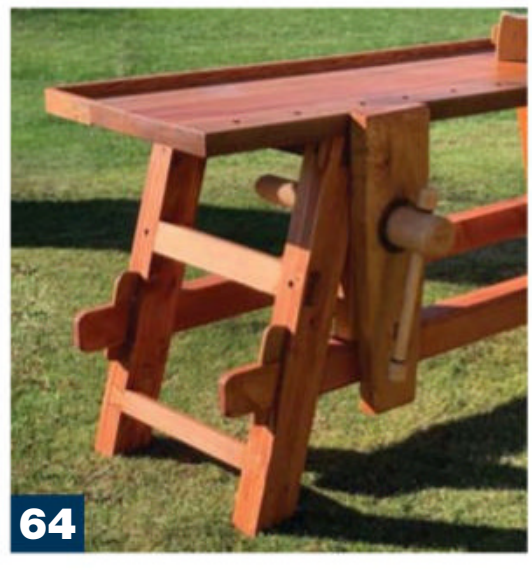

Connect

Craft

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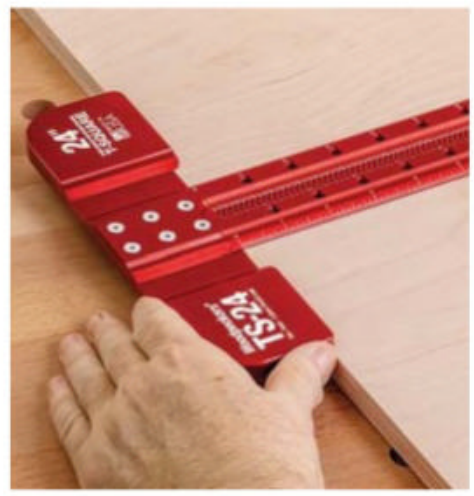
Precision Woodworking Squares

- One-piece central core machined to exacting tolerance.
- Stainless model includes scribing guides for perfect parallel layout.
- Lip formed by base keeps the square flat on your work.
- Scales engraved to a tolerance of ±.004" total stack-up error.
- Guaranteed accurate to ±.0085° for life.
- Available in inch or metric graduations.

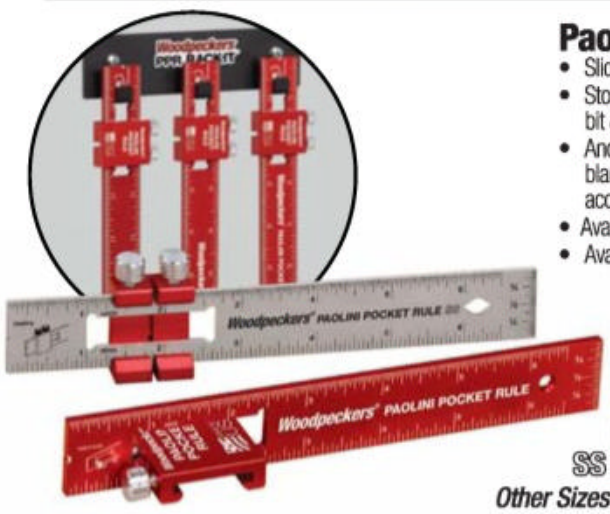
Precision Woodworking Square
Includes a Woodpeckers wall-mountable wooden case
12" 1281....$119.99
12" 1282SS Stainless Steel....$139.99
Other Sizes Available on Woodpeck.com

Precision T-Squares

- Precisely spaced 1mm holes machined every 1/16".
- Laser engraved scale accurate to ±.004".
- Outer edges machined to a 30° bevel for easy reading.
- 600mm metric version available.



Precision T-Square
Includes a wall-mountable Rack-It™
TS-12 12"....$89.99
TS-24 24"....$124.99
TS-32 32"....$154.99



Paolini Pocket Rules

- Sliding stop simplifies repetitive marking.
- Stop doubles as stand to set router bit & saw blade height.
- Anodized aluminum or stainless steel blade with laser engraved scale accurate to ±.004".
- Available individually or as a set.
- Available in inch, metric or combination.

Paolini Pocket Rule
Includes a wall-mountable Rack-It™
6", 8", 12" Set....$124.99
SS 6", 8", 12" Set....$149.99
Other Sizes Available on Woodpeck.com

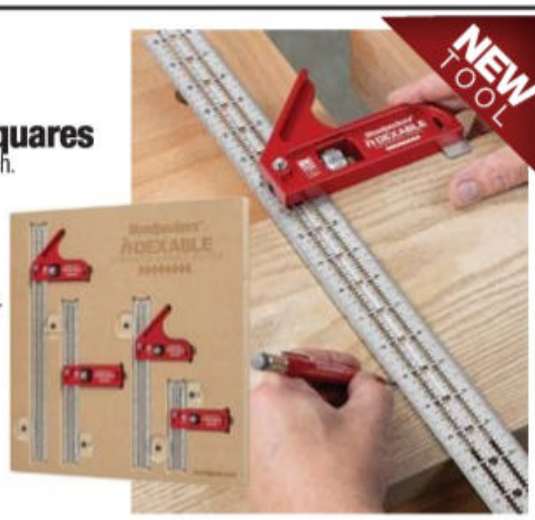
Saddle T-Squares

- Scribing holes on 1/32" centers.
- Milled from solid aluminum billet.
- Mark face and edge at the same time.
- Edges beveled 30° to reduce parallax.
- Scale accurate to ±.004".
- Available individually or as a set.
- Available in inch or metric graduations.
- Metric scribing guides on 1mm centers.

Includes a wall-mountable Rack-It™
Saddle T-Square Set....$299.99
Includes a Systainer case
Saddle T-Square Set....$369.99
Other Sizes Available on Woodpeck.com

in-DEXABLE™ Combination & Double Squares

- Push-button index locks head at any full-inch.
- Laser-cut scribing guides for precision parallel lines.
- Retractable support keeps head aligned to your stock.
- Combination & Double Squares in two sizes.

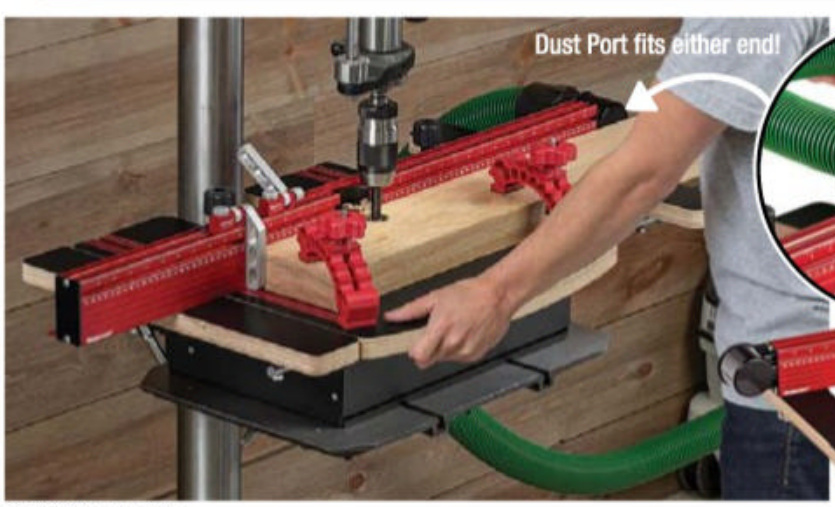


***in-DEXABLE* Squares**
Includes a wall-mountable Rack-It™
Double 6"....$129.99
Double XL 12"....$169.99
Combination 12"....$169.99
Combination XL 18"....$199.99

EZ Edge Corner Plane

- Plane sole is a perfect 90° to fit your stock.
- 3 radius profiles and 45° chamfer available.
- Hardened blades are easy to re-hone.
- Profile perfectly centered on your stock.

EZ Edge Corner Plane
Includes a wall-mountable Rack-It™
1/8", 3/16", 1/4" Radius
-or- 45° Chamfer....$159.99
Deluxe Set....$519.99



DP-PRO Drill Press Table System

- DP-PRO Fence integrates dust collection & delivers accuracy.
- Micro-adjustable DP-PRO Flip Stops.
- DP-PRO Drawer Base simplifies installation on any drill press.
- DP-PRO Tables are full 1" thick with laminate top & bottom.
- Extension Wings for long material support.
- Drawer Base and Fence compatible with all drill press tables.

DP-PRO Drill Press Table Master System
36" Table, 24" Fence.....$369.99
36" Table, 36" Fence.....$389.99
48" Table, 36" Fence.....$419.99
48" Table, 48" Fence.....$439.99

Drill Press & Hose not included.

Woodpeck.com

MADE IN USA

AUTO-LINE DRILL GUIDE™

NEW TOOL

- Drill perfectly perpendicular holes anywhere.
- Fence fits on all 4 sides and works 4 different ways.
- Laser-engraved target lines indicate center of bit.
- Works with nearly all 1/2" and smaller drills.
- 1" capacity inside frame and 2" capacity outboard.
- Optional extensions and stops available.

Drill not included.

Auto-Line Drill Guide....$239.99

Multi-Function Router Base

NEW TOOL

- Micrometer adjustment positions cutter perfectly.
- Cut parallel to existing edge or pivot in a perfect arc.
- Wide, stable base improves routing accuracy.
- Works with most routers that have guide rod holes.

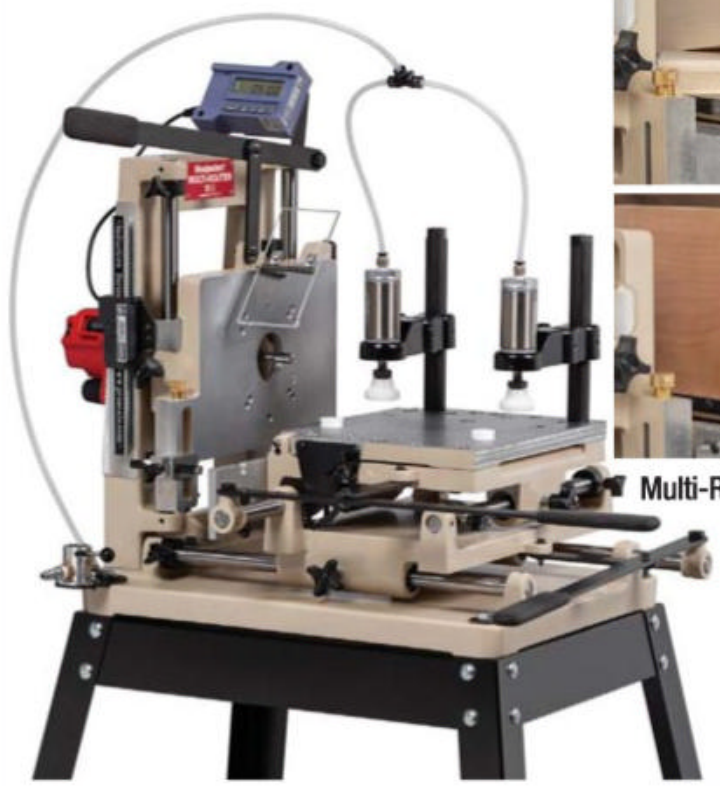
Router not included.

Multi-Function Router Base
Includes 1 Pair Extension Rods
w/ 5/16" Guide Rods....$239.99
w/ 3/8" Guide Rods....$239.99
w/ 10mm & 1/4" Guide Rods....$239.99

Multi-Router

NEW TOOL

- True 3-axis linear control over your workpiece.
- Template system guides stock for flawless joinery.
- Mortise & tenon, dovetails, box joints and more.
- Tables travel on close-tolerance linear ball bearings.
- Repeatable results improve productivity.
- Works with many 2-HP round-body routers.



Multi-Router...$2699.00

Shown with optional ProScale, Pneumatic Clamps & Machine Stand.

RIP-FLIP Fence Stop System™

NEW TOOL

- Bring your rip fence back to the same spot each and every time you need it.
- Stop drops out of the way when not needed, flips up when you want it.
- Couple two stops together for perfect fitting dadoes in two cuts.
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- Extra stops and dado couplers available. Add as many as you need!

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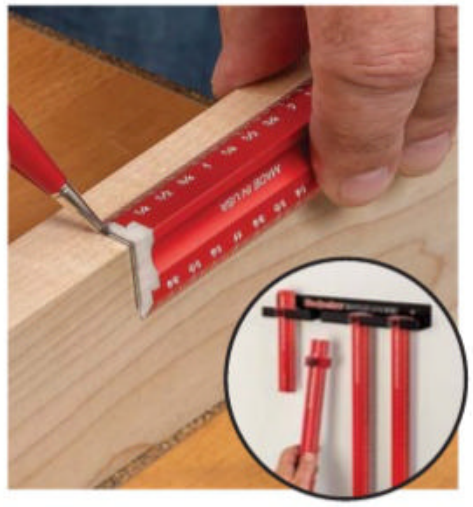

For more sizes & ordering options for these tools plus hundreds more, visit ***Woodpeck.com***

**NOTE: The Festool, DF-500, DF-700 XL, SawStop & Powermatic brand names are the registered trademarks of the respective companies and are not associated with Woodpeckers, LLC.*

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FROM THE EDITOR

Focus on the Future

By Andrew Zoellner

Much what we do as woodworkers is rooted in the past, using many of the same tools and techniques that joiners and cabinetmakers used in previous centuries. Lately, though, I find there's an awful lot of new technology creeping into the shop (or my shop at least).

Last year around this time, we surveyed our readers and found that most had the basics of a power tool-centric shop: a table saw, band saw, jointer and planer. Almost all had a cordless drill, miter saw and a handheld router. But what was the one machine they would purchase next if they could? Overwhelmingly, our readers indicated that machine would be a CNC router.

A machine that's super precise and can do the mundane, repetitive tasks while you focus on the fun stuff? Sign me up!

Then I think about all of the very talented people I know who create things digitally, who want to see their creations in the physical realm. It's similar to what I do at the start of a project—I make a sketch of what I want the finished thing to look like and make a plan for how to get there. Is that so different than drawing an object on a screen and then using machines to realize it?

Though sometimes technology can be frustrating or intimidating, it's also very exciting. I think that might be a key to getting some new people into woodworking. Using the Shaper Origin, for example, sometimes feels like a video game: You're trying to keep the dot as close to the line as possible. And if you do, your joints will line up perfectly (you win!).

My 3D-printed dust collection adapter, created by Chris Cosentino and downloaded from thingiverse.com.

When the dust collection adapter on my planer cracked this winter, I couldn't find a replacement anywhere. Then I saw a post online about a 3D-printed adapter, made from plastic. My friend, who caught the 3D printing bug for making miniatures, printed it for me and it was ready the next day (faster than if I'd ordered a replacement online).

There's definitely an artistry to modeling things virtually, then creating them in the physical realm. I look at the various port sizes on my tools and think about printing custom adapters to hook my dust extractor to everything. And hooks and clasps to hold tools on the wall or keep drawers organized. Or being able to replace a plastic part that breaks at the most inopportune time. It's bordering on Star Trek-level technology.

The idea that how we make things is changing is one reason why I was so excited to get Tim Celeski's design for a workbench. Thinking about a surface that uses a grid for layout, using non-traditional tools such as track saws, Domino joiners, CNC routers and the like, is invigorating. Yes, perhaps the way we've always done it is the best way. Exploring what else is possible is just as worthwhile and central to what I like most about being a maker.

Popular Woodworking

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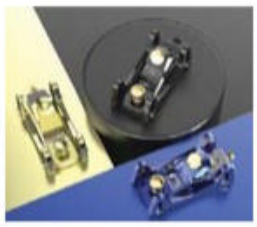

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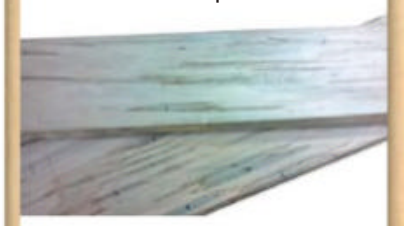

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It's time to give every Dad his due with a month full of top-flight woodworking prizes. From May 19 through June 20 (Father's Day), *Popular Woodworking* and its sponsors are giving away a prize a day to celebrate dads. To earn your chance, you must enter separately for each day's prize. All entrants will qualify for the **Grand Prize: South Bend 2HP Canister Filter Dust Collector (SB1100).**

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GRAND PRIZE

South Bend 2HP Canister Filter Dust Collector (SB1100)

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Popular Woodworking Magazine and its sponsors will award one prize each day from May 19 through June 20. The prize pictured on each day in the calendar above is the prize offered for that day. To register for a chance to win each prize, you must enter on the day the prize is offered, you may enter as many of the daily contests as you like but you are limited to one entry per day. All entries from the first 32 days will be eligible for the Grand Prize: a **South Bend 2HP Canister Filter Dust Collector (SB1100)**.

Registration starts 12:01am, EDT on May 19, 2021 and ends 11:59pm EDT, June 20, 2021.

ENTER EVERY DAY AT **WWW.POPULARWOODWORKING.COM/33DAYS**

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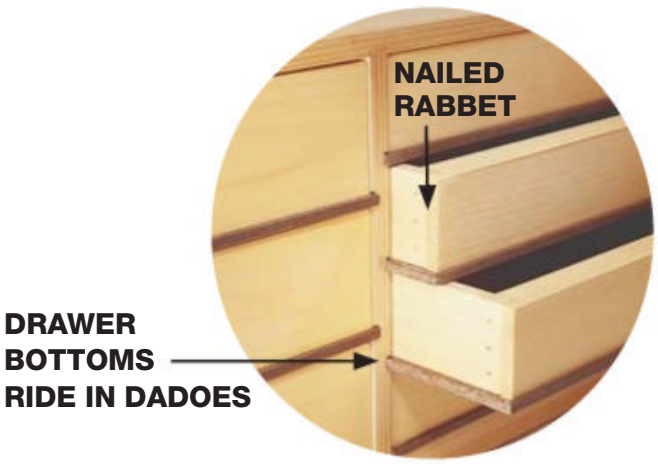
WORKSHOP TIPS



Small Tool Cabinet

Store your small tools in this simple, easy-to-build plywood cabinet. The shallow drawers are ideal for layout tools or carving gouges, while the deep drawers are best suited for marking gauges and block planes. Place your cabinet on a shelf or hang it from a wall by fastening through the back.

Use 1/2" thick ApplyPly or Baltic birch for the case and back, 1/4" tempered hardboard for the drawer bottoms, and pine for the drawer sides.

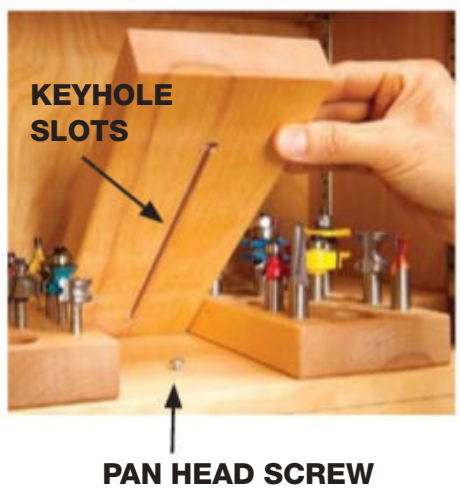
The drawer bottoms do double duty. They function as slides and pulls as well. Cut 3/16" deep dadoes in the case's sides for the drawer bottoms to slide in. Stagger the dadoes in the middle divider so it stays strong. The lowest drawers do not have dadoes. Cut rabbets for the cabinet's back and fasten it with screws or nails.

Simple rabbet joints hold the drawer sides together (the back of the drawer is made the same way as the front). Nail and glue the sides together, then even up the bottom edges. Glue the sides down to the hardboard bottom. The stiffness of the drawer sides keeps the hardboard from bending under the weight of your tools.

Eye-Level Bit Storage

Lots of folks store router bits in wooden blocks, but this nifty pull-out method keeps those blocks securely mounted inside your cabinet. The blocks become shelves that pull out and hang at eye level while you find the bit you need. Each pull-out block slides on a pan head screw captured in a routed keyhole slot on the bottom of the block. If you want to remove the block and take your bits to where you're working, just lift the block off the screw and go.

Rout the stopped keyhold slot in the center of each pull-out block and drill a 1" dia. by 1/2" deep finger hole in the front.



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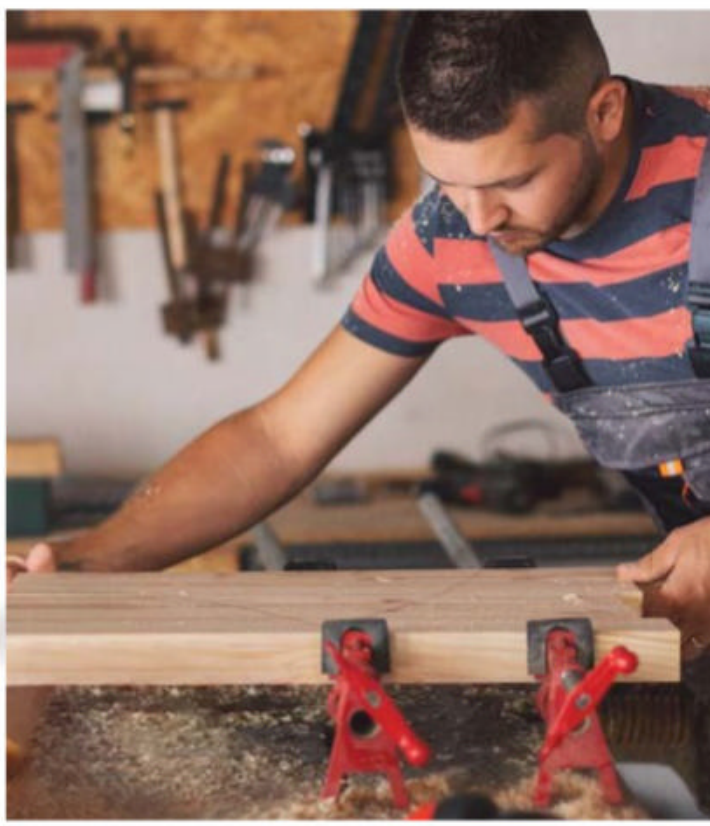

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WORKSHOP TIPS

At-Hand Tool Storage

If you hate fumbling around in drawers or digging into cabinets for tools, try this add-on for your workbench. It displays hand tools out in the open where you can grab them instantly. Most workbenches have a perfect spot to hang some perf-board for bench tools between the legs. You'll enjoy having tools within easy reach, right where you're most likely to use them.

Bandsaw-Blade Clip

You'll never think twice about the spring tension in coiled-up bandsaw blades until you drop one. When a blade hits the floor, the coil can explode and the wild blade can bounce right back at you.

Binder clips are much more convenient to use than twist-ties, and they make coiled blades easy to carry and hang. Binder clips cost less than a buck each and they come in a rainbow of colors, so you'll be able to color-code your blades by size.

Sanding Drum Dust Collector

Suck up the fine dust that flies off a sanding drum with this simple setup. All you need is your shop vacuum, a 3" x 2" PVC reducing coupling and a pot magnet. Bolt the magnet to the coupling and put the coupling over the end of the vacuum hose. A 2 1/4" dia. shop vacuum hose fits snugly inside the coupling's smaller end without clamps or glue. And, you can use this magnetic dust hood on any power tool with a metal table.

Router Rack

Keep your fixed-based routers handy and ready to go with your favorite bits. Make this rack from scraps of 3/4" MDF or plywood. It measures 4" tall x 9" deep x 16" wide. Each slot measures 2" wide by 6" deep. To make the slots, just drill a 2" hole at the back of each slot and cut out the rest of the slot on a bandsaw. Router wrenches and extra collets fit nicely under each router.

Square Hanger

Store delicate squares in a safe, convenient place. These brackets have sloped tops, so the squares stay put if the rack is jiggled. Make the back at least 1" thick. Your tools are easier to grab if they sit well away from the wall.

Connect

NEW TOOLS

South Bend Enters the Woodworking Market

You may be familiar with South Bend as a metalworking tool brand—at one point half of all engine lathes were made by the company. It was acquired and re-energized by Shiraz Balolia (owner of Grizzly, Inc.) about a decade ago, and they just announced this new line of tools.

The South Bend woodworking tools lineup is focusing on commercial and educational users (with special financing terms), as well as higher-end users. That means the machines are spec'd to stand up to heavy use and include options not found on other similar machines (variable speed controls, additional stop/safety switches, digital readouts, etc.). Its first tools under the brand are a 16" band saw, a 37" wide belt sander, an 8" parallelogram jointer and a combination belt/disc sander, with more to come over the course of 2021. — *Andrew Zoellner*

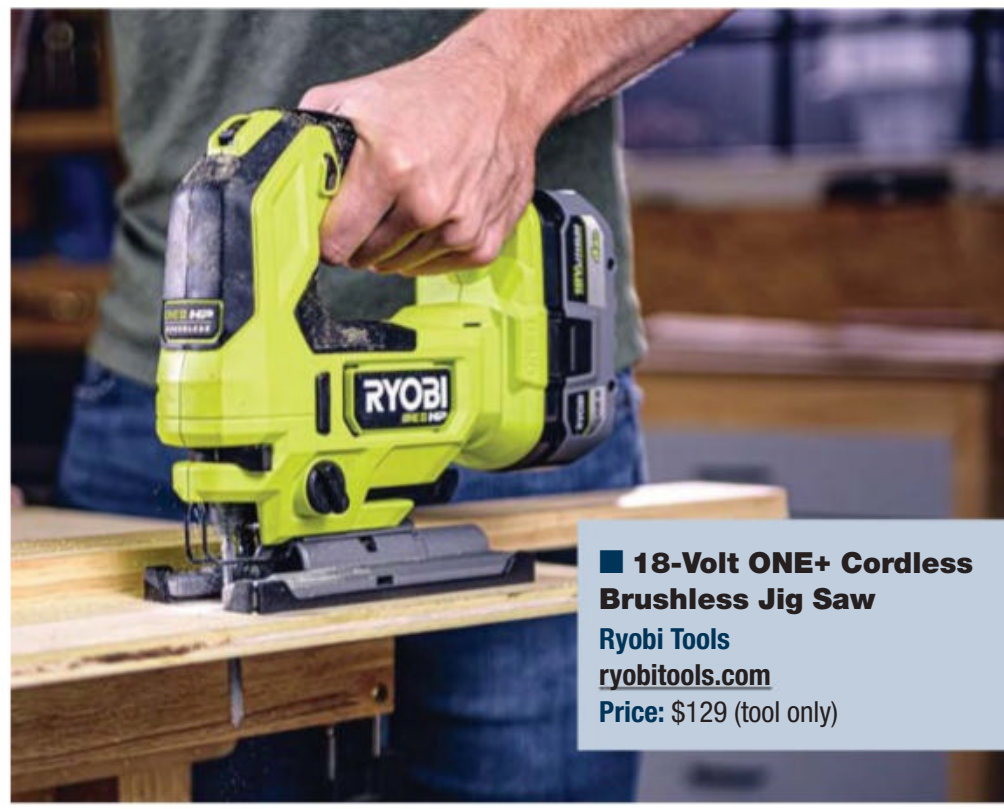
South Bend Tools
southbendtools.com

Ryobi's Refreshed Cordless Line

Like most brushless tools, the ONE+ HP Brushless Power Tools from Ryobi are more energy-efficient and powerful while featuring lightweight, compact designs. There's not a bad tool in the bunch, but a few were a standout to me.

One+ HP Brushless Jig Saw

Right off the bat, this saw has a lot going for it. It weighs in at nearly a half-pound lighter than the non-brushless 18-volt Ryobi jig saw, but still has every feature you'd want. Speed adjustment within easy reach of your thumb? Check. Tool-free bevel adjustment with locking detents? Check. Easy access blade lever for quick changes? Also check. There's storage for spare blades built into the base and four orbital settings for different materials. Those orbital settings are the source of my complaint. Previously Ryobi printed guidelines for each setting right on the saw itself (instead of the manual, where I'd need to look now).



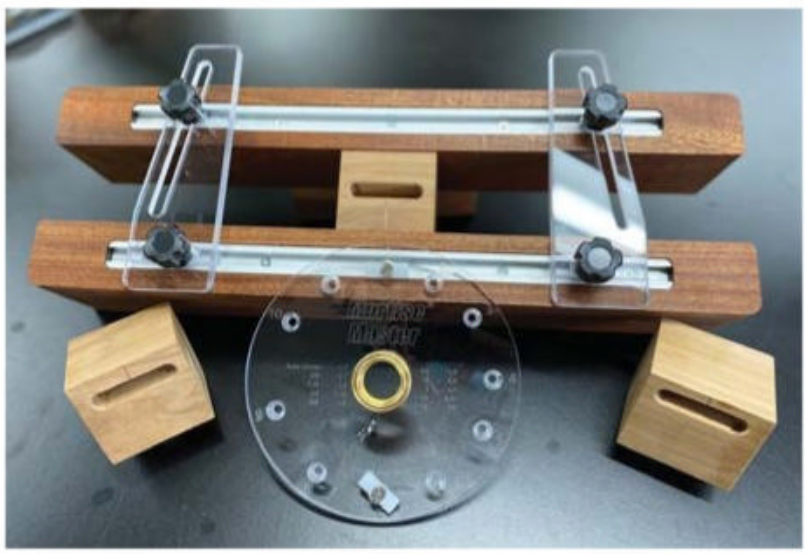
18-Volt ONE+ Cordless Brushless Jig Saw
Ryobi Tools
ryobitools.com
Price: $129 (tool only)

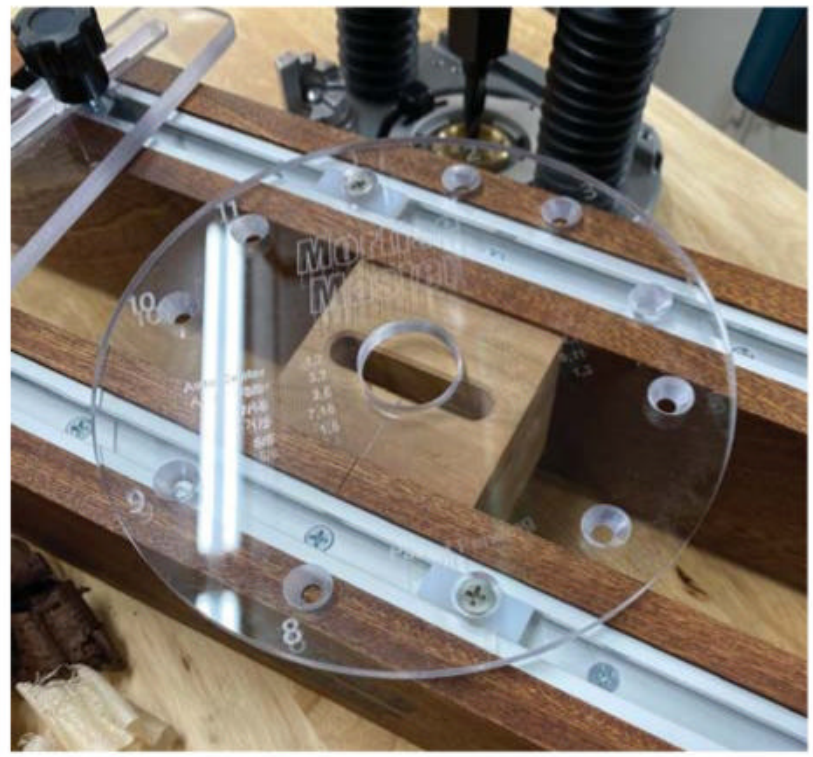
Mortise Master

Routers are the way to go for making large mortises, but making a mortise precisely centered on a rail or end grain can be tricky. If you can still locate all the pieces for your router's edge guide, it's helpful. But overall, it's a setup that doesn't usually inspire confidence and isn't easily repeatable.

The Mortise Master solves that problem. It's a purpose-made jig for cutting perfectly centered mortises on stock up to 3 1/2" thick. There are three parts of the jig: a clamp plate, a slide plate and a 1" guide bushing. Install the guide bushing in your router, attach the clamp plates to your workpiece (it's held in place with user-supplied clamps), install the slide plate, set your stops, and start cutting. The slide plate attaches to guide blocks that ride in grooves on the clamp plates, keeping the mortise perfectly centered. If you want a non-centered mortise, you can reposition the plate using offset alignment points. Once you wrap your head around how it all works, you can quickly cut mortises of all sizes accurately and repeatedly. —*AZ*

■ Mortise Master Mortising System
mortisemaster.com
Price: $279.99

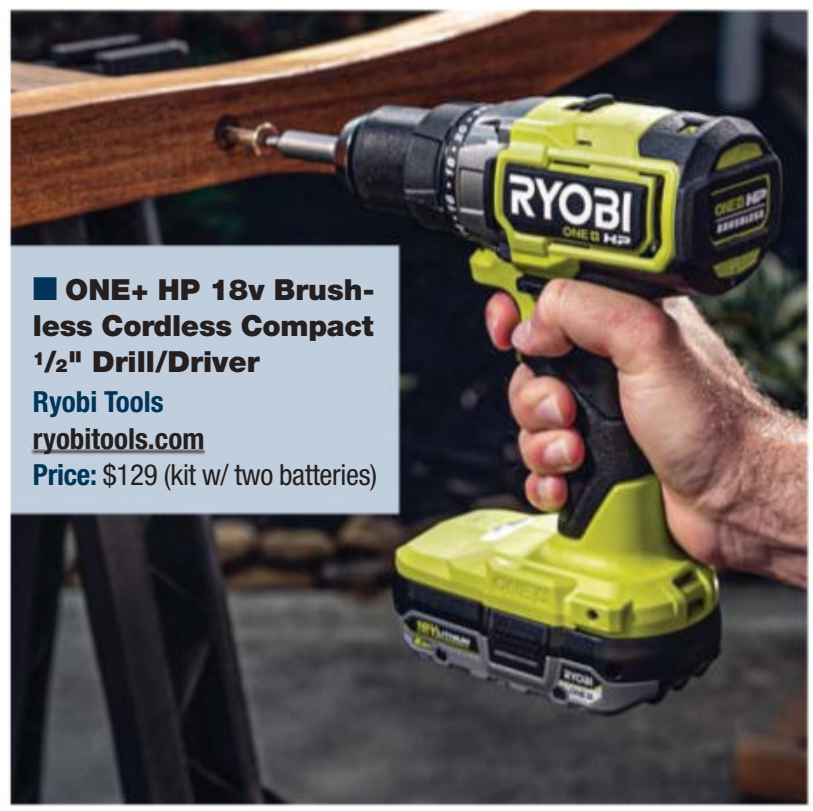




One+ HP Brushless Cordless Compact 1/2" Drill/Driver

How much of a difference can there really be when it comes to drills? I grabbed this one while building some shelves for my garage and absolutely fell in love. It is really just a dream to use—the drill is perfectly balanced and smooth. I didn't have the bit skip or pop off of the screw head a single time during the project. I wasn't sure if I was imagining this smoothness or not, so I did a side-by-side test using some other more expensive drill in my shop. The Ryobi definitely felt the best. For driving screws during my project (versus, saying driving lag bolts or other more demanding construction projects), I'll take smooth over more power any day.

One final plus: All Ryobi 18-volt tools are compatible with any Ryobi 18-volt battery—going all the way back to 1996. So, once you get on this battery platform, there's no shortage of new and used tools available to you. — *Collin Knoff*



■ ONE+ HP 18v Brushless Cordless Compact 1/2" Drill/Driver
Ryobi Tools
ryobitools.com
Price: $129 (kit w/ two batteries)

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NEW TOOLS

Powermatic's 100th Anniversary

When you've been around for 100 years, you're allowed to celebrate yourself, and that's just what Powermatic is doing. The company was started by an enterprising lumber salesman and farmer in Tennessee, who built his own planer to better process his lumber. An offer to buy it sparked the manufacture of four more planers and a decision to leave the lumber business entirely. Fast-forward to 2021, and Powermatic will be releasing seven tools to commemorate their centennial anniversary (along with some other special promotions). First off will be special editions of the 54H Jointer, 15HH Planer, PWBS-14CS Band Saw, and PM1300XT Dust Collector. Each of these tools are customized with a limited edition sparkling black and gold stripe paint scheme and special extras. Later, in the fall, Powermatic will also release commemorative editions of the PM2820EVS Drill Press, PM1000 Table Saw, and 3520C Wood Lathe. —*CK*

100th Anniversary Tools
Powermatic
powermatic.com
Prices: $1699.99 54H Jointer
$3299.99 15HH Planer
$1399.99 PWBS-14CS Band Saw
$1099.99 PM1300XT Dust Collector

Tailspin Collinear Marking Tools

Good layout is the key to any woodworking project. That goes doubly so when you're getting into dovetail joinery. Tailspin Tools makes laying out dovetails nearly foolproof, letting you lay out both pins and tails with a pair of dovetail markers and 0.7mm mechanical pencil before even picking up your saw.

The secret sauce is the small offset built into the marker to account for the size of the pencil lead. In essence, instead of the pencil riding along the edge of the marker as you're making a line, the offset means your pencil is actually bisecting the edge as you make a line. In practice, this leads to more accurate lay out of both pins and tails and transferring one board to the other (the age-old tails or pins first conundrum) doesn't need to happen.

The marking tools, made from high-grade ABS plastic, and are available in 1:4, 1:6 and 1:8 dovetail ratios, as well as completely square (Tailspin SQd). You can purchase them in individual sets or in a combination pack. —*AZ*

Tailspin Marker Sets
Tailspin Tools
tailspintools.com
Price: $45 - $180

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Demonstration on red oak

VARATHANEMASTERS.COM

Buchanan-Smith's Axe Handbook

By Andrew Zoellner

Abrams Image / 240 Pages / $24.99 / abramsbooks.com

I'm a sucker for tools and good design, so Buchanan-Smith's Axe Handbook was immediately added to my preorder list when I found out about it. Simply put, it's a book about axes, written by a person who helped reignite interest in the tool as a symbol of both survival and hipster status. Peter Buchanan Smith, the author, built an entire high-end store around useful, high-quality tools and clothing, and it all started with an ax, painted with purpose.

While he does present a brief history of the tool and its modern-day uses, the bulk of the book is devoted to understanding how axes are made and designed to be used today (including buying and restoring vintage axes, safety and sharpening). The section on axes in use was particularly enlightening, talking through proper form and technique for limbing and bucking trees with an axe, why you should never chop down a tree with an axe (use a saw!) and just how useful and precise a small ax can be.

The real gems in this book come in the restoration portion. The Dudley ax vice, named for the former head of the Best Made ax shop, is simple yet incredibly useful jig for holding an ax during sharpening and restoration. There are some best practices for removing rust while keeping patina (it is a tool, after all), and advice on buying old axes.

The section on adorning an ax was very interesting. There are completely practical reasons to use bright colors on a tool: easy to identify in woods filled with browns and greens and a way to signal ownership of a tool. And there are reasons completely unrelated to practicality. And therein lies what was so inspiring about this book: there's so much joy tied into this simple object for the author, a designer who wanted to reconnect with the nature while living in a big city. So he painted ax handles. **PW**

PHOTOS COURTESY OF THE PUBLISHER

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Cutting Dovetails with Shaper Origin

It's all about precisely removing waste.

By Andrew Zoellner

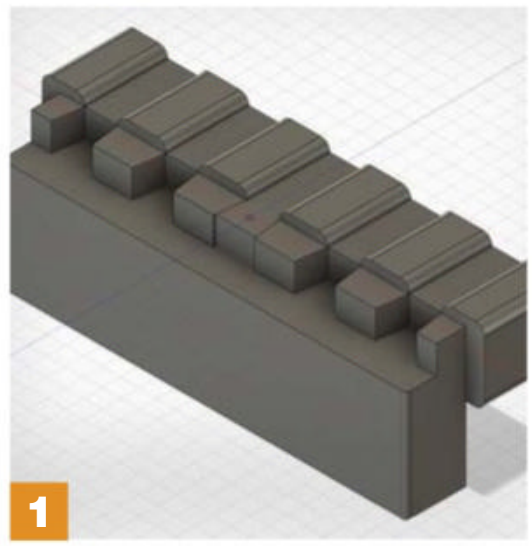
Shaper Origin and Workstation are still pretty new to our woodworking world, but I've gotten to spend lots of time with the system over the last year. And it's really quite incredible. Using a series of domino-looking shapes on a flat surface, the Origin is able to tell precisely where the machine is. As you cut, the router inside the Origin moves within the base, allowing it to precisely track a line (even if you aren't able to do it with just your body). It will cut precisely to the line, inside or outside the line, and even offset from the line by a fixed amount.

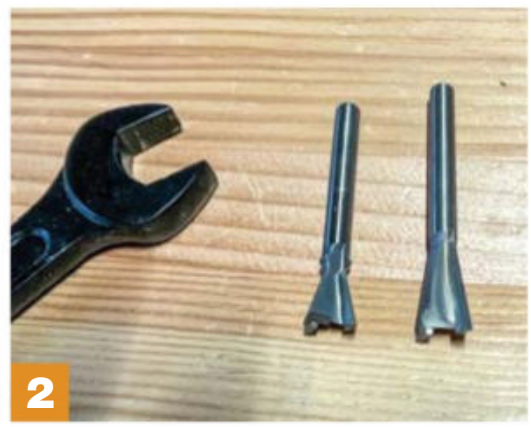
Woodworking really boils down to being able to cut precisely to layout lines, and that's what the Origin excels at. It's a handheld CNC router that you can use on almost any flat surface, whether that's an inlay on the lid of a tool chest, a medallion on a hardwood floor or the edge of a board (as we'll explore here).

Making Tails and Pins

Dovetail joinery comes down to accurately removing waste between tails and pins. If you know the size and angle of your tails, you can make pins to match. With a clear image of those dimensions, it's simply a matter of cutting to those lines. Shaper has developed a Fusion 360 file that automatically generates the SVG files needed to cut dovetails with Origin. You input the width and thickness of your stock, the angle and diameter of your dovetail bit, the diameter of your straight bit, and the export two files: one for the tails and one for the pins.

Shaper's Workstation is what makes the cutting process simple and repeatable. There are registration pins that allow you to accurately





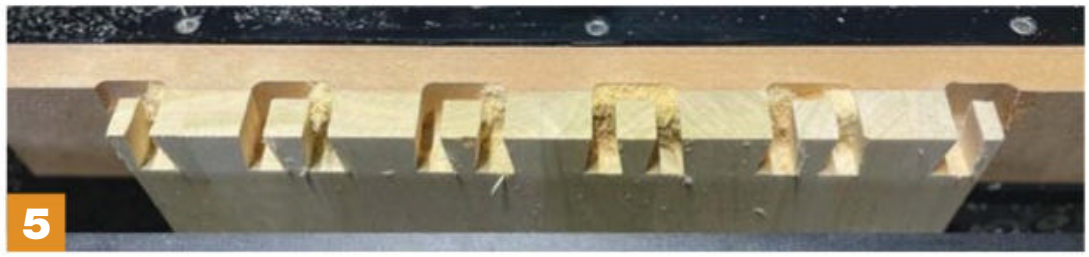
1 I used Shaper's dovetail generator for Fusion 360. Though the image looks complicated, it's really just generating two SVG files used for cutting the dovetails. Input the details of your stock and router bit, number of pins, and the file is updated to your specific joint, with equally spaced pins and tails.

2 The cutting height of the dovetail bit needs to be equal to or taller than the thickness of the material you're cutting. The bit on the left is suitable for 1/2" thick material but wouldn't work with 3/4" material. The bit on the right has a cutting height just over 3/4" and is the one I used for my 3/4" thick case materials.

3 There are two registration pins on each side of the Workstation to square your stock (I only use the left-hand registration pins here). There's a replaceable waste board, as the bits will exit the back of the board while you're routing pins and tails.

4 The on-screen grid is aligned to your board using three registration points (two on the face of the board, and one on the edge), measured with a reference pin in the router's collet, to create the origin point. I use a 1/2" grid with the origin point being either the left-hand or right-hand corner of the board closet to me.

Cutting Dovetails



5 Cutting the tails is the trickiest part of this process. Because of the geometry of the bit, you make one pass at full depth. If you move outside the cut path or otherwise cause an error, the bit quickly retracts. If that happens when you're cutting tails, there's a good chance the bit will remove a portion of the tail as it retracts. Move slowly and deliberately, with plenty of space between the front of the board and the Workstation support bar.

6 When cutting tails, I set a 0.01" offset for the first pass to define the shape. I come back and make a second pocketing pass to hog out the waste. Then I make a final with no offset to remove that final bit of wood and leave a clean surface.

7 You use a straight bit to cut the pins, which means you can cut in multiple passes down to the depth of the socket. Take two 3/8" passes with a 0.01" offset, going down to the full 3/4" depth. Cutting right to the line on both the tail cut and pin cut might make the fit looser than you want (as I found with this popular). Adjusting the fit is as simple as adjusting the offset for the pins. I found a 0.003" offset gives me a fit that's just right.

place each board every time, in relation to your digital workspace. Two clamps firmly hold the board in place. The replaceable MDF waste board provides a firm backer (and minimizes risk of cutting into aluminum Workstation). And outboard support for the base of the Origin so you can safely route end and edge grain.

Cutting the Tails

With your stock milled to size (I'm using 11" wide poplar here), mark the front edge of all of your pieces (I use an ×). Start with a tail board, and the × edge against the left-hand registration pins on the Workstation. Clamp it in place with the top edge of the board flush with the top of the Workstation and scan your workspace.

Using a 1/4" registration pin (Shaper recommends flipping the 1/4" V bit that comes with the machine in the collet), lay out a grid (I used a 1/2" grid to accommodate the 1/2" offset in the tails file), using the front edge of the board and the side of the board with the × on it. Then load your tails file and place it on the grid (the 1/2" offset means the corner of the cutting path will be 1/2" to the left of the origin, so the tails are centered on the board).

8 Cutting joints that all go together to create a square box means paying attention the faces and edges when you're laying out your pin boards and tail boards. I put an × on the front edge of the four boards, and it's very important to pay attention to orientation when you're routing the pin boards.

9 After you've cut the first set of tails, rotate the board 180°, so the × is now on the right-hand side. Set your grid with its origin on the right-hand corner and use that origin to position the cutting path. This minimizes the change of any compounding error.

10 The joint right off the machine fits just as good or better than almost any other dovetail joints I've cut. The main limitations to this system are the size of the Workstation and the depth of cut on the router bit. The Origin supports up to a 1/4" collect, so that limits the size of the router bit you can use (I wouldn't want to make a pass more than 3/4" deep anyway).

Change out the bit for your dovetail bit and perform the Z-touch—the Origin will slowly lower the bit until it contacts the top edge of the board to orient itself in the Z axis.

Now it's time to cut. You'll be making a full, 3/4"-depth cut with your dovetail bit in the end grain of your board. (Unfortunately, you can't make multiple passes at different depths, because that messes up the shape of the tail.)

Cut the tails in three passes, using the inside cut and pocketing cut functions on the Origin. First, do an inside cut with a 0.01" offset (meaning you'll cut 0.01" inside the cut line). Then, do a pocketing cut to clear out the waste. Finally, do an inside cut with no offset, to cut right to the line. Flip the board end for end, making sure the × stays on the left-hand side of the board, and repeat.

Cutting the Pins

Because the walls of the pins are completely vertical (not angled like the tails are), you can use a straight bit to cut the pins (make sure to verify the diameter of your bit and Z-touch after a bit change—Origin reminds you, too). Again, clamp your pin board in place with the marked × side against the left-hand registration pins. Create the grid and place the cut file. I like to cut tails in three passes, too. Two pocketing passes of 3/8" depth at a 0.01" offset hog out most of the waste between the pins. Then I'll make a full 3/4" depth inside pass with a 0.003" offset, which leaves the pins slightly oversize.

The offset is where you fine-tune the fit of the joint. A 0.005" offset took a lot of effort to put the joint together. No offset, and the joint was too loose. I settled on a 0.003" offset for a great-fitting joint. Of course, I'd recommend you cut a couple practice joints to dial in the fit before you move to your actual work pieces.

To cut the pins on the other end of the board, you rotate the workpiece so the marked × side is on now on the right-hand side of the workstation. You still align it against the left-hand registration pins, but you set up the grid using the right-hand corner of the board for the origin. That ensures both sides are cut from the same reference face. Then repeat for the other pin board.

All Together

With precisely machined stock, you'll get great-fitting joints. Once you get the hang of the order of operations, you'll be able to cut a box's worth of joints in 30 minutes (or less). And there's no layout! The equally spaced pins and tails don't necessarily have the charm of hand-cut dovetails, but they're still strong and functional, and look just as good as those you can cut with most router dovetail jigs. And, with some measuring and figuring, you could create cut files that have skinnier pins and wider tails. That's my next challenge. **PW**

Andrew is Popular Woodworking's editor in chief.

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Lyre-Legged Table

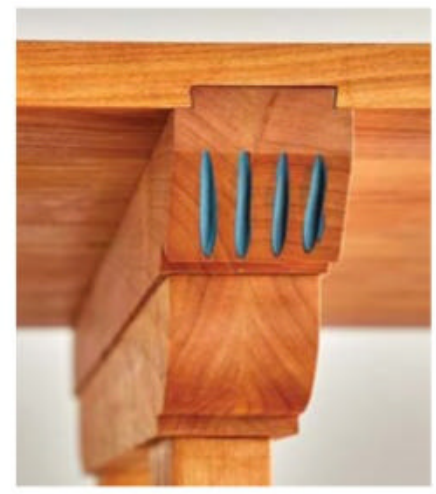
Inspired by a striking statement piece. **By Dillon Baker**

PROJECT #2107

Skill Level: Intermediate
Time: 5 days
Cost: $350

PHOTOS BY CHRIS HENNESSEY

One of the unique features of this table is it's ability to be disassembled and tucked away. It's also very scalable. If the surface area (or lack thereof) is an issue, create a larger top and increase the length of the stretcher.



Lyre-Legged Table

The inspiration for this project originated during a recent trip I took to visit my brother in Milwaukee, Wisconsin. The activity list for such occasion typically includes a stop at the Milwaukee Art Museum, catching a show at the Oriental Theatre, and some social imbibing down by the lakefront. It wasn't until recently (after partaking in the latter of the activities listed above) that I discovered and old palatial estate on a bluff that overlooked Lake Michigan. To my surprise, it turned out to be a place called "Villa Terrace," a decorative-arts museum that was once a private residence belonging to a couple named Lloyd and Agnes Smith at the beginning of the 20th century. Known as Sopra Mare


1

1 This is the original lyre-legged bench in The Mercury Courtyard at Villa Terrace, that inspired the project.

2 Using the template, trace out the profile of the leg onto the blank. Notice that the joinery is established during this process.

3 A wheel marking gauge for layout creates a groove for the chisel to ride.


2


3

4 With sliding-bevel set to 5°, lay out the mortise shoulders on the short stretchers.

5 With the marking gauge set, lay out the joinery on all "like" pieces.


4


5

("above the sea" in Italian) to the Smiths, this resplendent piece of architecture is extraordinary beyond description.

Before entering the house, you are led through a stone-walk courtyard surrounded by a vaulted loggia with two-stories of Tuscan columns. Once you finally arrive at the main entry, to the left, you are greeted by a black-painted bench with scrolling curved legs and stretchers. It was later I came to discover that the design element that initially caught my attention is known as a lyre arm. Although originally a classical Greek form, this element was incorporated into several different types of furniture throughout the 18th and early parts of the 19th century.

Other than the sensory experience involved in discovering something new, what originally stood out about this bench was its juxtaposition of style against the backdrop of stucco walls, tile roofs, and arched openings. Although baroque in design, it had an appearance of modernity within the contrast of its current setting. The body was painted, the top was modest in form, and the legs had style; to me, this was a combination that warranted further exploration.

Scroll-Style Stile

Before we get started, take this time to create a template for the "scrolling" legs out of 1/2" plywood. Take your time as this will be the model in which your final piece(s) will follow. Once this has been completed, create the blanks for the legs using 8/4 cherry. Trace the pattern of the leg onto the individual blanks using a template. Continue this process by laying out the tenons as well as the mortises.

With the leg blanks still square, it's time to head over to the drill press and begin mortising. Tilt the table to 5°, set your depth stop and begin to drill a series of holes using a 5/8" Forstner bit using your layout lines as a guide. When performing this task, it's common to use a bit the same diameter as the width of your mortise. However, I prefer to use a smaller bit and cleanup the mortise walls with a sharp chisel—this not only provides accuracy, but a much-needed peace-of-mind. Proceed to do this for all four leg blanks. With a bulk of the material removed, finish up the mortises by pairing up the walls with the help of a mortise and bench chisel.

The next step is to cut our blanks to their final lengths. Since the legs are splayed at 5°, proceed to cut the blank (on both the bottom as well as the top) at the same angle. Once this is complete, using the traced reference line, rough cut the profile of the leg out over at the band saw

NOTE: Since routing end grain can be tricky, it's best to cut as close to the reference line to prevent any potential tear out. Now attach the plywood template using double-sided tape to the blank, and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6-7 I used a 1" bench chisel to cleanup the mortise faces followed by a 1/2" mortise chisel to pare the edges.

8 Use a Forstner bit about an 1/8" smaller in diameter than the width of your mortises. Leave the fine-tuning to the fine tools.

9 A stop-block attached to the drill press fence aids in repeatable and accurate holes.

flush trim the leg using a pattern bit. Since we are trimming an 8/4 piece of stock, scorching may occur due to the bit overheating—this can be remedied over at the spindle sander. Normally, the next step would be to cut the tenons; however, let's hold off until we are back at the bench.

Creating Battens & Rails

Laminate a couple of pieces of 5/4 stock together and cut your two rails as well as battens to size. Start by drilling out the mortises on the rails with a 7/8" Forstner bit using the same methodology as before. Swap out the bit for a 1/2" Brad-point bit, flip the piece 180° and drill the three dowel holes on the top side. Once this is complete, cut the Ogee profile on both ends of the rail(s) using a band saw. Use a cabinet rasp to clean up any tooth marks left by the saw blade.

With the rails put aside, and the drill press still set up with the 1/2" bit, drill the three dowel holes on the bottom of the battens that will correspond with the ones created on the rails. Then, flip the batten


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15

10-11 To expedite the waste-removal process, I cut the cheeks of my tenons using the bandsaw.

12 Cut the Ogee shoulder first. This allows for a "relief" when cutting the curve.

13 Cut as close to your layout lines as possible to decrease the amount of finishing work.

14 Cutting out the leg is done in several steps. Make relief cuts where there are tight radii, and work on a section at a time.

15 End grain is notorious for blowing out when coming in contact with a router bit. To remedy this, cut as close to your layout line ass possible, thus leaving a minimal amount of material to be removed. Still unconvinced? Use a spindle sander instead of the router.

16 Creating a "channel" on the shoulder layout line allows the saw to move with accuracy and ease.

17 Restore confidence in your cut by using an angled guide block made of scrap wood.

18 The same method is applied to the structural shoulder to ensure continuity and to prevent any gaps between the joint(s).

19 Dry fit the leg assemblies before you commit to glue and clamps.

180° (top side) and counter bore a 3/4" hole approximately 1/8"- 3/16" deep. Once again, substitute your current bit for a 5/16" Brad-point bit (using the same center point) drill about 1/2" down. This counter bore is created to house a series of T-nuts used to attach the top.

Using the band saw, cut the V-notch detail along with the mitered ends and cleanup any tooling marks using the rasp. There is one more detail you may notice, and that is the dovetail created on the top side of the batten. This process is cut to fit and will later discover why.

Stretchers, Short & Long

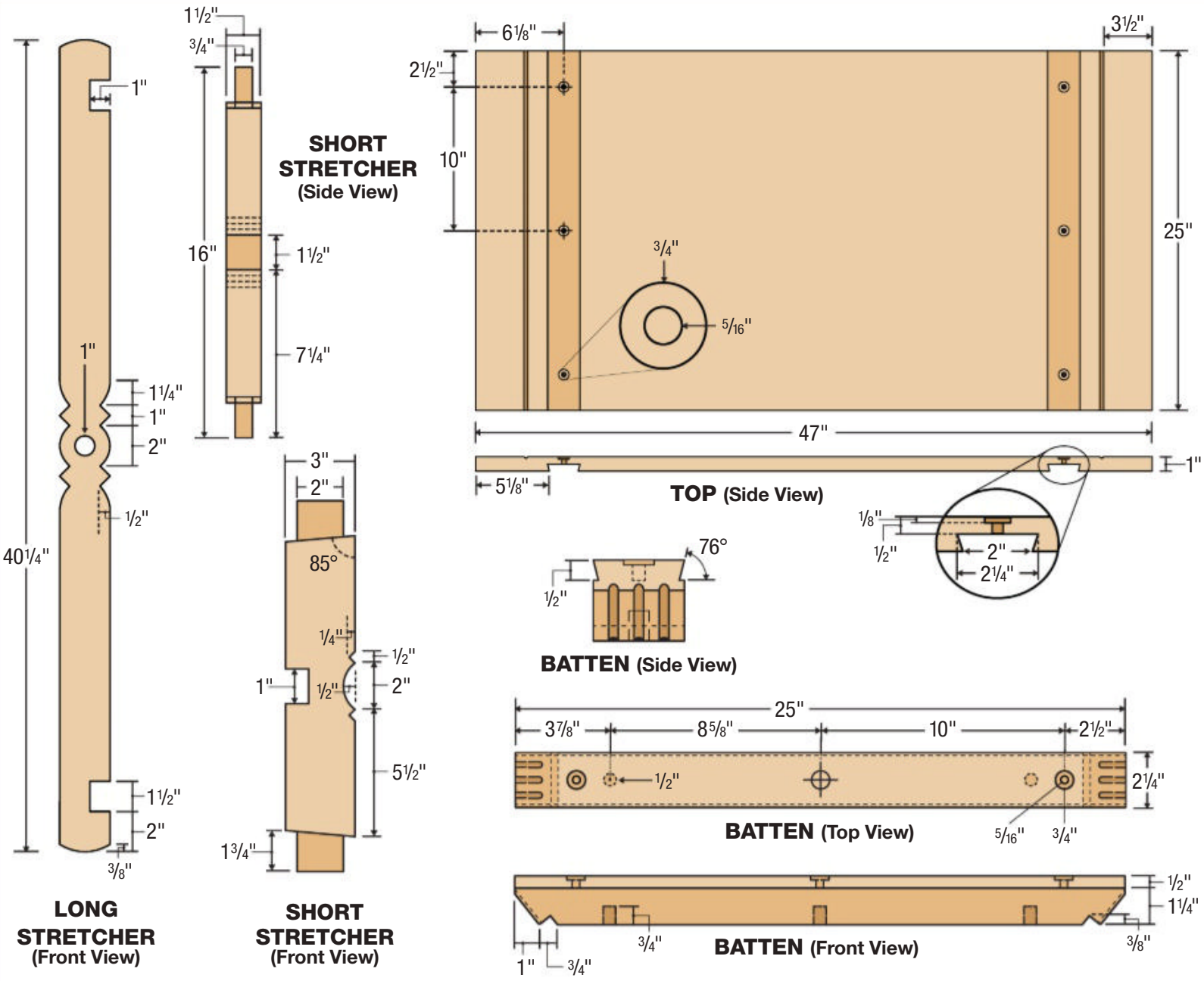
Using the leftover 8/4 stock from the legs, cut your stretchers (both short and long) to their final dimensions. Begin by laying out the tenons on both short stretchers followed by the location of the half-lap joints. With the assistance of a sled and stop block, create the "mouth" of the joint using a Dado blade. If you don't have access to one, don't sweat it, a sharp rip blade will suffice. Remember to sneak up on your cut and check the fit, as it's much easier to remove material than to replace it. With that said, if any ridges remain from the saw blade, make sure to clean these up using a router plane or a sanding block.

To play off the "scrolling" shape of the legs, I chose to incorporate a few motifs on both stretchers to help unify the underbelly of the table. A few subtle curves and a little bit of symmetry go a long way. Once again, take advantage of the band saw to make all necessary relief cuts to successfully complete this process. To further accentuate the existing motif(s), I added an 1/8" chamfer to all of the outside edges of the legs and stretchers.

Accurate Hand-Cut Joinery

With a bulk of our parts cut out, it's time to revisit the tenons on the legs and short stretchers. For this step I chose to cut most of my joinery by

Lyre-Legged Table

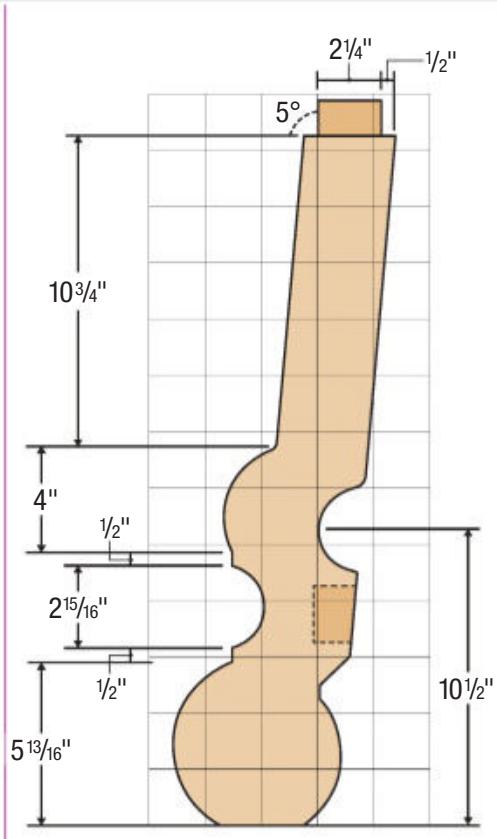


hand with the assistance of a couple shop-made cutting guides. This made for not only quicker, but also more accurately cut shoulders. Start by creating a slight "channel" using a standard bench chisel. This groove will help aid in guiding the saw blade and further ensuring accuracy of your shoulder cuts. Repeat this step on all four faces of each leg/stretcher. This is probably as good of time as any to address the woodworking faux pas on full display in the image(s). You will notice the saw being used to cut the tenon shoulders is in fact a dovetail saw and not a proper carcass saw with crosscut teeth. Admittedly, it had been many years since this saw had seen any use and was more an act of desperation than ineptitude—for this, my sincerest apologies.

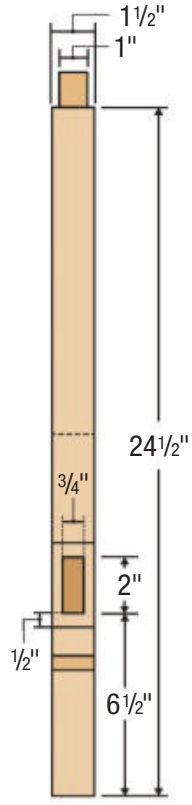
Moving on. Since our legs are already cut to their final profile(s), there is no straight edge to reference. Proceed by making the cuts using the assistance of your ripsaw or utilize a sled in tandem with the table saw. To expedite the process, I went ahead and cut the cheeks of the stretchers over at the band saw. If the intersection between the shoulder and the cheek do not meet at a 90°, use your bench chisel to cleanup any remaining material.

Big Sliding Dovetails

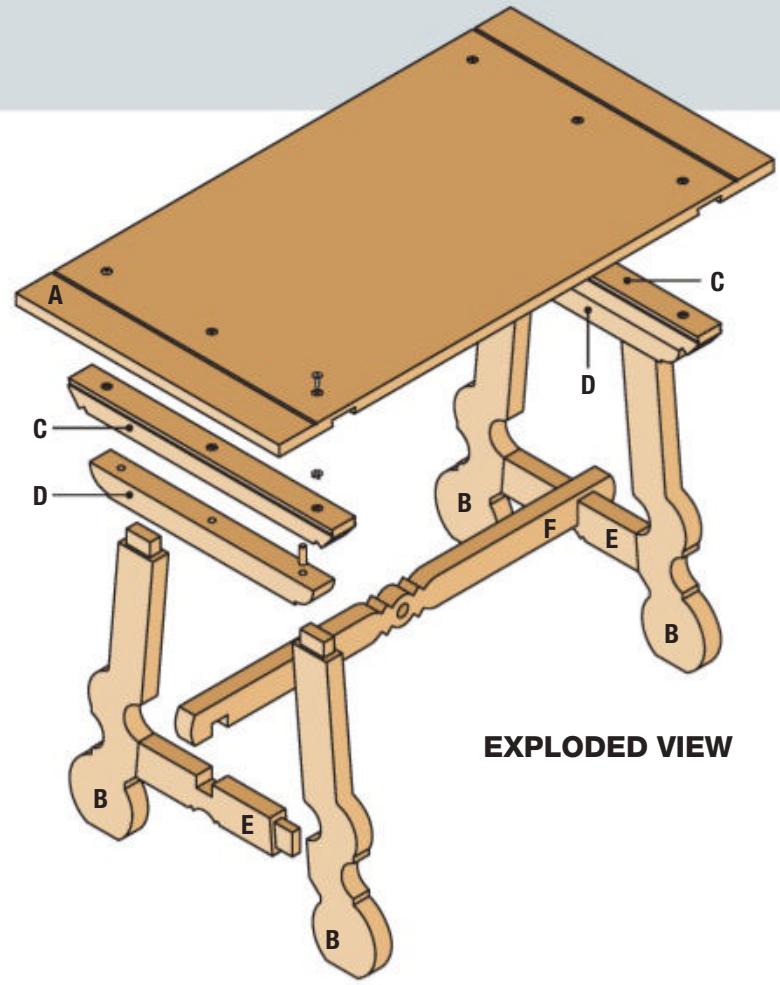
Take this time to glue up a top for your table. Once dry, go ahead and cut it down to its final dimensions. As you can see, there are a couple different applications involved in preparing the top to accept its base. Using a 7° dovetail bit in conjunction with a guide bushing and a jig, begin by making a series of passes with the router until you have reached your 1/2" depth. Proceed to do this on both ends until you have created



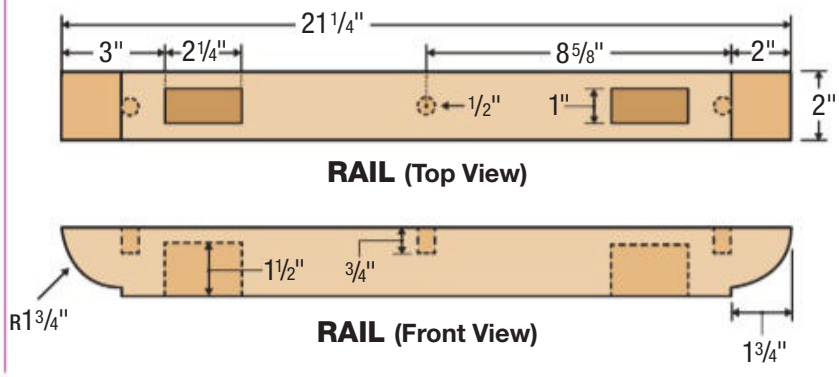
LEG (Front View)



LEG (Side View)



EXPLODED VIEW



RAIL (Top View)

RAIL (Front View)

Cut List

No.	Item	Dimensions (in.) T	W	L
1	**A** Top	1	25	47
4	**B** Leg Blanks	1½	6	25¾
2	**C** Battens	2	2¼	25
2	**D** Rails	2	2	21¼
2	**E** Stretchers (short)	1½	3	16
1	**F** Stretchers (long)	1½	2½	40¼

Hardware

- ¼"-20 binding screws
- ¼"-20 tee nuts
- ½" dowels cut to size

20 Since the T-nut inserts are press fit, I applied epoxy to the recess to further increase their strength.

21 Use a dowel rod to install the inserts. This evenly distributes the blow as well as prevents from any marring.

22 ½" dowels were used to align as well as adhere the batten to rail.

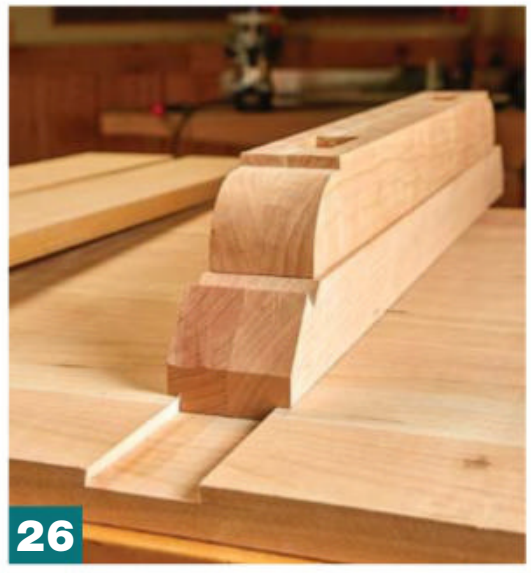
23 Make sure the table top and the jig are clamped down tight to your work surface. This step is germane, as it ensures for a flat (not cupped) dado bottom.

24 If marks are left by the router bit, clean up the bottoms of the sliding dovetail using a router plane or sanding block.

25-26 Once the sliding dovetails have been created, you can sneak up on the fit of the dovetail batten using the router table.

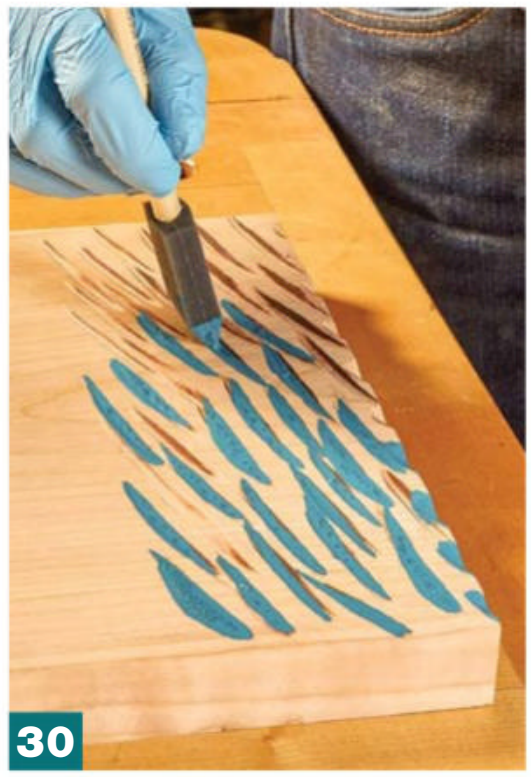
27 Creating the half-lap joints with a dado blade is a quick and accurate procedure.

28 Since the table is designed to be disassembled; a firm, but not a tight, fit is desired. Remember, additional finish will increase the thickness of the material.



the final dovetail dadoes that will receive the battens. As mentioned earlier, we held off on creating the dovetails on the battens until now, and here's why: Creating the pin (i.e. dovetail) after the socket is created allows us to more accurately sneak up on the fit. Using the same bit with the assistance of a router table and a fence, establish the height of your shoulder on one side first. Once this is accomplished, continue to make a series of light cuts on both sides of your batten. Be patient, check the fit often, and eventually the pin will slide into the socket perfectly.

Flip your top over and begin to layout a center line directly above the dovetail socket created in the previous step. For this process, I have found that establishing center and measuring out from this point yields a more accurate measurement, especially when trying to align two independent pieces. Once these points are established, begin counter-boring the 3/4" holes (about



29 Even without paint, the scorch marks left by the angle grinder add a warm contrast against the natural finish of the wood.

30 Coloring outside of the lines is acceptable; however, the more careless the application, the longer it will take to clean up.

31 Make sure to wait until the paint is completely dry before you sand. Otherwise, you may find yourself applying another coat of paint.

1/8" in depth) which will receive our binding screws. Using the same center points, swap out the Forstner bit for a 5/16" Brad-point bit and drill through the top. The bolts used to attach the top are 1/4"-20; however, oversizing the hole allows for seasonal movement as well as any alignment discrepancies.

A Touch of Texture

To complete the top, I thought back to the notorious 'Nail Cabinet' created by American furniture maker, Garry Knox Bennett. Although I am far from the consummate craftsman Bennett is, I do like to think that we share in our affinity for color and whimsy, and often times a defiant approach to design. Although I have no intensions of driving a nail into the façade of this piece, I could hear it calling out for a splash of color and a touch of irony.

With the same router/jig system used in the sliding-dovetail process, swap out the dovetail bit for a V-groove bit. Proceed to make about an 1/8" deep pass, approximately 3 1/2" in from both ends of the top. The purpose of this detail is to visually emulate a breadboard end and to create a defining line between the main part of the top and the ends. In order to achieve the swooping "depressions" detail, grab an angle grinder with an 80-grit flap-disc attachment and begin to make short sweeping passes perpendicular to the grain direction. After completing both ends (to your satisfaction) continue by applying this technique to the ends of the battens. And although not necessary–if you are going to deliberately vandalize your piece, you best make sure its visually accessible from all directions.

To further accentuate the physical scarring just performed, add a bit color to the impressions left behind. For this task, I applied 'Blue Moon' milk paint using a foam brush and then sanded it back once the paint had dried.

Two-Part Leg Assembly

The best way to approach this part of the project is to separate it into two glue-ups. First, start by gluing the battens to the rails using the dowels as a guide for alignment. Once these have dried, you can begin the process of bringing the leg assemblies together. There is a litany of more than adequate choices when it comes to glue out there, and for this project I chose to use West System 105 epoxy combined with the 206 slow hardener. What's great about this formula is the extended working time it allows, which works great when dealing with larger and often times uncooperative assemblies. As an added bonus, it even sands well.

Finishing and Assembly

With the leg assemblies complete, it's time to turn our focus towards the finish. Cherry is an inherently fussy wood to finish due to its drastically contrasting sapwood and heartwood. It also has a tendency to darken with age and can appear blotchy even without stain. Instead of attempting to repress these innate attributes with a series of rather involved finishing techniques, I chose to keep it simple. Three coats of Danish oil to restore its natural luster and a couple coats of lacquer did the trick. Once everything has fully cured, assemble your table, grab a chair, and put your feet up—you deserve it. **PW**

Dillon Baker is a furniture designer/maker and Popular Woodworking's projects editor, based in Des Moines.

Turning a Platter

Push your skills and create a showstpper.

By Jimmy Clewes

PROJECT #2108

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

PHOTOS BY LOGAN WHITTMER

The platter is probably my most favorite subjects to turn. The form is open and shows off the grain in the wood. On the outside, the beautiful double curve of the ogee and a rim that gently curves into the inside makes this piece aesthetically pleasing and ergonomic to hold. It's also utilitarian.

Prepping the Blank

To start, I find the center of the blank using a pair of dividers or compass by scribing four arcs into the surface. Imagine a clock and scribe the arcs from 12, 3, 6, and 9 o'clock into the center of the blank, keeping the point of the compass on the outside points. When you make the four arcs, it will form a cross that indicates the middle.

Cutting the blank round on a band saw will make the initial balancing of the blank much quicker and easier. Even just cutting the corners off to make an octagon will be far faster to turn than from square.

Mount the Blank

There are several ways that the blank could be mounted on the lathe. I use a screw chuck for diameters up to 12". For blanks larger than 12", I prefer to use a 6" faceplate. This gives me more support when turning towards the outside of the platter.

When the blank is mounted securely, make sure that the blank is tight against the face of the screw chuck. I start with the speed approximately 1600 to 1800 rpm. The speed you can turn at depends on the blank being used. For example, if the blank has half sapwood and half heartwood, there will be a harmonic and vibration due to the different densities within the blank. As a guide to speed, I prefer to turn as fast as I feel safe, without any vibration.

First Cuts

Using a 1/2"-long grind bowl gouge, I proceed to true up the outside edge of the platter using a push cut with the bevel "floating" behind the cut, but in contact with the wood. Then, I true up the face which will become the bottom of the platter. I do this with a draw cut—drawing the tip of the bottom wing of the long grind bowl gouge towards me. I do this until I have a clean, flat face on the blank. With the blank now true on the edge and face I prepare a recess that will house dovetailed jaws in a chuck. This will hold the platter when turning the rim and hollowing out the platter.

I measure the diameter of the chuck jaws with dividers and transfer the measurement to the wood. To make the recess, I use a parting tool to make two or three plunge cuts into the blank, side-by-side. These are about 3/16" deep. This leaves enough room to get a bowl gouge in there and remove the rest of the waste. The inside of the recess needs to be slightly dovetailed, and I do this with a parting tool ground at 10° to match my dovetail jaws. Be sure this cut is clean and accurate, as it makes a huge difference to how true the platter will run when remounted.

1 Drill a centered hole in the blank, slightly deeper than your worm screw.

2 Mount the blank on the screw center.

1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3 Use a push cut to true up the rim of the blank.

4 A draw cut, from center to rim, trues the face of the blank.

5 Set a pair of dividers to your chunk jaws.

6 Transfer the jaw measurement to the blank, scribing with the left divider leg.

7 Use a parting tool to form the recess in the platter.

8 Define the outside edge of the foot, cutting half as deep as the recess.

9 A bowl gouge removes the rest of the waste in the recess.

Creating the Foot

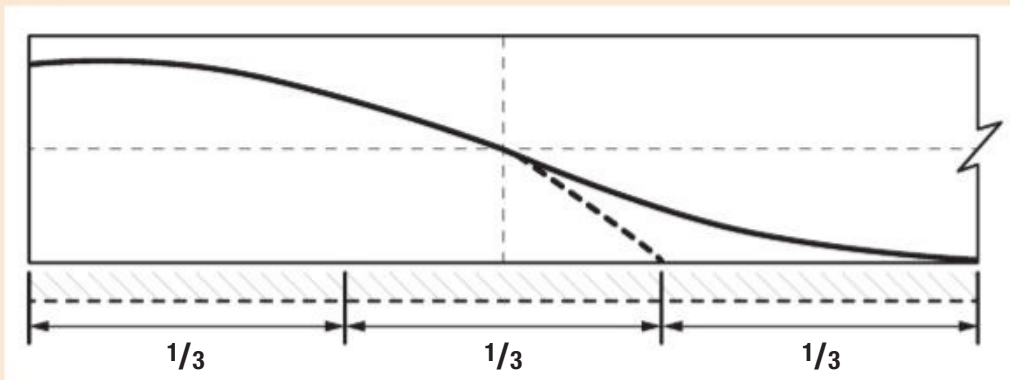
The full diameter of the foot is approximately one-third of the diameter of the platter. From the outside edge of the foot, I make a cut with the parting tool about 1/16" deep, and then remove the excess 1/16" wood from the foot to the edge of the platter. This defines the foot and is the final thickness of the foot when the platter is finished.

An Ogee via Geometry

An Ogee is easy to create via geometry. It's simply a sine wave after all. I start by making a few layout lines to follow as I turn. Divide the area between the foot and rim into thirds. The finished rim is about 1/8" thick. I mark this rim thickness with a pencil line about 3/16" from the back face. This extra thickness allows extra for any changes in the curve that may be necessary. Remember, you can take wood off, but you can't put it back on!

Now that I have the reference marks, I use a draw cut from line closest to the foot to the rim line.

The Ogee Simplified

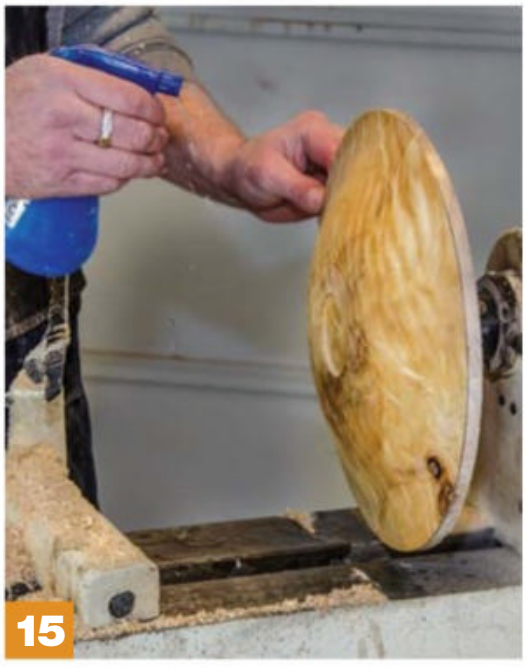


Here, I'm making a simple flat to remove the bulk of the waste. Once the flat is made, I use a push cut to from the first part of (the hollow) of the Ogee curve. This cut is from the rim towards the foot and is against the grain. Yes, I cut against the grain. I do this because it allows me to cut in a position where I can see the profile develop and allows me to see the curve I am cutting. This is a push cut so remember to ride the bevel.

10 Mark the rim thickness and divide the distance from the foot to the rim into thirds.

11 Connect the inner third mark to the rim by creating a large bevel.

12 Cutting from the rim to the foot, use a push cut to create the curve of the ogee.



13 Maker a mark halfway between the foot and the rim.

14 Use a draw cut to form the ogee and blend the two curves together.

15 Use denatured alcohol to raise the grain before sanding.

Finished Ogee

After the flat has been formed into a soft curve, I mark a pencil line at the halfway point between the outer edge of the foot and the rim of the bowl. This is the "inflection" point of the sine wave and where one curve transitions into the other. You can see this in the drawing.

Then, using a draw cut with the grain and again looking at the profile whilst cutting, I remove the waste wood from the high point left after the initial curve cut. These cuts will extend out to the edge of the platter in order to remove any "tear out" from cutting against the grain when forming the initial curve. This is the reason for leaving the extra thickness towards the rim. It allows for these clean up cuts. Here, I prefer the draw cut as I can take off hair-like shavings when refining the ogee curve and I am also in a position where I can look at the profile whilst cutting. A light shining on the edge of the platter allows me to see any high points and refine them.

To determine if the Ogee curve is correct and balanced, I replace the pencil line and then look at the profile closely. I am looking to see if one curve is exactly the other but just opposite and 50/50 in proportion.

Finish the Back

Now on to sanding and finishing. Many turners have their own preferred finish and there are so many products out there that it can be very confusing. The finish I use is very simple and look great.

Depending on how good a finish you get from your finishing cuts will dictate the grade of grit to use first. I usually start with a 180 grit and work through to at least 400 grit, maybe finer if the wood requires it. The sanding speed of the lathe is anywhere from 500 to 900 rpm. I like to power sand, and generally use a 2-inch sanding pad and electric drill. Again, there are many on the market and I have tried several brands some of which are better

16 Power sand the back of the platter through 600-grit.

17 Apply sanding sealer and let it dry before applying a coat of Danish oil.

18 Mount your chuck on the lathe and expand the jaws into the platter recess.

19 Mark the finished thickness of the rim on the edge of the platter.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than others but tend to gravitate towards the "Skilton" brand sanding pad, which I have used for well over 20 years now. They're available in 1, 2 and 3-inch diameters and are designed to be used with Velcro-backed discs.

There is some discussion amongst woodturners tat sanding against the grain by turning the lathe in reverse will give you a better finish. I have never found the need to do this as I tend to like to raise the grain between sanding grits with either water or denatured alcohol.

After sanding, I apply a liberal coat of sanding sealer. My mix is 70% Zinzer's wax-free shellac mixed with 30% denatured alcohol. I find that this diluted mix is drawn further into the pores of the wood and after the first coat is dry and the second applied and dried the wood, it will be sealed for an application of natural Danish oil. After wiping a coat of Danish oil, I let it set for a few minutes before wiping away any excess. I'll let the surface dry and apply as many coats as I feel necessary letting each one dry in between to give me the depth and sheen I am looking for.

The number of coats you'll want to apply depends on the density of the wood and the figure. When the last coat is applied and fully cured, I buff the surface with a soft lint free cloth. If sanded and finished correctly, you'll have a deep sheen and the oil will emphasize the grain and chatoyancy in the wood. It's a beautiful silky-smooth sheen.

Remount the Platter

With the outside finished, the platter is removed and remounted in the dovetail jaws. The dovetail jaws slip into the recess and you can open the chuck to expand the jaws, holding the platter in place. Make sure that the platter turns true and square. If it doesn't and it wobbles, you'll have an uneven thickness on the rim. With the platter held in the chuck, the face can now be trued up and turned to the thickness desired for the rim. Again, I use a draw cut find it easier with more tool control to draw the tool towards me rather than push it away. There's a reason Japanese saws planes work in the same manner!

When you have trued the face and turned it down to the desired thickness, we can now work on the rim itself. I create the rim at this stage in particular, because it's possible when you start to remove the waste from the center of platter that tension and stress will be released within the blank. This can cause the platter to move slightly, becoming warped or oblong. If the platter moves, it's difficult to sand a rim evenly when the rim is running out of true!

20 Mark out the rim and divide it into the thirds.

21 Use a light draw cut to slightly round over the outer third of the rim.

22 Make a push cut to angle the inner 2/3rd of the rim towards the center of the platter.

23 The final rim should be rounded and flow towards the center.

24 A light cut with a parting tool defines the rim.

Make the Rim

My preferred proportion for the rim is that it's a third of the radius of the platter. The rim itself is also not flat–it has a slight curve and is angled in towards the hollow of the platter.

After making out the rim width, the rim itself is divided into thirds again. The outside third is turned away first, using a draw cut. Here, you're looking for a slight curve towards the outside of the platter, with the pencil line being the high point. On the inside edge of the rim, use a push cut towards the center to turn the inside two thirds curving down towards the center.

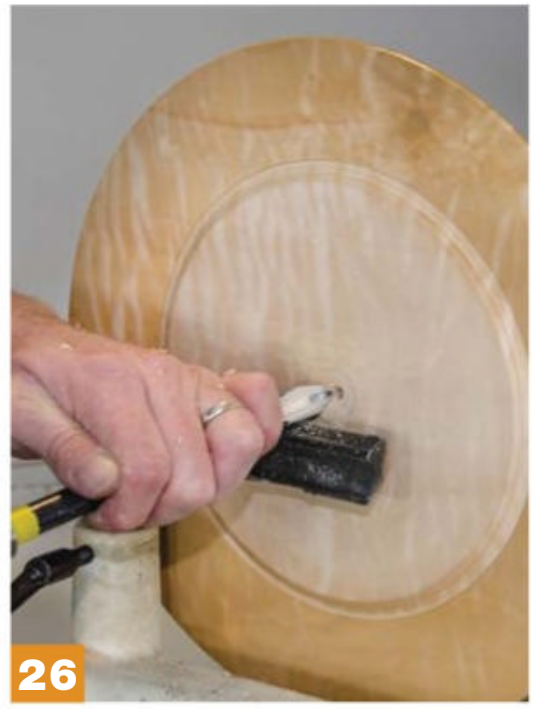
The design of the rim is intended to do two things. Aesthetically, it draws your eye into the piece. But, it's also ergonomic as well. As you hold the platter, your thumbs rest on the curve and it feels "right".

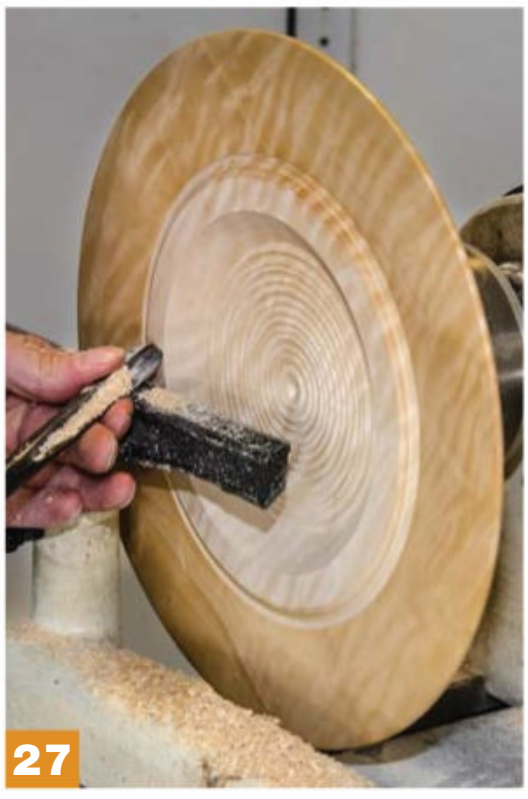
Once the rim has been turned and shaped, I sand it and apply sealer so that it's ready for the Danish oil finish later.

Now, on to the Hollowing

As I mentioned before, I prefer the rim to be approximately a third of the radius. To give me a defined starting point for hollowing, and a clean entry cut, I use the parting tool to make a small groove where the rim transitions into the hollow. This will also allow for the bevel of the bowl gouge to rest on it when cutting away from the rim into the middle of the platter.

I start hollowing from the middle and go as deep as the hole left by the screw chuck, then work my way out to the edge of the rim of the platter. This technique leaves some material in the middle that





25 Sand, seal, and finish the rim.

26 Start hollowing the platter from the centercut. Leave some waste to keep the blank sound.

27 Work back towards the rim, finishing the interior in sections at a time.

28 Make smooth finish cuts from the outside towards the center.

29 Sand, seal, and oil the platter and let it cure before using it.

Tools & Materials List

- 1/2" long grind bowl gouge
- 1/8" parting tool
- 3/8" micro-bevel bowl gouge
- 1" round nose scraper (if necessary)

Finishing

- 2" Skilton sanding pad
- 2" sanding discs (120 to 400 grit)
- Shellac and denatured alcohol mix (70% Shellac/30% denatured alcohol)
- Danish oil

supports the platter, whilst getting the first half of the hollowing done. Where the inside edge of the rim meets the hollow, I make a small undercut with a 3/8th micro bevel bowl gouge. This leaves a very pleasant, ergonomic feel to the platter. When I am happy with the lead in curve from the edge of the rim to where I had previously hollowed, I continue to remove the rest of the waste wood working the bowl gouge from the outside into the middle. This cut is in the direction of the grain and, if your gouge is sharp, leaves a nice finish.

Be aware that the platter is being held in a recess and that the leading curve into the platter does not go too deep. If it does, your last couple of cuts can enter the recess and leave you with a hole in the platter! If you need to, you can use a curved scraper to refine and blend any high spots on the inside of the platter.

After the inside is completed, I sand and finish the inside curve in exactly the same way as the outside working through the grits of abrasive, sealing and then a light coat of Danish oil.

If all goes well you should end up with a beautiful, ergonomic, aesthetically pleasing utilitarian platter! **PW**

Jimmy Clewes teaches woodturning from his shop in Las Vegas and at events around the globe. See more of his work at jimmyclewes.com.

PROJECT #2109

Skill Level: Intermediate
Time: 1 Week
Cost: $400

The Maker Workstation

A modern workbench system

By Tim Celeski

PHOTOS BY THE AUTHOR

Most workbenches come with a little history. This history is personal. My very first woodworking project was Tom Casper's clever and simple, *"Workbench in a Weekend"* workbench article in the long gone and revered *Woodwork Magazine*. It's a great bench. It got me excited about woodworking. Later while editor at *American Woodworker*, Tom updated it and designed a clever box beam MDF workbench.

Several years later – over a few beers of course, Tom challenged me to create my own plywood workbench. Being a designer who likes a good challenge, I said I'd think about it. And, so I did. For several years, in fact. The result is a new kind of workbench designed for modern woodworkers and makers. The Maker Workstation. A modern workbench system.

What is a Maker Workstation?

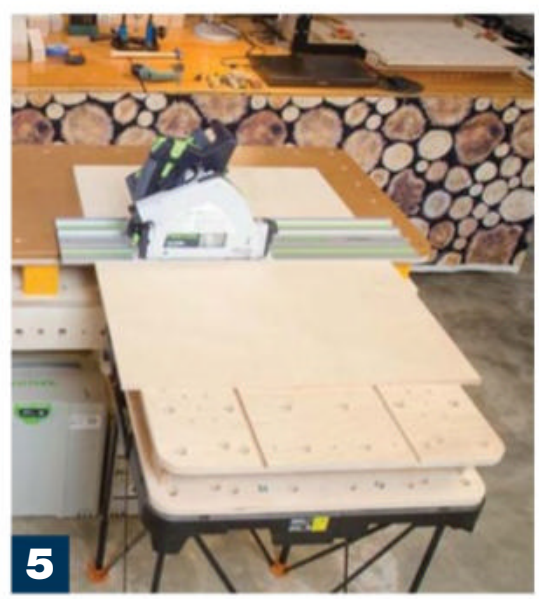
What makes the maker workstation different than conventional workbenches is the various ways it can be modified and the different ways it holds workpieces. Its key feature is that it's adaptable to different needs and is customizable. It's a system that uses workstation "furniture" to position and hold work, customizable top and side plates, modules, fixtures, hardware, tool holding capability and accessories.

Unlike traditional workbenches, the Maker Workstation is made out of plywood with a MDF top. Instead of hardwoods and classic joinery, it takes advantage of the stability and strength of Baltic Birch plywood, stack lamination, torsion box and I-beam construction, and the flatness and surface hardness of MDF. Instead of joinery, it's assembled with a handful of Festool Domino joints, glue, screws, and a lot of T-nuts.

The top is a complete structural unit that performs like a heavy-duty torsion box. It's heavy, flat and stiff. The middle and bottom layers are 3/4" plywood separated by five-layer-thick, glue laminated risers. The replaceable work surface attaches to the middle layer with screws and T-nuts. The laminated plywood base utilizes the strength of the top unit, has no long stretchers, is stiff and stable and is completely open in the middle.

What can the Workstation do?

The maker workstation handles traditional woodworking tasks and adds new capabilities for modern power tool woodworkers. By combining a grid of dog holes and workstation furniture the user can hold a work piece of any shape and position it where it's most comfortable to work with. With modules, plates, and tool sets it can adapt any woodworker or maker task or project.



1-6 The bench is versatile and adaptable, for assembly, workholding in all planes and keeping yourself organized.

Traditional vs New Workbenches

Refined over centuries, traditional workbenches are a superb platform for hand tool woodworking tasks. They really work. I've used them for decades and built several. With heavy hardwood construction and a flat top, they handle the physics of chopping, cutting, and planning. Parts are held with vises, stops, holdfasts and clamps. As good as they are for working with hand tools, there are a few shortcomings when working with other tools. Work height, part positioning and holding and adaptability to task are top of the list.

What's Different About the Maker Workstation?

For improved power tool control and closer observation without bending over, the maker workstation is about 2" taller than a traditional workbench. Unlike a classic bench where parts are held down to the top with holdfasts and clamps, the workstation uses dedicated furniture, hold downs and accessories to control parts both laterally and vertically.

A major design goal is the ability to position and secure any size or shape work piece for using modern power tools like Festool's Domino joiner, track saws and tasks like carving or project assembly. "Position" is key here. Because the workstation grid requires CNC accuracy to build, that accuracy is available to the user as a tool.

All components are designed around a precision grid system. A grid system is a system of lines and intersections based on a set of standard dimensions designed to enhance a task. If the work surface and components are all accurate to the grid, they can interact. In the case of the maker workstation, the dogs, hold downs, furniture and plates can quickly be moved around to position and secure workpieces for various tasks.

Primary grid lines are spaced 4" with 3/4" dog holes. Sub-grids sit underneath. (NOTE: A 96mm/20mm metric version of the maker workstation will be available soon.) Combining known spacing, measurement and reliable 90° angles let the user position and square a workpiece anywhere on the bench for work and project assembly. From a designer's perspective, a grid-based system opens up a lot of exciting possibilities. Yes, there's a lot more to come.

7-9 Dogs, furniture and a cheese plate. A workstation collection should include several lengths of furniture and wedges for workholding. Furniture, dogs and dog-clamps or wedges secure this panel for some carving.


7

Workstation System Components

Workstation Furniture

Most maker workstation furniture is 2" wide and dog holes are spaced 4" apart. This allows users to position and square workpieces in convenient and comfortable locations. Work can be secured with wedges, dog clamps or threaded hold downs.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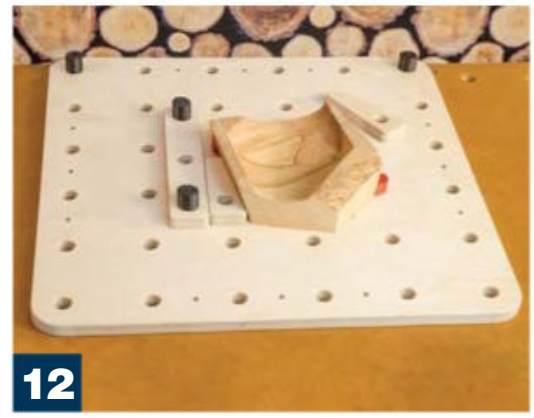
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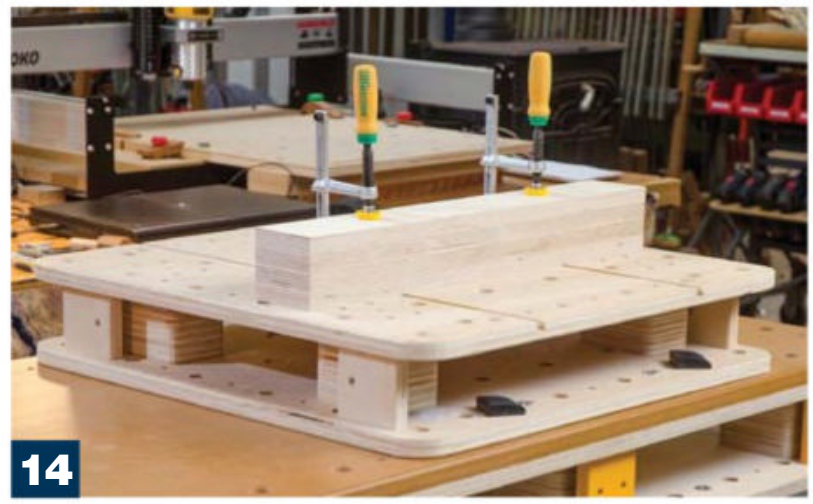
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10-12 The top plate is one of the most versatile accessories to clamp objects of any shape. A bonus is that the plate is completely removeable without having to unclamp the workpiece.

13 Top plates can also be created for specialty fixtures and jigs or as spoil boards that protect the top for track saws, drilling and routing.

14 Stacks are units that turn a Worx Sidekick work table into a side bench that can extend the workstation's work space. They can also be used as elevated, open-sided work surfaces for power tools, assembly and more. Dog holes and Microjig dovetail clamps can be combined to position and hold any work piece to the workstation base.

15 Because the workstation and base use the same grid system, top plates can be used horizontally and vertically. When mounted to the base, the plates are flush to the edge of the workstation top.

Top Plate System

Rather than a sea of holes interrupting the work surface, add-on top plates give users flexibility. A high density or custom arrangement of dog holes and hold downs can be added by mounting a top plate as needed. The plates register to the work station via dogs and can be attached via hold downs. The 72" workstation is designed for three 23" top plates. A great use of top plates is to add extra holding versatility as needed. Added dog hole density gives the user flexibility to hold smaller or odd-shaped work pieces. Custom arrangements, specialty fixtures and hold downs allow the maker station to adapt to the task.

Side Plate System

Side plates are 3 1/2" x 16" and mounted via 14 side plate mounts

along the sides of the workstation. Side plates can be specialized and make it easy to add tool holders or modules to the workstation.

Dogs

The workstation uses commonly available round bench dogs and dog accessories that are typically 0.74" in diameter for 3/4" dog holes. I purchased several different kinds. The orange ones came with the Worx sidekick and the dark gray dogs have tabs on the end and cushioned tops. The black dogs are slightly smaller at 0.72" for a looser fit. Every dog has its place. I recommend workstation builders acquire a couple of types and build a starter set of eight or more plastic dogs before beginning construction.

Not finding bench dog designs I liked, I created several new designs for specific workstation tasks. I 3D printed and tested dozens for the maker workstation. Though the dogs may be plastic, they're tougher than they look. I have yet to break one. All the 3D models I created for the maker workstation are free and shared at www.thingiverse.com.


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16 I made a side plate with a magnetic strip on my right side to quickly stash hand tools or hold metal parts.

17 Side plates can also mount modules such as a vise module. Rather than permanently mounting a woodworking vise in a single location, instead the vise is mounted to a module that can be moved to your choice of 10 locations around the workstation. It's attached with two knobs or screws to the side plate mounts.

18 Side plates can be simple or specialized. For those that like to organize their tool sets on French cleat walls, cleat plates can be attached to the workstation. This makes it possible to swiftly move tool sets to the bench as you need them.

Maker Workstation Online Articles

Among the challenges when writing a print article like this are fitting a lot of information into a limited space. Being a new kind of workbench, significant print space needs to be dedicated to introducing the design and features of the workstation. New techniques, tools and methods and a step-by-step building process also require a lot of room. With those limitations in mind, this print article is focused first on introducing the Maker Workstation. The article is supported with companion online articles that aren't space limited and videos to help Popular Woodworking readers build a maker workstation. Included with the online series are DXF files for making workstation and side bench templates, suggestions for getting templates made and PDF drawings of the workstation.

Go to www.popularwoodworking.com for the following companion articles:

- A Video Introduction to the Maker Workstation
- A Step-by-Step Guide to Building the Maker Workstation Top
- Building the Maker Workstation Base
- Maker Workstation Furniture, Components and Vise Module
- Using Large, Small and the Shaper Origin CNCs to Make the Maker Workstation

19 Off the shelf bench dogs from Worx and other manufacturers.

20 Though not required, I 3D-printed bench dogs specifically for the maker workstation, including round, square and notched versions.

21 The full complement of bench dogs, threaded knobs and other accessories. I used Rockler's portable drill guide to drill dog holes at a perfect 90° angle.

I print dogs in different colors to indicate function at a glance. Black and gray dogs are standard shapes and mostly used for workstation furniture registration and holding. Red dogs have different face shapes are used for bench stops. Dogs with ridged handles for grip are tight fitting for registering templates and layers during workstation construction. Indented dots, like those used on dice are imbedded into dog tops to indicate dog length so when stored on the workstation legs, I can grab the ones I need. One dot is one plywood layer high, two dots, two layers high, etc.

3D printers are great design tools and handy for creating jig parts, tool holders and other useful things around the workshop. I created a number of 3D printed parts for cam clamps, vise handles, prototypes of a hand rest that improves the Rockler Portable Drill Guide, soft plastic cushions to make the adjustable feet stickier and spacer sets for the upcoming workstation Festool track saw module that integrates the tool with the maker workstation.

Building the Maker Workstation

The maker workstation is designed to be built by experienced beginners to advanced woodworkers as long as they're comfortable with basic woodworking tools and tasks. Being primarily made of plywood, it costs around $300 or so to build.

Though plywood construction might imply casual, building the workstation demands a commitment to working at a high level of precision, CNC level precision. Since many woodworkers don't yet have access to digital woodworking tools, I designed this project to be made with CNC-made templates and power tools. DXF template files and PDF drawings are available with the companion online articles. With that in mind, I'll take you on a tour of how the templates work and a new woodworking tool I used to build the maker workstation.

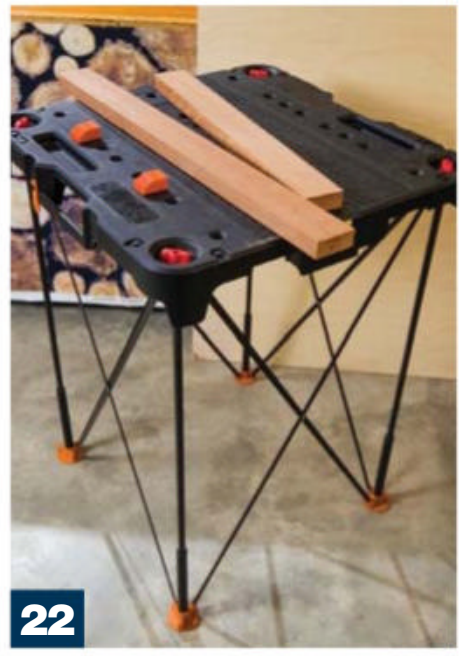
First, I Built a Bench to Build a Bench On

Among the challenges building my first workbench were two classic woodworkers chicken and egg questions: How do you build a workbench without a workbench to build it on? How do you build it without a shop full of tools? I struggled with a rickety Workmate and too much time working on the floor using just an old Skillsaw and a drill for tools. It was a great bench but not fun to build. So, in honor of this being the 25th year since that first bench, I approached this project in much the same way — as a new woodworker without a bench to build on and minimal tools. This time I put together a modern toolset and used a Festool Tracksaw, a Rockler Portable Drill Guide, a router and cordless drill.

First, I built three small workbenches to build the 72" workstation on. The Maker Side Bench is a smaller, simplified version of the Maker Workstation — same concept

and construction with less parts, make it a great warm up for the main event. Plus, when you're done, you have same height side benches that expand the physical boundary of the maker workstation.

I started off by using the excellent, 32" tall Worx Sidekick portable work table as a foundation. Using a template, I built what I refer to as a "stack" that mounts onto the Sidekick, that turn it into a portable woodworking workbench with many of the features of the full-sized maker workstation.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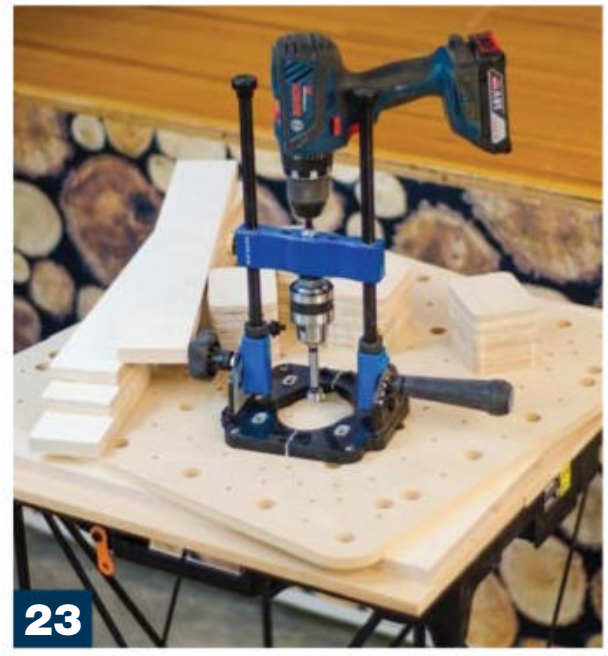
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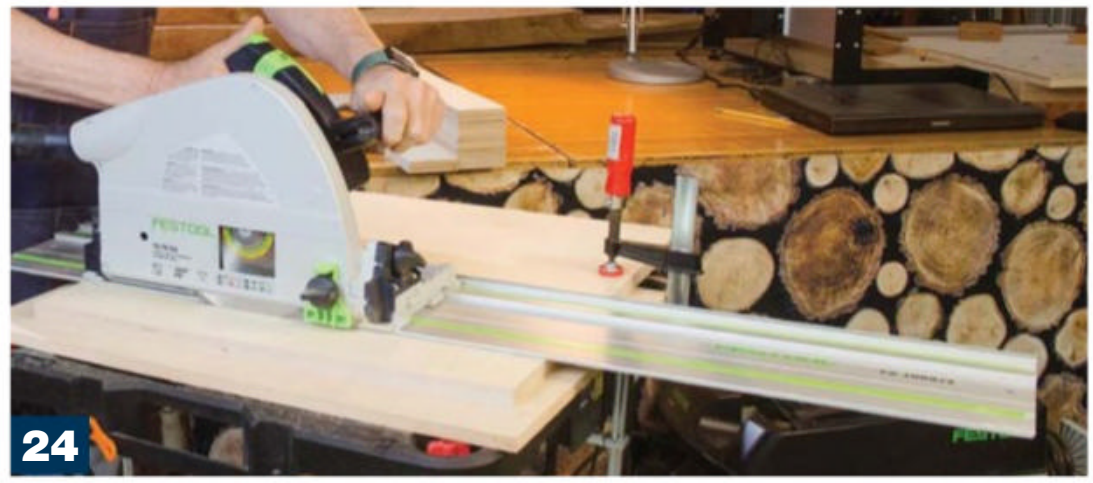
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22 The bench build starts on an inexpensive worktable (that's turned into a more versatile worktable once the bench is built).

23 A portable drill guide is one highly recommended tool for this build. Rockler's is one of the best out there.

24 A track saw is also an indespensible tool for making this workbench. It's easy to make precise, repeatable cuts, and it's much easier to bring the saw to the plywood and try to cut full-size sheets on a table saw.

25 A dedicated offset block helps align the track saw track.

26 Aligning the Rockler drill guide to the template, ¾" dog holes are drilled.

27 Side bench riser blocks are made from offcuts, four stacks of plywood thick, and elevate the working surface to match the Maker Workstation.

28 Four extra dog holes align the "stack" to the Worx Sidekick.


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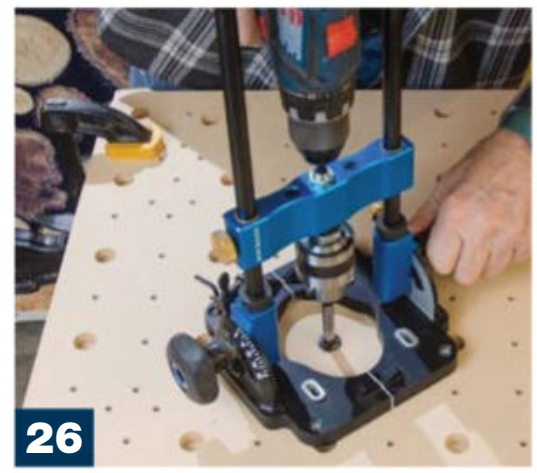
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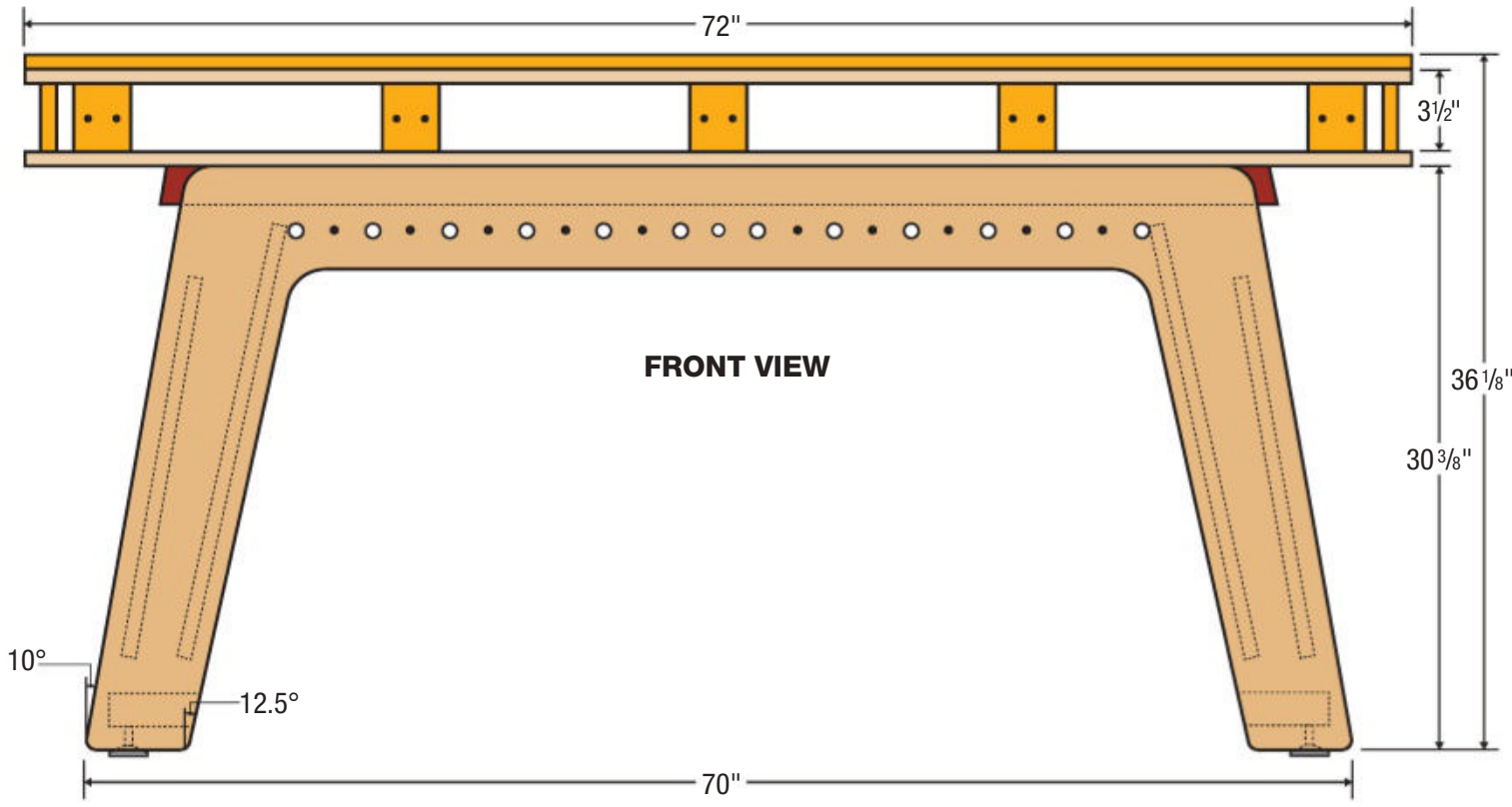
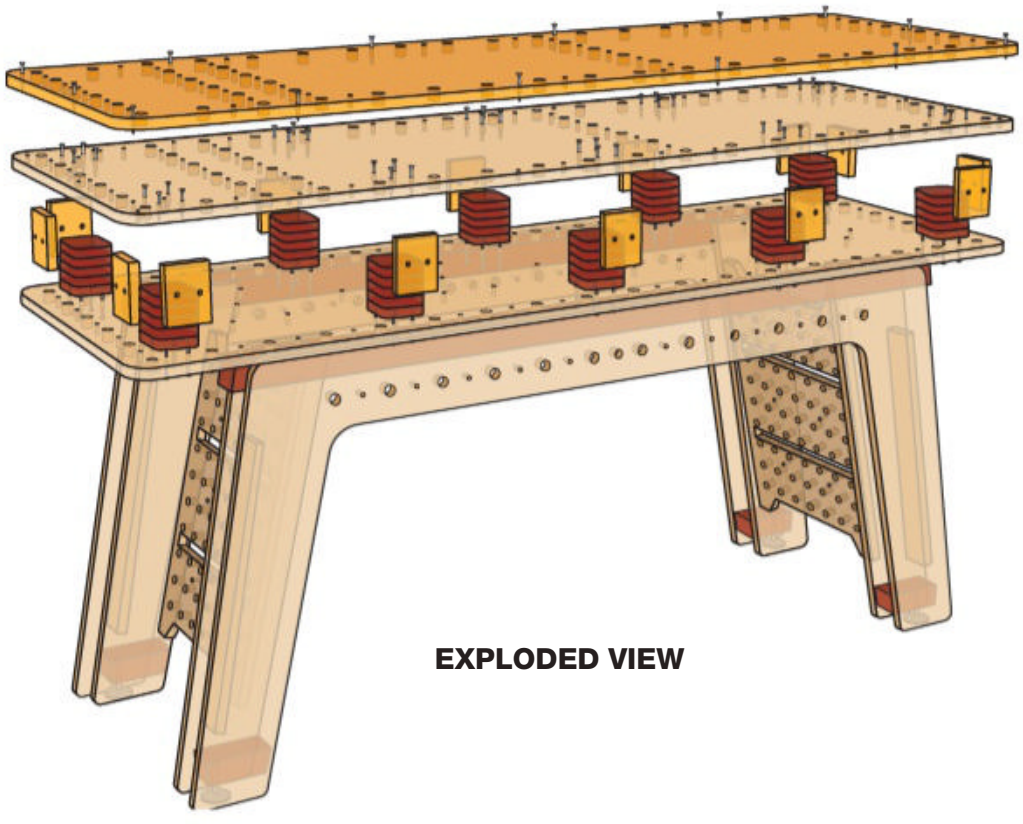
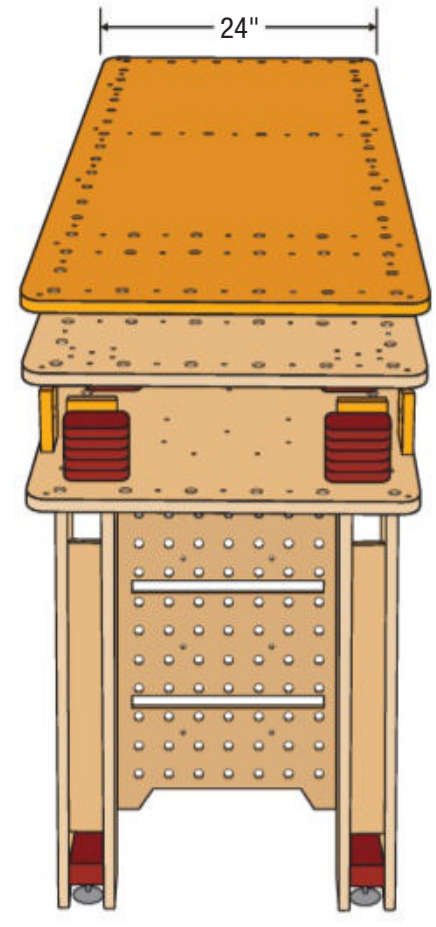
Maker Workstation





EXPLODED VIEW

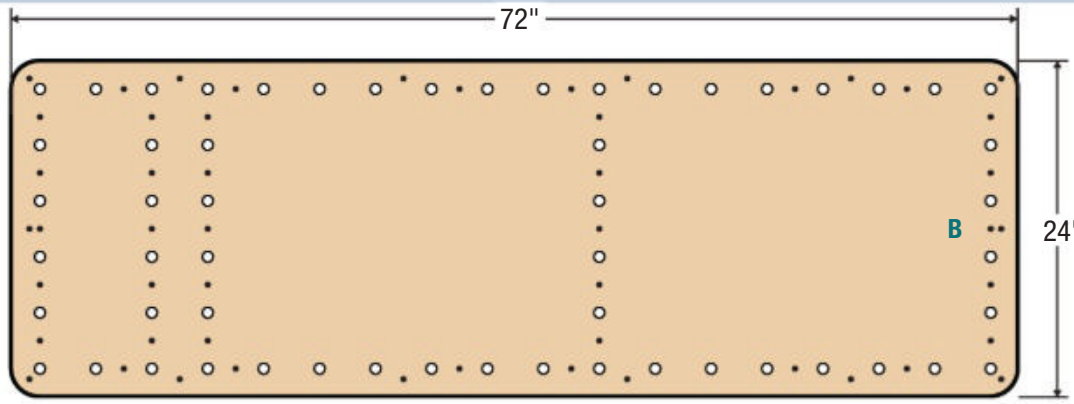


SIDE VIEW

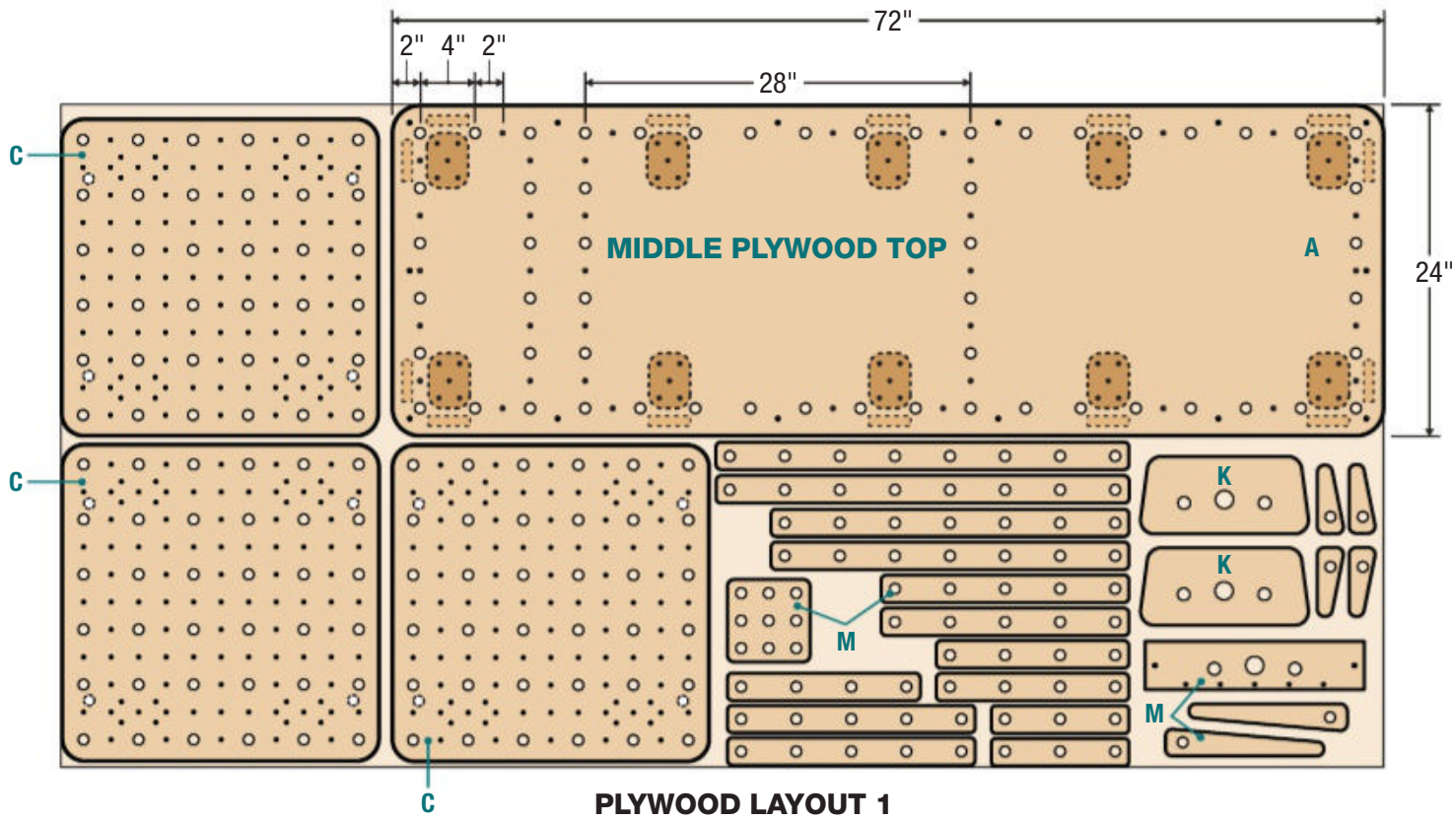
Full Plans Online

Plans and cut lists for three different sizes of benches, plus a metric version, will be available at popularwoodworking.com/makerworkstation.

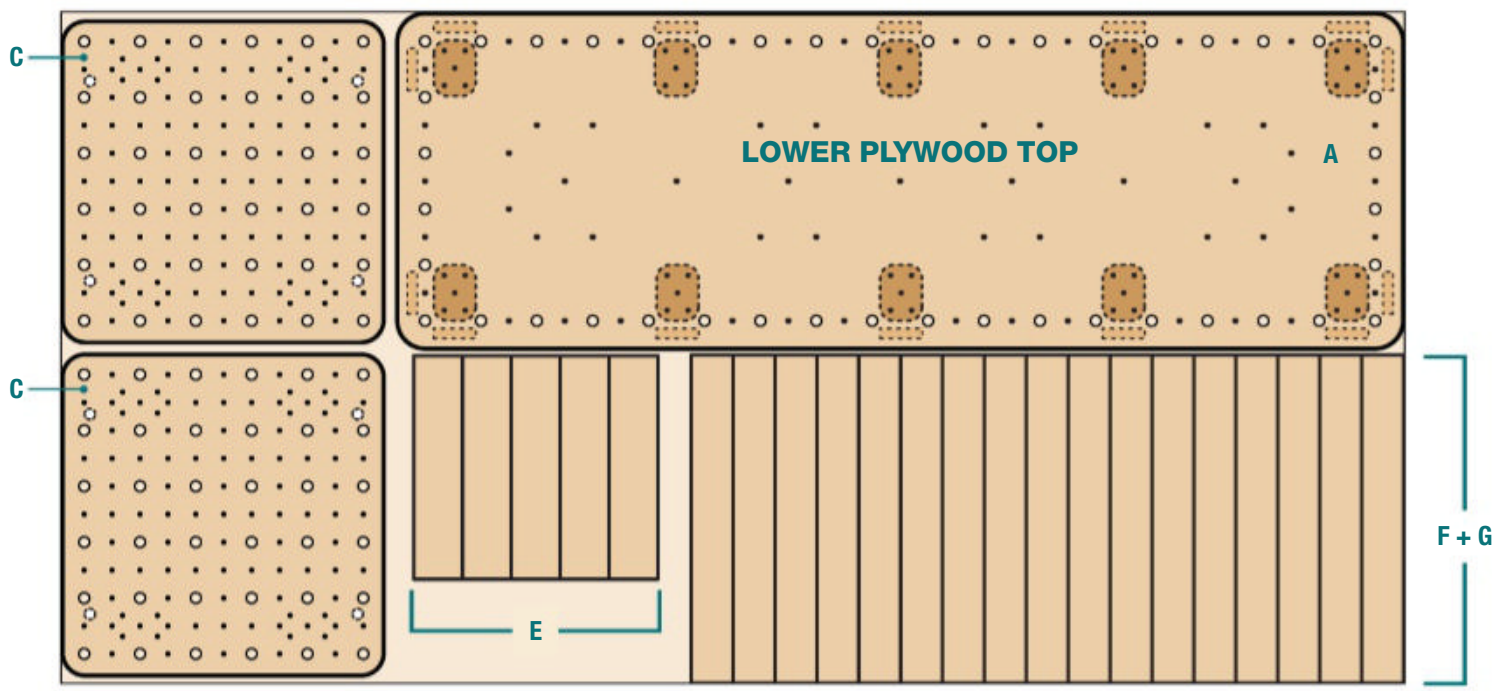
Maker Workstation



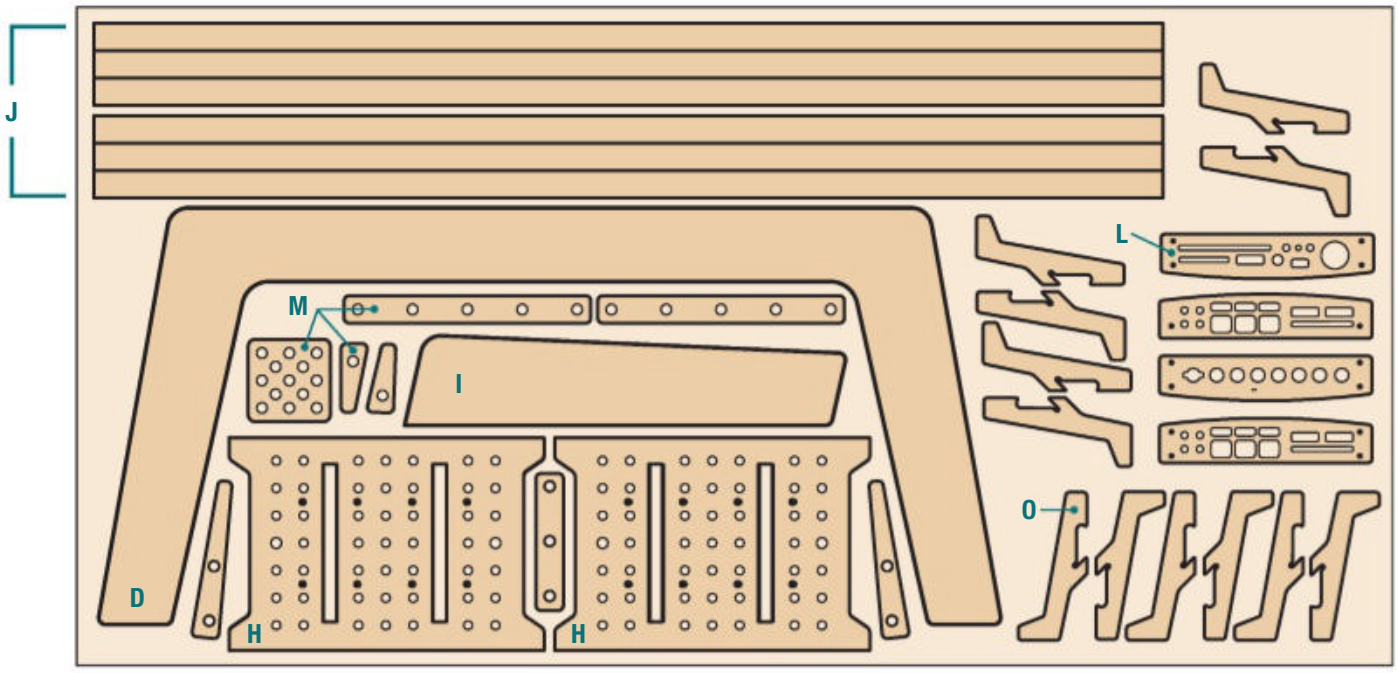
MDF TOP



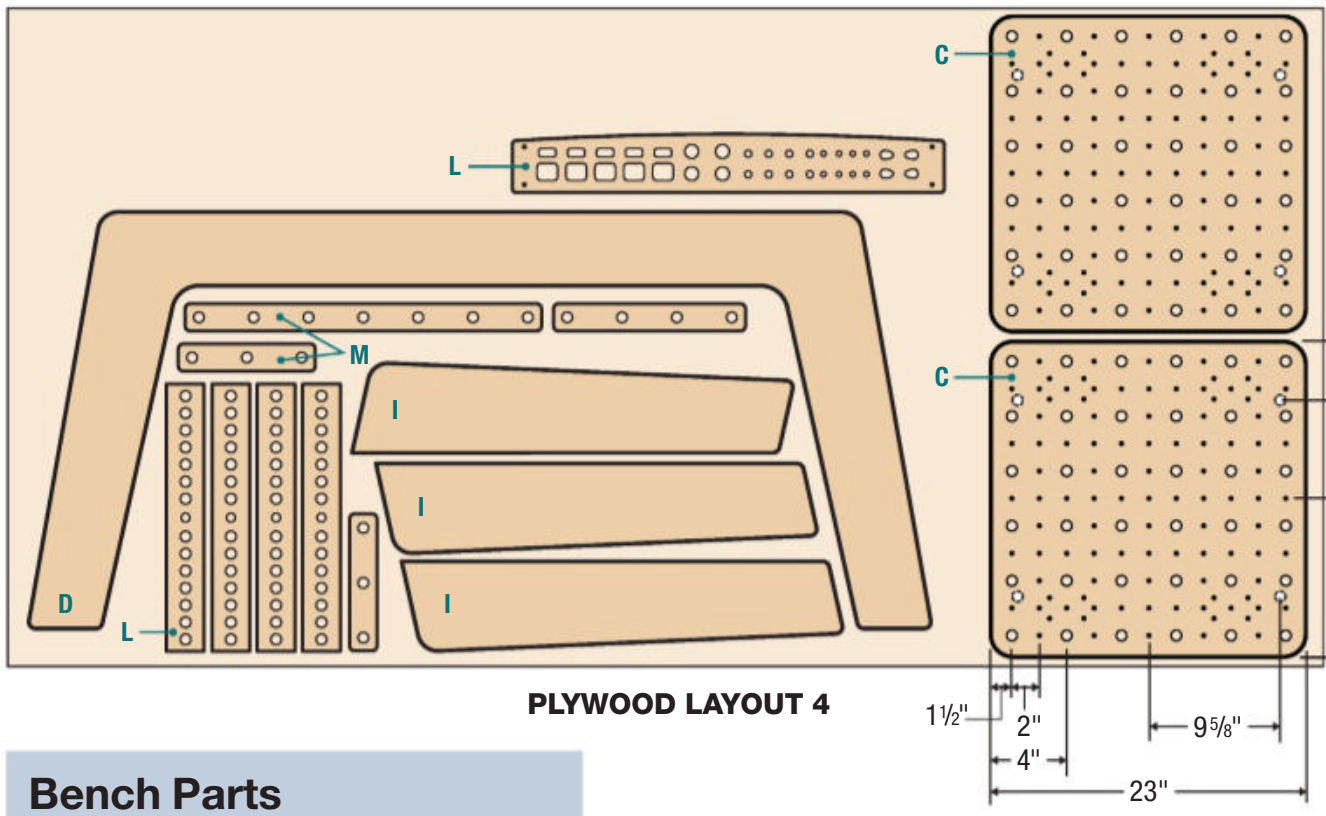
PLYWOOD LAYOUT 1



PLYWOOD LAYOUT 2



PLYWOOD LAYOUT 3



PLYWOOD LAYOUT 4

Bench Parts

No.	Item	Dimensions (in.) T	W	L
2	**A** Plywood Tops	3/4	24	72
1	**B** MDF Top	3/4	24	72
7	**C** Top Plates	3/4	23	23
2	**D** Outside Legs	3/4	30 1/2	60
2	**E** Side Plates	3/4	3 1/2	16
-	**F** Riser/Mount Stock	3/4	3	23
-	**G** Side Plate Mounts	3/4	3	4
-	**H** Side Stretchers	3/4	15 1/2	23
4	**I** Inside Legs	3/4	7 1/2	32
6	**J** Lamination Strips	3/4	2	72

Bench Furniture

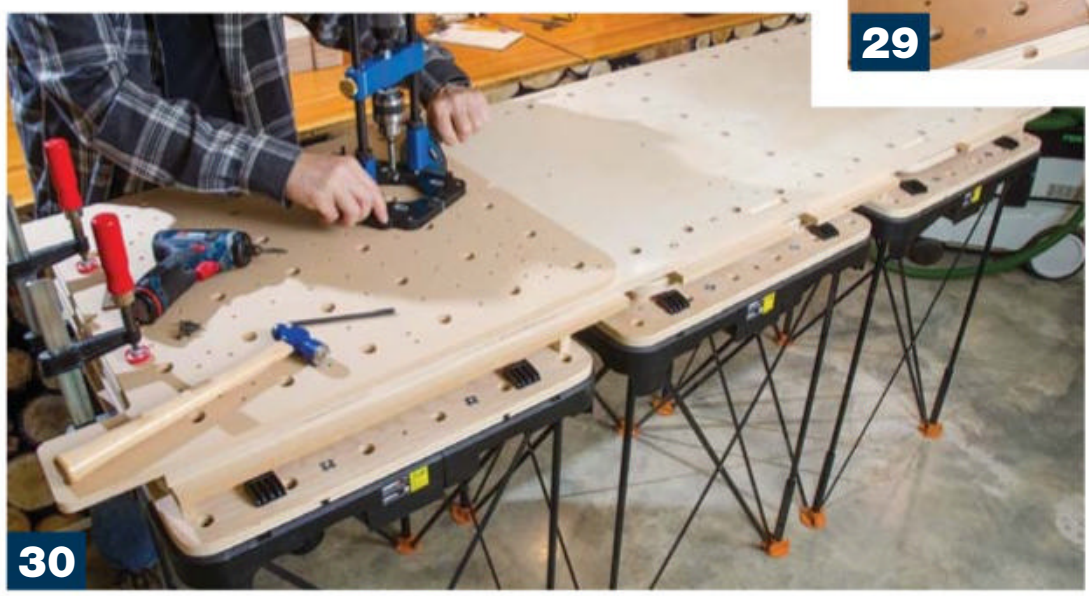
Item	
K	Vice Plates
L	Accessory Holders
M	Bench Furniture
N	Wedges
O	French Cleat Supports

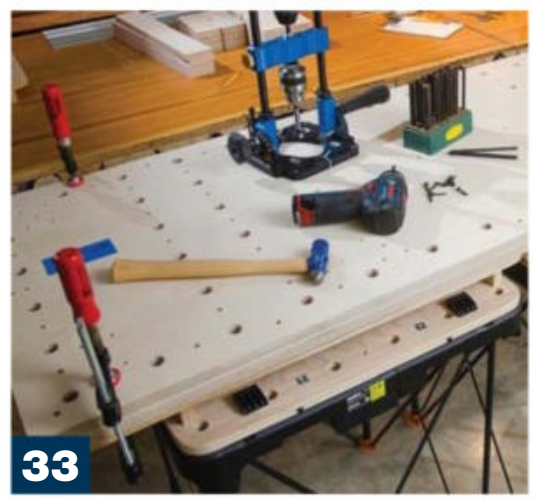
Full Templates

Plans, cut list, and more at popularwoodworking.com/makerworkstation.

Precision is Key to Maker Workstation

For the workstation grid system to work, every component has to be precise. Precision templates are the critical ingredient to making the workstation. Armed with a CNC-made template and a new tool, the Rockler Portable Drill guide, you can come close to CNC accuracy. The templates use dogs for registration to step along the 72" workstation layers.





29 A CNC made MDF template ensures you are able to accurately drill all of the grid holes.

30 Align the template on one side of your top (start with the middle, plywood layer) and use the drill guide and a ¾" Forstner bit to create grid holes.

31 The template aligns with the holes you previously cut and is positioned with a pair of bench dogs.

32 The process is repeated for the last part of the top.

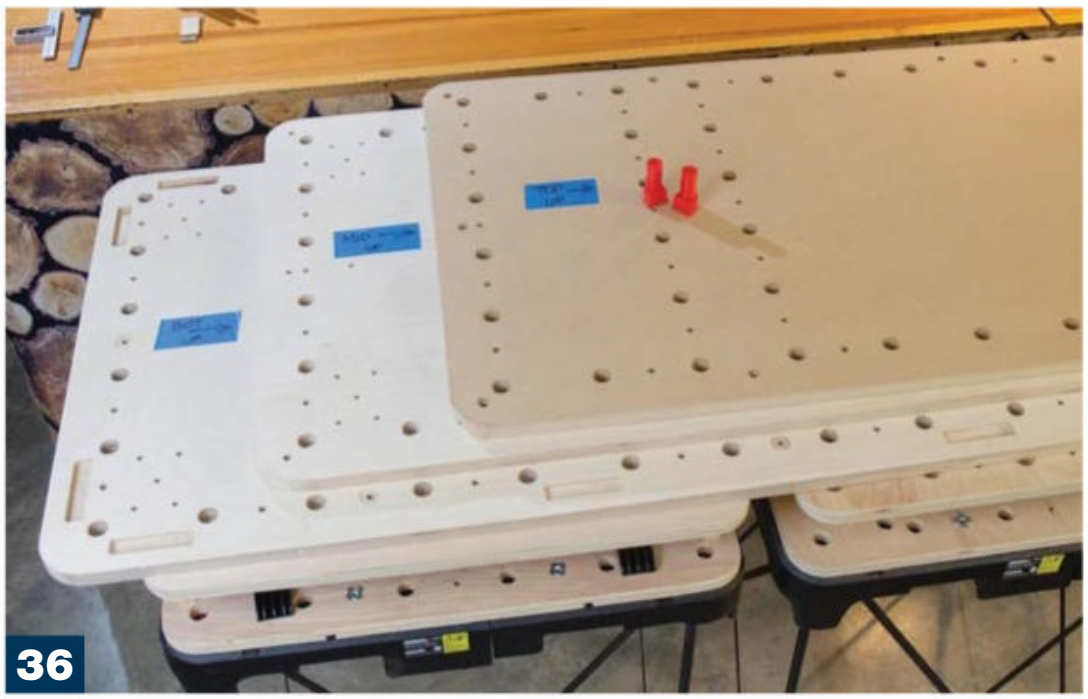
33-34 With the middle layer done, it becomes the template for the top and bottom layers.

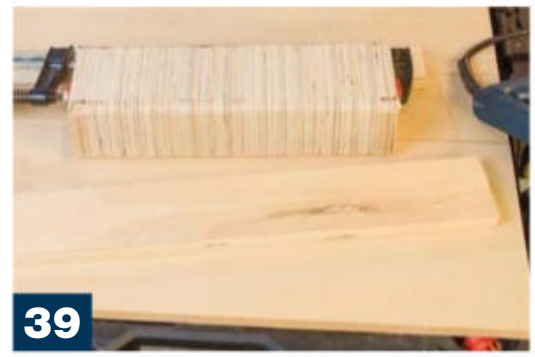
35-36 Countersink the top's alignment holes. When finished, you chould have three 72" top layers that line up.

37 The holes between dog holes are for built-in hold downs. ¼"-20 T-nuts are pounded into position. Buy a box of 100. The workstation uses a lot of then.

38-39 Risers are five-layer stacks of 3" x 4" laminated plywood. Build glued up strips first, then cut to size. Plywood has sharp edges so round the corners of the risers.

40 Drill a ½"-deep registration hole in the center of each block to keep things aligned.



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41 The riser blocks are positioned and aligned square to the sides with small pieces of dowel, leaving an open space between the tops.

42 The side plate mounts are positioned along the open sides of the bench to hold side plates for workbench tools and modules.

43-44 Assembly and squaring layers with 10 risers and 14 plate mounts is a little fiddly at first. Thankfully, no glue is involved. Just a lot of 2" screws.

45 The top is attached to the middle layer with screws and T-nuts. Once attached, it's flush trimmed and the top rounded over. Dry plugs hide the screw holes.

46 Finish is applied to protect the MDF top. The MDF top is also designed to be replaceable if needed (another reason it's just attached with screws).


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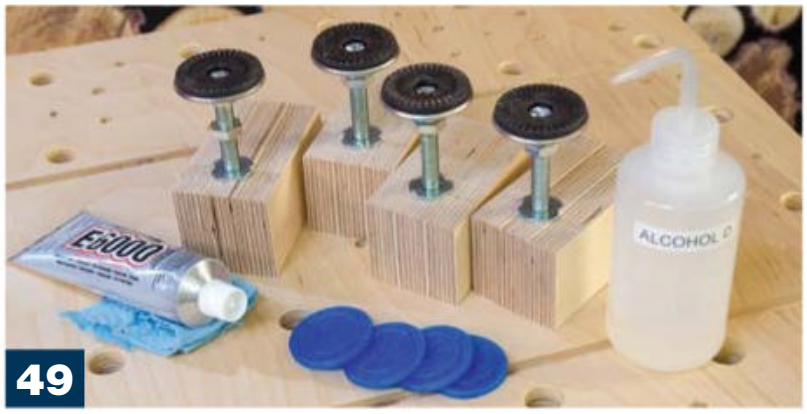

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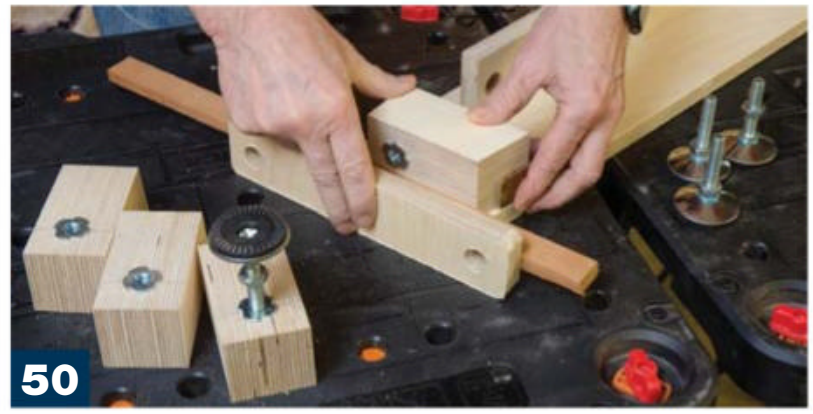
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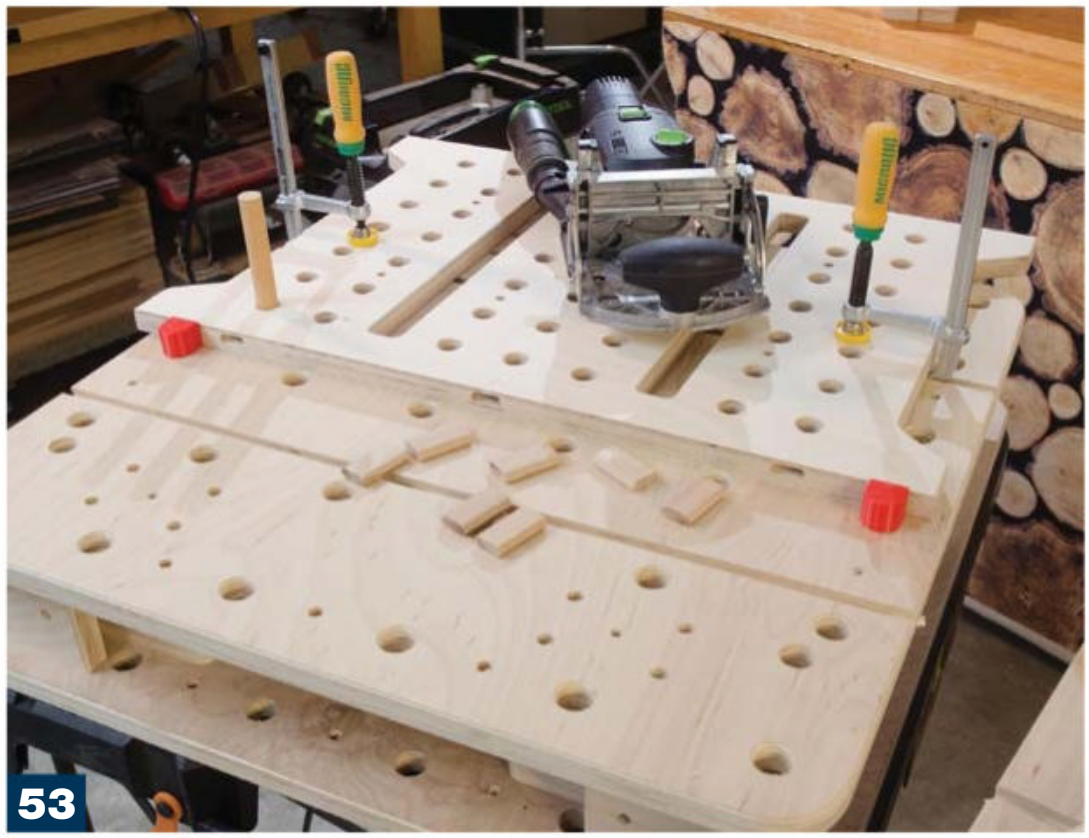
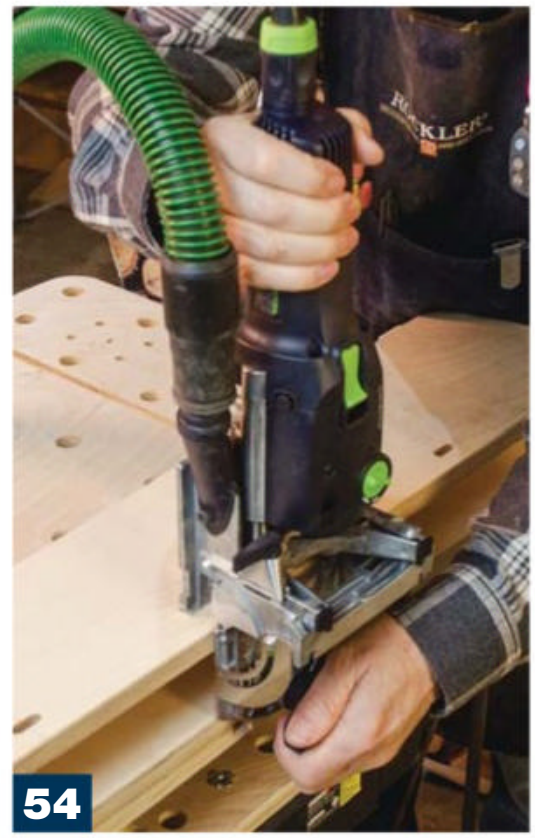
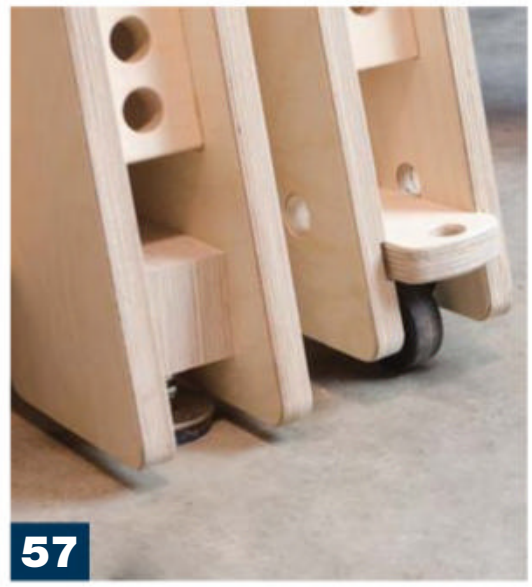
47-48 The base uses similar construction metods as the top unit. Each leg is built by lamination and open box construction.

49-50 T-nuts in the foot of each leg let you add adjustable metal feet (for those uneven shop floors).

51-52 Squaring the base during glue-up is important. The top attaches to the base with 8 bolts.







53 Side stretcher panels connect each half of the base with Dominos.

54 Alignment of the Domino mortises is critical to creating a square base.

55 Glue the side stretchers in place and make sure the base is square by measuring the diagonals (and adjusting your clamps as necessary).

56-57 Base leg options: Either, but not both. Instead of adjustable leveling feet, you can also use removeable wheel plates (a caster mounted to a piece of plywood slides in a dado).

Conclusion

The workbench system will continue to grow and evolve. The maker workstation is just the first in a series of planned maker work surfaces.

Modules that integrate the Festool Track Saw into the workstation system, marker panels for the Shaper Origin CNC, a machinist vise module, a router table module, bench cookie plates, plates for metal working and more are planned for the near future. New accessories and modules will be announced in the online companion articles at www.popularwoodworking.com. **PW**

Tim Celeski is furniture maker, artist and digital woodworking enthusiast in Washington.

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Angela Harris

Interview by Collin Knoff

How did you get started woodworking? Who were your mentors?

My greatest influence in becoming a maker and builder was my grandfather who taught me from the time I was 5 years old that it didn't matter if I was a girl, I should be able to handle my own business. For him, "business" meant taking care of things for yourself. If something broke, we fixed it. If there was something that needed building, we built it! He was a home builder and I was by his side, fetching tools and learning the measure and cut for as long as I can remember. I started rehabbing furniture and building for myself and friends as an amateur interior designer and that led to a full on passion for woodworking and desire to build a business and life for myself in carpentry. I get tons of inspiration and help from the online woodworking community and local craftspeople I'm lucky enough to know.

What do you think is your best work? What kind of work do you do the most?

My favorite thing to build is a window seat. For me, window seats mean connection. As I am building window seats into a client's home, I think of the conversations and "life" that is going to happen there. Whether it's in a little girl's bedroom window, or the family kitchen, there will be laughter, tears, homework, cups of tea, and LIFE shared on that simple structure I leave for them. I build many, many window seats as well as custom wall units with shelving for family treasures, books and storage. Another popular build for me is the "mudroom locker" or cubby systems that transform

"I read a note somewhere when I first started that said,

'Make the next job you accept be one you don't have the tool or know how to do.'

I love this and live by it. This is what keeps me learning and growing. If I only did what I'm comfortable doing, I'd never be able to grow my business."

Folks to Follow

Two people I try and check in with every week are:

@woodenmaven
@overkillwoodcraft

I also follow this hashtag:
#womenwhobuild

For every woman hustling to start up:

@msrachelhollis: (No relation) She has written two inspiring books:

Girl, Wash Your Face: Stop Believing the Lies About Who You Are So You Can Become Who You Were Meant to Be

Girl, Stop Apologizing: A Shame-Free Plan for Embracing and Achieving Your Goals.

PHOTOS COURTESY OF ANGELA HOLLIS

a regular hallway or storage room into a functioning drop zone and command center for the family. It's amazing what we can squeeze into 18" of floor space!

What's your best hands-on tip or wood-working technique?

My residential carpentry instructor in the tech school course I took when I first started charging money for my work told our class, "You will be a good carpenter, but it's learning to fix your mistakes that will make you a great carpenter." Taking time to go over your work and really get to know the wood before you even begin will save time and the heartache when things don't go well with a project. Plan, plan, plan! It doesn't matter if no one else can decipher your drawings, take the time to do them anyway. Visualize what it will take to actually put the project together and work through one step at a time. Check your lumber for square, sand out rough spots, line up and plane your boards/sheets before you glue up. Take your time and maybe you won't have to pull apart quite as many pieces of furniture as I did when I started! **PW**

Angela Hollis is carpenter and historic preservationist from Alabama. See more of her work at grlbuilder.com or on Instagram @grlbuilder.

My Pandemic Project

By Christopher Moltion

I have been an avid woodworker for years, working on one project or another in my spare time. I've built blanket chests, cutting boards, small tables and the like over the past few years, but like many, have become distracted by the usual responsibilities of life. Having three boys and a job in healthcare means long hours, busy weekends and little time for ambitious grandiose projects. This all changed in March of 2020.

I work in a health care and have never been in a position where I thought my job was ever in jeopardy. As the pandemic raged here in New York, we were put in lockdown, which meant no elective cases in the hospital. As an independent contractor in my industry (which until now had awarded me a better schedule and more freedom) it meant I was the first to be laid off.

Home now with my wife and kids (no school either), I was faced with long hours closed inside with nowhere to go and nothing to do. By the second week, I came to the realization that this was going to be a while, so I sought solace where I have in the past: my small basement shop.

It is nothing special. In fact, its little more than a dungeon but with slightly better lighting. Growing up watching the *New Yankee Workshop* on weekend mornings, I dreamt of a shop like Norm Abrams worked in. My shop is filled with objects that comfort me, including carved panels, a mostly finished version of a Roubo bench and, of course, a collection of hand tools and some power tools (a router, some battery drills and a very sad, over-used contractor-style table saw). Just standing there made me feel better. Over the next few weeks, I built a bird house out of scrap with my 5-year-old and a dining room table from cherry with oak aprons and legs. My next project was one that was pitched to me from a friend who was unemployed due to Covid and was new to woodworking.

My buddy had been working building small projects out of his garage using some Paul Seller's style sawhorses as a makeshift bench. They worked but were a far cry from a functional joiners bench. After research, he had come across a video on building a Moravian workbench by Will Myers. After sharing with me, I was immediately hooked. The design was radically different with legs at 15° angles, a leg vise, a carriage vise, a thick top, a multitude of great joints to practice the craft on, and some tusk tenons holding it all together so it could be disassembled easily and moved or stored. I HAD TO HAVE THIS BENCH!

After we talked and did some planning on the phone we began to get together and start the build. We were unemployed and it was a pandemic, so we had some hurdles to overcome. We didn't have a lot of money to go splurging on wood and a lot of our sources were closed at the time.

PHOTO BY THE AUTHOR

I decided we would use wood I had been hoarding in my basement for years. Lots of 8/4 hardwood of mixed species, specifically oak, maple and cherry. We would buy only what we absolutely needed. When we measured all the hardwood for the bench tops, we were short. Then I remembered there was some large riven chunks of red oak air drying in the side yard. A little elbow grease and problem solved.

With the planning done, we set to work. We did some of the work together, some apart. When together we maintained social distancing and wore masks when we couldn't (it was a pandemic after all). My father-in-law was even showing up occasionally to give his grunt of approval as he watched the project unfold. We went old school on the log in the side yard and spend the day riving, axing and handplaning until I had something that would fit through my planer. There were days spent chopping mortises, cutting tenons, and continuously planing wood to the correct dimension. In addition to the woodworking, there was also the occasional Scotch shared among friends over a pile of wood shavings.

At the end of it all, I have far more than just a great new bench. I have even more appreciation of what woodworking and the art of building something with your hands can do. It can bring friends together during times of worry, relieve anxiety and give you back a sense of purpose when you have lost yours. When we were building our benches, we weren't thinking about the pandemic or our jobs; we were thinking one joint at a time on the task at hand. So next time you find yourself drowning in the world around you, take a walk down the stairs to the workshop and pick up a saw or your favorite plane. You might just wind up with more than just a great new bench. **PW**

Chris Moltion is a nurse anesthetist and woodworker in New York.

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