

CLASSIC ARTS & CRAFTS PROJECT: Bow-Arm Rocking Chair



Popular Woodworking

AUGUST 2020 | #254



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HAND TOOLS

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BEAR CRAWL SERIES MOBILE BASES

The Grizzly Bear Crawl Mobile Base is the end-product of years of customer input, product design and testing. We believe it to be the best Universal-Base system available. It is available in three sizes.

ALL SIZES FEATURE

- Heavy-duty rubber/steel casters with sealed bearings
- Reinforced 2" welded caster posts
- Adjustable steel bars
- Easy assembly
- Powder coated finish
- Adjustable positive stop/rubber leveling feet
- 2 fixed casters and 2 swivel casters
- Easy float toe flip lifting levers
- Corner-tight engagement bolts
- 1200 lbs. capacity

BEAR CUB - 14" x 14" - 25 1/2" x 25 1/2" FOOTPRINT

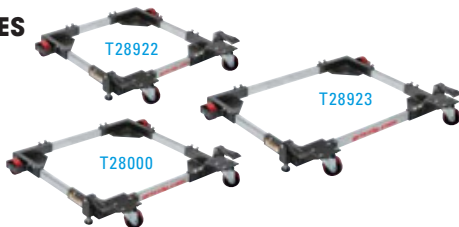
T28922 ~~\$79⁹⁵~~ **SALE \$69⁹⁵** ⚠️ **WARNING! †1**

HEAVY-DUTY - 19" x 21" - 29 1/2" x 29 1/2" FOOTPRINT

T28000 ~~\$89⁹⁵~~ **SALE \$79⁹⁵** ⚠️ **WARNING! †1**

PAPA BEAR - 19" x 26" - 29 1/2" x 34 1/2" FOOTPRINT

T28923 ~~\$89⁹⁵~~ **SALE \$84⁹⁵** ⚠️ **WARNING! †1**



ALL SWIVEL HD MOBILE BASE

19" x 21" - 29 1/2" x 29 1/2" FOOTPRINT

If you need maneuverability in a small shop, look no further for the Grizzly All Swivel Bear crawl mobile base.

- 4 steel, foot-operated locking levers
- 4 ball bearing swivel casters
- 900 lbs. capacity

⚠️ **WARNING! †1**

T31566

~~\$99⁹⁵~~ **SALE \$94⁹⁵**



GRIZZLY GROWLER CYCLONE SEPARATOR

Dust Collector Not Included

Separates large wood chips and only lets fine particles go to the dust collector.

- Drum size: 20" diameter x 22" H
- Maximum drum capacity: 20 gallons
- Overall height: 67"
- 2" Ball casters for easy mobility
- 7"-6" Outlet reducer
- 6" Inlet with 2 x 4" "Y" adapter
- Uses 19" diameter drum collection bags (sold separately)
- 16-Gauge steel construction
- Handles dust collectors up to 3 HP
- Approx. shipping weight: 47 lbs.



⚠️ **WARNING! †1**

G0863 ~~\$299⁹⁵~~ **SALE \$269⁹⁵**

10" 2 HP PORTABLE TABLE SAW WITH ROLLER STAND AND VARIABLE SPEED

- Motor: 2HP, 115V, single-phase, 60 Hz, universal motor, 15A
- Table size: 22" x 26 1/2"
- Arbor: 3/4", 2000-4000 RPM
- Blade tilt: Left, 45°
- Max depth of cut @ 90°: 3 1/4"
- Max depth of cut @ 45°: 2 1/2"
- Rip capacity: 28" right
- Dado capacity: 1 1/2"
- Dust port: 2 1/2"
- Overall size: 41 1/2" L x 37 1/2" W x 41" H
- Approx. shipping weight: 106 lbs.

MADE IN AN ISO 9001 FACTORY



⚠️ **WARNING! †1**

G0870 ~~\$475⁰⁰~~ **SALE \$425⁰⁰**



COMPOUND MITER SAWS

- Motor: Universal, 1500W, 110V, single-phase, 15A
- Blade size: 10" dia., 3/4" arbor (T31634), 12" dia., 1" arbor (T31635)
- Arbor speed: 3800 RPM
- Maximum sliding travel: 9"
- Bevel range: 45° left to 45° right
- Bevel stops: 45° left, 0°, 45° right
- Miter range: 52° left to 60° right
- Miter stops: 0°, 15°, 22.5°, 31.6°, 45° left/right, 60° right
- Fence max. extended length: 34" (T31634), 43 1/4" (T31635)
- Overall size: 34 1/2" L x 42 1/2" W x 24 1/2" H (T31634), 37" L x 45 1/2" W x 26 1/2" H (T31635)
- Approx. shipping weight: 54 lbs. (T31634), 62 lbs. (T31635)

MADE IN AN ISO 9001 FACTORY



T31634 Pictured

⚠️ **WARNING! †1**

10" SAW

T31634 ~~\$312⁹⁵~~ **SALE \$299⁹⁵**



⚠️ **WARNING! †1**

12" SAW

T31635 ~~\$359⁹⁵~~ **SALE \$345⁰⁰**



OSCILLATING SANDER FLOOR-MODEL

- Motor: 1 HP, 110V, single-phase, 6.9A
- Spindle speed: 1725 RPM
- Cast-iron table: 20" dia.
- Spindle oscillation: 52 OPM
- 3 Rubber sanding drums: 3/4" x 4 1/2", 2" x 9", and 3" x 9"
- Table inserts: 6
- Floor-to-table height: 36 1/4"
- Dust port: 2.5"
- Toggle ON/OFF safety switch w/ locking tab
- Approx. shipping weight: 143 lbs.

INCLUDES TWO WRENCHES FOR EASY SPINDLE CHANGES



⚠️ **WARNING! †1**

T26418 ~~\$575⁰⁰~~ **SALE \$515⁰⁰**



1 HP DUST COLLECTOR

- Motor size: 1 HP
- Airflow capacity: 537 CFM
- Impeller size: 10"
- Filtration: 30 Micron
- Filter size: 13 1/2" x 24" bag
- Intake ports: 1 x 4"
- Sound rating: 77-79 dB
- Overall height: 19 1/2"
- Approx. Shipping weight: 50 lbs.



MADE IN AN ISO 9001 FACTORY



⚠️ **WARNING! †1**

G1163P ~~\$225⁰⁰~~ **SALE \$195⁰⁰**

12" BENCHTOP DRILL PRESS VARIABLE-SPEED WITH LASER

- Motor: 1/2 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: 1/2" - 3/4", JT3, keyless
- Drilling capacity: 3/8" mild steel
- Max. distance from spindle to table: 13 1/4"
- Table dimensions: 9 1/2" x 9 1/2"
- Table tilt: 45° left/right
- Table swivel around column: 360°
- T-slots: (4x) 1/2", X pattern
- Footprint: 9 1/2" x 16"
- Overall height: 36"
- Approx. shipping weight: 93 lbs.

INCLUDES DIGITAL READOUT



MADE IN AN ISO 9001 FACTORY

⚠️ **WARNING! †1**

T31739 **ONLY \$425⁰⁰**



2 HP CANISTER DUST COLLECTOR

- Motor: 2 HP, 240V, single-phase, 9A
- Blower/impeller: 12 1/2" aluminum, radial fin
- Air suction capacity: 1700 CFM
- Static pressure: 10"
- Sound rating: 83-85 dB
- 6" inlet has removable "Y" fitting with three 4" inlets
- Canister filter size (dia. x depth): 19 1/2" x 23 1/2"
- Bag capacity: 4.5 cubic feet
- Overall dimensions: 31 1/2" W x 37 1/2" L x 71" H
- Approx. shipping weight: 150 lbs.



MADE IN AN ISO 9001 FACTORY

⚠️ **WARNING! †1**

G05482P

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14" DELUXE BANDSAW 35TH ANNIVERSARY EDITION

- Motor: 1 HP, 110V/220V, single-phase, prewired 110V, 11A/5.5A
- Precision-ground cast-iron table size: 14" x 14" x 1 1/2"
- Table tilt: 10° L, 45° R
- Floor-to-table height: 43"
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 6"
- Blade size: 93 1/2" (1/4" to 3/4" wide)
- Blade speeds: 1800 and 3100 FPM
- Overall size: 27" W x 67 1/2" H x 30" D
- Footprint: 23 1/2" L x 16 1/2" W
- Approx. shipping weight: 247 lbs.



WARNING! †

G0555LA35 \$655⁰⁰ SALE \$595⁰⁰ \$99⁰⁰ SHIPPING

12" BABY DRUM SANDER

- Sanding motor: 1 1/2 HP, 115V, single-phase, 13A
- Conveyor motor: 1/4 HP, 115V, single-phase, 0.3A
- Drum surface speed: 2127 FPM
- Maximum stock dimensions: 12" W x 3 1/2" H
- Minimum stock length: 8"
- Minimum stock thickness: 1/4"
- Sanding drum size: 4"
- Dust port size: 2 1/2"
- Sanding belt size: 3" x 70" hook and loop
- Feed rate: 2.5-17.3 FPM
- Approximate shipping weight: 166 lbs.



WARNING! †

G0459 ONLY \$695⁰⁰ \$99⁰⁰ SHIPPING

13" DEWALT PLANER WITH STAND AND HELICAL CUTTERHEAD KIT

Set yourself up with one of the best 13" benchtop planers out there, combined with a mobile base stand and helical cutterhead upgrade.

- Max. Stock width: 13"
- Max. Stock thickness: 6"
- Max. Depth of cut: 1/8"
- Includes 3-row helical cutterhead with 30 indexable carbide inserts
- Features blower-assisted dust extraction

(Kit comes with a 3-knife cutterhead installed. Helical cutterhead upgrade must be installed by customer)



WARNING! †

T32190 \$1138⁰⁰ SALE \$995⁰⁰

6" JOINTERS WITH CABINET STAND

- Motor: 1 HP, 110V/220V, single-phase, 14A/7A
- Prewired voltage: 110V
- Table size: 47 1/2" x 6 1/2"
- Table type: precision ground cast iron
- Table adjustment: dovetailed ways
- Cutterhead type: straight knife (G0814) V-helical (G0814X)
- Cutterhead diameter: 2 1/2"
- Max depth of cut: 1/4"
- Fence size: 4" x 29 1/4"
- Approx. shipping weight: 260 lbs.

WARNING! †

WITH STRAIGHT KNIVES

G0814 \$725⁰⁰ SALE \$695⁰⁰ FREE PAIR OF SAFETY PUSH BLOCKS

WARNING! †

WITH V-HELICAL CUTTERHEAD

G0814X \$1175⁰⁰ SALE \$895⁰⁰ \$99⁰⁰ SHIPPING



MADE IN TAIWAN

NEW!

G0814 Pictured

QUIET CYCLONE DUST COLLECTOR 1.5 HP

- Motor: 1.5HP, 120V/240V, 15/7.5A, single phase, 3450 RPM, TEFC
- Airflow capacity: 785 CFM at 2" SP
- Max static pressure: 10.8"
- Filtration: 99.9% at 0.2-2 microns
- Intake port: 6" with included double 4" adapter
- Impeller: 12 1/2"
- Cartridge filter surface area: 53.85 sq ft
- Filter rating: 0.3-2 micron
- Lower bag size: 17 1/2" x 23 1/2"
- Sound rating: 78 dB
- Overall size: 35 1/2" W x 54 1/2" D x 77 1/2" H
- Approx. shipping weight: 280 lbs.



MADE IN AN ISO 9001 FACTORY

WARNING! †

G0852 \$950⁰⁰ SALE \$895⁰⁰ \$99⁰⁰ SHIPPING

15" 3 HP PLANER W/ CABINET STAND

- Motor: 3 HP, 230V, single-phase, 12A
- Maximum stock width: 15"
- Maximum stock thickness: 6"
- Minimum stock thickness: 3/4"
- Minimum stock length: 6"
- Maximum cutting depth: 1/4"
- Cutterhead diameter: 3"
- Cutterhead type: 3-knife
- Knife size & type: 15" x 1" x 1/4", HSS
- Cutterhead speed: 5000 RPM
- Feed rate: 16 & 28 FPM
- Table size with extensions: 15" x 50"
- Dust port size: 4"
- Footprint: 21 1/2" x 21"
- Overall dimensions: 32" W x 50" D x 44" H
- Approx. shipping weight: 517 lbs.

MADE IN AN ISO 9001 FACTORY

WARNING! †

G10212 \$1595⁰⁰ SALE \$1395⁰⁰ \$175⁰⁰ SHIPPING



MADE IN TAIWAN



1 1/2" HP SHAPER

- Motor: 1 1/2 HP, 120V/240V, single-phase, prewired 120V, 12A/6A
- Precision-ground cast-iron table size: 20 1/4" x 18"
- Floor-to-table height: 33 1/2"
- Spindle travel: 3"
- Interchangeable spindles: (2) 1/2" and 3/4"
- Spindle openings: 1 1/4", 3/4", and 5"
- Spindle speeds: 7000 and 10,000 RPM
- All ball bearing construction
- Max. cutter diameter: 5"
- Powder-coated finish
- Approx. shipping weight: 221 lbs.



G1035 Pictured w/ G1706 optional wing



WARNING! †

G1035 \$750⁰⁰ SALE \$695⁰⁰ \$99⁰⁰ SHIPPING

17" HEAVY-DUTY BANDSAW 30TH ANNIVERSARY EDITION

- Motor: 2 HP, 110V/220V, single-phase, TEFC, prewired 220V, 17.25 RPM
- Amps: 20A at 110V, 10A at 220V
- Precision-ground cast iron table size: 17" x 17" x 1 1/2"
- Table tilt: 45° R, 10° L
- Floor-to-table height: 37 1/2"
- Cutting capacity/throat: 16 1/4"
- Blade length: 131 1/2" (1/2" to 1" wide)
- Approx. shipping weight: 342 lbs.

MADE IN AN ISO 9001 FACTORY

WARNING! †

G0513ANV

\$1075⁰⁰

SALE \$975⁰⁰ \$129⁰⁰ SHIPPING



18" x 47" WOOD LATHE

- Motor (with inverter): 2 HP, 220V, 3-phase, 5.6A
- Required power supply: 220V, single-phase, min. 15A circuit
- Swing over bed: 18"
- Swing over tool rest base (banjo): 14"
- Distance between centers: 47"
- Spindle speed: Variable, 100 - 3200 RPM
- Spindle threads: 1 1/4" x 8 TPI
- Spindle taper: MT#2
- Tailstock taper: MT#2
- Tool rest width: 14"
- Tool rest post diameter: 1"
- Footprint: 20" x 65 1/2"
- Overall dimensions: 81" W x 19 1/2" D x 48 1/2" H
- Approx. shipping weight: 550 lbs.

MADE IN AN ISO 9001 FACTORY



WARNING! †

G0733 \$1975⁰⁰ SALE \$1750⁰⁰ \$175⁰⁰ SHIPPING

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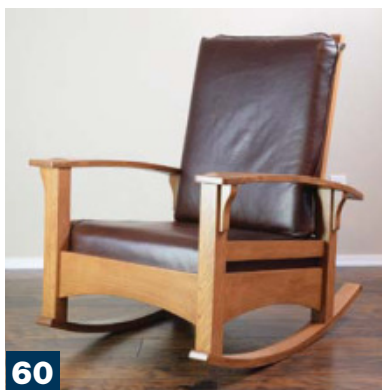
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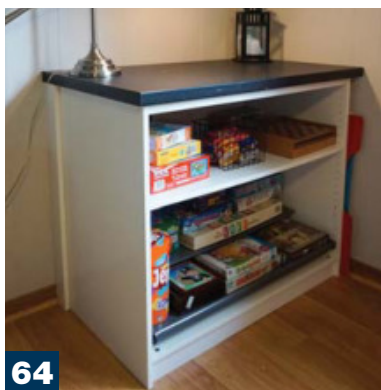
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ACHIEVE IN MINUTES WHAT TAKES MOTHER NATURE DECADES



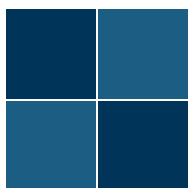
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Demonstration on red oak





Connect

■ FROM THE EDITOR

A Bit of Art

By Andrew Zoellner

The past few months have made me thankful for a lot of things. A partner who loves to cook and bake and keep me fed, even when I'm not always upholding my end of the bargain. A partner who knows that even though we love each other, that sometimes we need to make sure we have some alone time. Family and friends who do their best to stay connected even though we aren't seeing each other in person right now. Bosses and co-workers who are helping us navigate how to keep a publishing business running while the whole company works remotely. Not to mention all of those who are still out there in the working world, making sure shelves are stocked, feeding us takeout when we aren't cooking at home and most importantly, taking care of loved ones who need medical help.

It's not an easy time, but it's reinforced a familiar feeling that I'd lost: It's the creatives, the people who make things, write books, produce movies and record music that are really helping me get by.

I can't spend 24 hours a day in the shop (even though it seems I have the time to now). And I can't spend all of that extra time reading the news and thinking about the state of the world. Thankfully, we have some art to turn to, to bring us joy and give us an escape (at least momentarily) from the weight of the world that seems heavier than ever these days.

A lot of what survives from the past is the art: the books, the paintings, the sculpture, the songs. That



The world keeps turning and so do I. I've been making my way through a bunch of ash, rough turning legs and spindles for future projects. I'm not quite sure what I'll build, but I hope it brings joy to someone in the future.

says something about what humans intrinsically value, about what's really important.

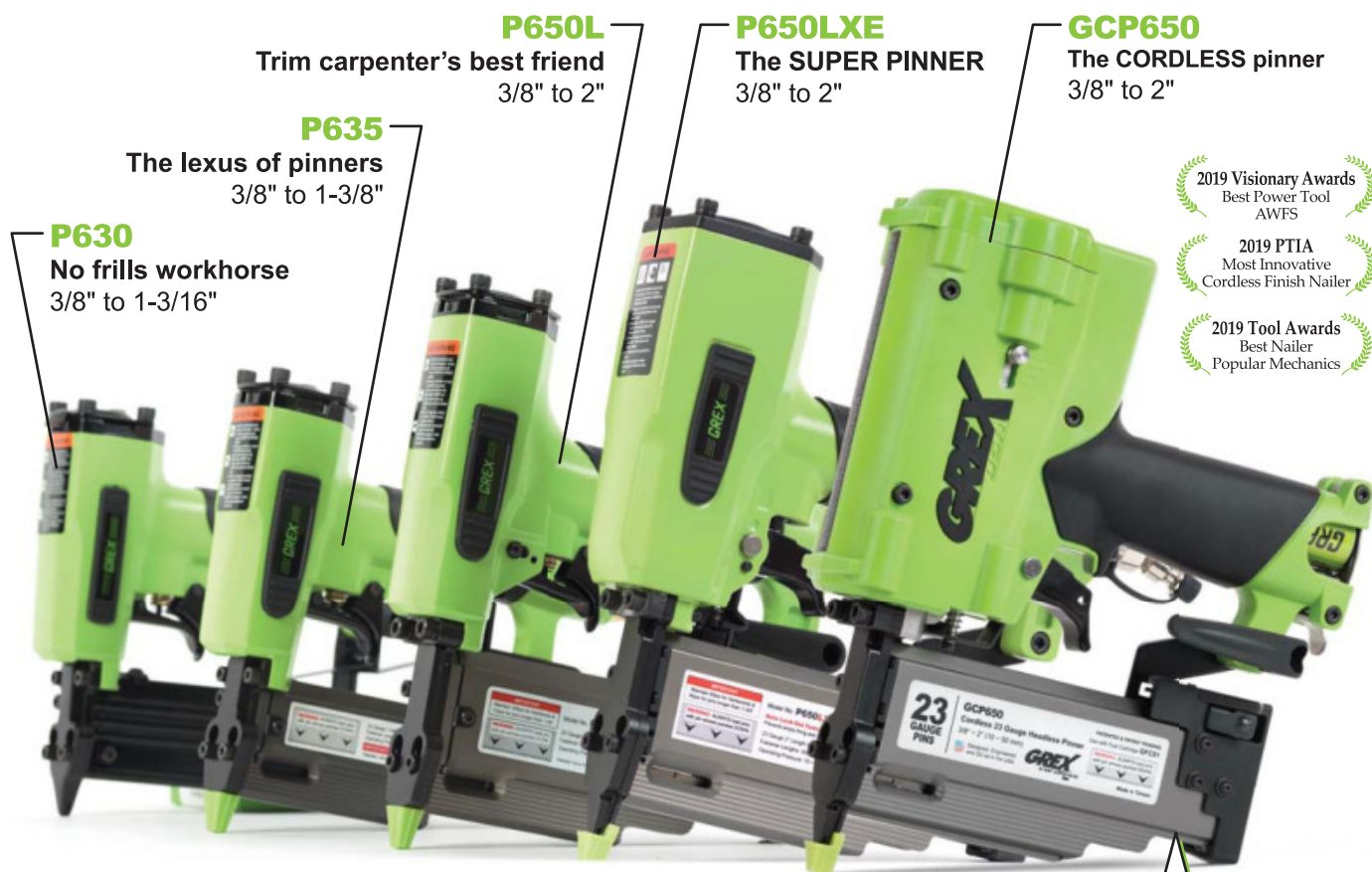
Like a lot of woodworkers, I bristle when someone suggests what I do is art. Art seems like something else, something that starts with a capital "A". Something you'd see in a museum. But I have to remind myself, oftentimes true art is in the eye of the beholder. If someone else finds joy in what you do, that's halfway to being an artist. And right now, halfway is pretty good.

Taking time to do things for yourself, things that make you happy, is essential to survival in the modern

world. For me, that's spending a lot of time in the shop. But it's also spending time reading, listening to music, watching movies and absorbing all the art the world has to offer. Let yourself recharge and take in new ideas and information. You just might discover something that speaks to you. Or you might create something that speaks to someone else. In the end, it's all worth it.

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WORKSHOP TIPS

Tail Vise Clamp

After years of wishing my old workbench had a tail vise, I realized I could make one of my new Jorgensen Cabinet Master bar clamps do the job. All I had to do was reverse the sliding lower jaw (it's removable) and mount the bar and fixed jaw under the benchtop.

I drilled and chiseled out an elongated hole in the leg so the sliding jaw would extend only $\frac{5}{8}$ " above the benchtop. Then I lag-screwed a notched block and cap at the opposite end to act as a bearing surface for the fixed jaw. To finish my tail vise, I drilled a row of $1\frac{1}{8}$ " diameter holes in line with the sliding jaw and fashioned a bench dog to fit.

When I need to use the clamp elsewhere, I just remove the sliding jaw and pull the fixed jaw and bar out from the other end.—*Robert A. Miller*



Instant Drawers

Large plastic boxes, the kind that restaurants use for bussing dishes, are perfect for shop drawers. They're strong, durable and lightweight, plus they have built-in handles. They're perfect for storing and transporting workshop essentials, from screws to power tools. They come ready-made and they're super-easy to install. I'll never build another storage drawer!

Bus boxes are designed to hang from their rims, so screwed-on cleats make perfect drawer supports. I like to graduate the distance between cleats, so the bottom boxes have more headroom. This wider spacing makes it easier to see what's inside the lower boxes. For large items, I reduce the number of boxes in the stack, so each box has ample headroom.—*Arthur Mitchell*

Jigsaw Cushion

The next time you use your jigsaw, forget about hauling out the sawhorses or cantilevering a hard-to-hold workpiece off your bench. Extruded polystyrene insulation board, the rigid pink sheets used in housing construction, makes sawing easy, whether you're cutting a small piece of hardwood or a full sheet of plywood. During the cut, the workpiece is always fully supported, so your saw has constant, stable support. The 2" thick insulation houses jigsaw blades as long as $3\frac{1}{2}$ ". The same piece can be used repeatedly; one 4' x 8' sheet will likely last you a lifetime. This same trick works well with track saws.—*Vern Johnson*



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Stickley Poppy Table Project [PDF Download](#)

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Mahogany (Genuine)	4/4	Select	5.10		\$122.00
Maple (Hard)	4/4	Select	3.65		\$116.00
Maple (Soft)	4/4	Select	2.60		\$ 95.00
Oak (Red)	4/4	Select	2.80		\$105.00
Oak (White)	4/4	QS	2.90		\$105.00
Poplar	4/4	Select	1.80		\$ 85.00
Walnut	4/4	Select	5.75		\$125.00
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WORKSHOP TIPS

Practical Paraffin

Ordinary paraffin canning wax has dozens of uses in my shop. It's cheap at a few bucks a pound, available at any grocery store and easy to cut into small chunks. Unlike candle wax, which often contains beeswax, or some spray lubricants, which may have silicone in them, paraffin won't contaminate oil and varnish finishes because it's a completely petroleum-based product. Most wax residue gets sanded off anyway.—*Tom Caspar*



A I often lubricate my jointer and planer beds with a paraffin wax squiggle. Wood is much easier to push down a waxed bed.

B Glue doesn't adhere to paraffin. I rub wax on clamping blocks to keep them from sticking.

C My plane is much easier to push when it's waxed, too. I rub paraffin on its sole every 10 strokes or so.

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EDITOR IN CHIEF ■ Andrew Zoellner

SENIOR DESIGNER ■ Danielle Lowery

DIGITAL EDITOR ■ Collin Knoff

CONTRIBUTORS ■ Teresa Audet, Dillon Baker, Dave Eklund, Chris Fitch, Willie Sandry, Logan Wittmer



PRESIDENT ■ Peter Miller

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ADVERTISING DIRECTOR ■ Heather Gniazdowski

CATAPULT MARKETING SERVICES ■ Amanda Phillips

DIGITAL PRODUCER ■ Josh Cohen

ADVERTISING SALES COORDINATOR ■

Julie Dillon; jdillon@aimmedia.com

ADVERTISING SALES MANAGER ■ Jack Christiansen

Tel: 847-724-5633; jchristiansen@aimmedia.com



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NEWSSTAND SALES

Scott T. Hill; scott.hill@pubworx.com

EDITORIAL CONTACT

popwood@aimmedia.com

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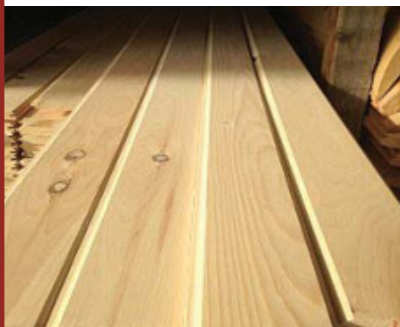
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WORKSHOP TIPS

Folding Table Base

Want a mobile table base that provides a huge work area, holds a ton and folds up to only 7" thick? You can get everything you need to make the one shown here at the local home center for about \$75.

Build it to any size. Just make sure the folding support arms (E) and panels (F) fit inside the end frames, so the assembled table folds up completely. Screw on a top when you need a work surface and remove it when you're ready to stow the table. Hook-and-eye catches hold the folding supports open when the table is in use and keep it closed during storage.—*Dick Ayers*

Cut List

Overall Dimensions: 24" x 28" x 44 3/4"

No.	Item	Dimensions (inches)		
		T	W	L
4	A Frame stile	1 1/2	3 1/2	21
4	B Frame rail	1 1/2	3 1/2	24
4	C Fixed support	1 1/2	3 1/2	21
4	D Hinge mounting strip	3/4	2	21
4	E Folding support arm	3/4	3 1/2	19 7/8
2	F Folding support panel	3/4	13 3/4	19 7/8

* Hardware: Eight 3" butt hinges, four 5" strap hinges, five hook-and-eye latches, four 3" locking swivel casters



New

W1863
**15" 3 HP PLANER
W/ HELICAL
CUTTERHEAD**

- Max. stock width: 15"
- Maximum stock thickness: 6 1/8"
- 3", 4-flute, helical cutterhead with 52 carbide inserts



W1812

**7" 2 HP PLANER MOULDER
W/ STAND**

D3393

ELLIPTICAL JIG

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- Planing width: 7"
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New

W1860
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JOINTER W/ HELICAL
CUTTERHEAD & MOBILE BASE**

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- Total table size: 9" x 76"
- Fence size: 4 1/2" x 38"



W1843

**KNIFE BELT
SANDER/BUFFER**

- Motor: 1 HP, 110V, 14A, 1725 RPM
- Belt size: 2" x 72"-76" range
- Left arbor: 1" x 8 1/2" extension with 5/8" arbor



New

W1837
**10" 2 HP HYBRID
TABLE SAW
W/ EXTENSION TABLE
& OPEN STAND**

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



New

W1870
**18" VS SCROLL SAW
W/ LED AND
ROTARY TOOL KIT**

- Variable speed motor
- Cast iron table
- 1 1/4" dust port



NEW TOOLS

Tricked Out Router Table

Over the years, I've been fortunate enough to use a variety of router tables, ranging from shop-made versions to high-end tables from top manufacturers. When Infinity announced they were releasing a new professional router table, I wanted to get a hold of it and put it through its paces. And I'm glad I did because I might have a new favorite router table. But I'll talk more about why that is that in a bit.

The router table arrived in six different boxes, and unboxing it was an adventure. Everything was well packed, and I discovered that the instructions on the Infinity website were much better than the ones included with the shipment. Overall, it took a couple of hours to assemble. The base is made from heavy-duty steel that's powder-coated black. It's a standard design, but it's built from much heavier steel than other similar styles. The optional caster set is a nice add-on, especially if you have a small shop like I do and want to move the router table around. The casters lock in place and keep both the tire and swivel immobile.

The top is made from layered Baltic birch plywood with a dimpled, low-friction laminate surface. It seems to be more durable than MDF versions that can get dinged up and chip. The aluminum fence tracks terminate in holes through the top, which allows sawdust to fall through and not clog the track—a nice feature.

The fence itself is one of the nicer fences I've used. It's made from a combination of extruded aluminum channel and faces made from more of the same laminate-covered plywood. The extruded aluminum means everything is adjustable, and you can position the infeed and outfeed sides of the fence independently for a tight fit around



Professional Router Table

Infinity Tools

infinitytools.com

Price: \$1000 (router table)

\$200 (extension wings)



your router bit. Infinity also includes two spacer bars for the outfeed fence, so you can quickly set up the fence for edge jointing operations (a great benefit if you don't have a jointer). The package comes with a Triton 3 1/4 HP router that mounts directly to an Infinity router insert (made by Jessem). The router adjustment isn't my favorite (I prefer a router lift style adjustment instead of the included crank through the insert), but it works well. The insert has a series of leveling screws around the base to get a perfectly flush fit to the tabletop.

So why do I like this router table above all others I've used? The two main reasons are adjustability and quality. There's not one single item on the router table that felt cheap. Everything is engineered and built well. As far as adjustments go, there's fine-tuning for almost everything on the table. The fence has set screws to adjust it square to the table. The router insert can be leveled, fine-tuned, and locked in place. The optional wings (shown in the photo) can be adjusted and leveled for an extended worksurface. Even the base can be adjusted to make the table height comfortable for the user. None of this is to mention the dust collection system, which is one of the best I've used on a router table. The collection port on the fence works in tandem with a shroud around the router. It gets almost all of the dust and chips. Overall, the Infinity tools Professional Router Table is a high-quality router table that deserves a hard look the next time you're shopping for a router table.—Logan Wittmer

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NEW TOOLS

Quick-Change Turning Tools

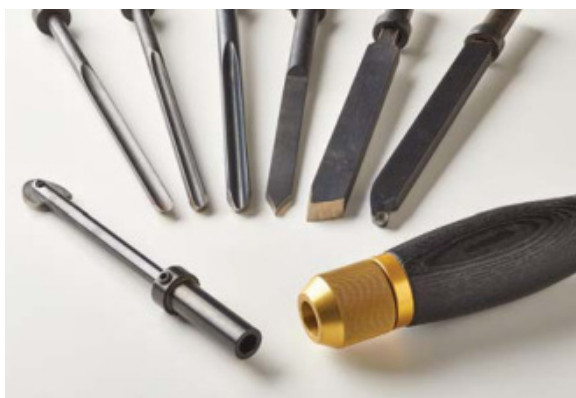
A recent weekend of turning with Jimmy Clewes in Las Vegas led me to a new, favorite set of turning tools—Jimmy's signature set of turning tools. Made for Jimmy

by Doug Thompson, the tools are some of the nicest I've used. I mainly turn bowls, and I found that the beginners set Jimmy's put together had everything I needed. The tools are made from

CPM10V steel. It's a powdered metal that's hardened to a 62 Rockwell hardness with a cryogenic treatment between the tempering cycles. This all means that the tools get sharp quickly and stay sharp.

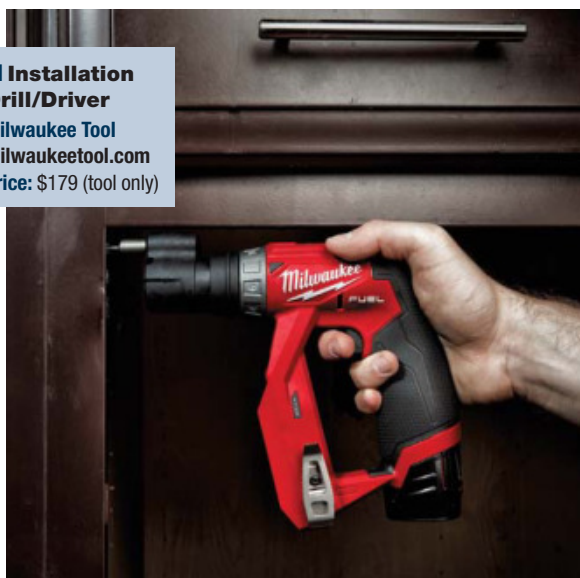
In addition to the standard gouges, scrapers, and parting tools, I picked up a mate tool. The mate tool is a hollowing tool with a small cutting head on it. The cutting action is controlled by the angle and protrusion of the head. It's easy to use and perfect for hollowing small vessels.

Setting the tools aside, I mainly fell in love with the quick-release collet. The machined aluminum collet is available in three sizes, and you can either purchase a handle or turn one (check out his website for how-to videos). The collet works via a cam system. A quarter-turn of the collet releases the tool, and another quarter of a turn locks the new tool in place. Gone are the days of having long-handled tools resting on my lathe bed, waiting to get knocked off. —Logan Wittmer



■ **Beginner's Set**
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jimmyclewes.com
Price: \$743 (beginners set)

■ **Installation Drill/Driver**
Milwaukee Tool
milwaukeetool.com
Price: \$179 (tool only)



Installation Drill/Driver

I use mostly 12-volt cordless tools in my shop. Modern technology helps you do a lot with lighter, more compact tools. But it wasn't until I needed to install hardware in a kitchen full of kitchen cabinets that I realized how much that compactness and flexibility was essential to these tasks.

Milwaukee Tool's brushless installation drill/driver comes with four different heads: a standard $\frac{3}{8}$ " chuck, a $\frac{1}{4}$ " hex quick-release attachment, an offset attachment and a 90° attachment. The offset and 90° attachments have gotten me out of a few different jams (with cabinets and countertops that were already installed). There's onboard bit storage in the handle and an LED that does a good job of illuminating dark corners of cabinets. It has plenty of torque and an adjustable clutch for delicate hardware screws. The only thing that takes a bit of getting used to is the top-mounted button to change between forward and reverse (an OK tradeoff for a sleeker design). —Andrew Zoellner



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Shop Made Arts & Crafts Knobs

All it takes is a router and a bandsaw.

By Dave Eklund

You'll only need two machines

to make these Arts & Crafts-style knobs: a bandsaw and a router table. Although the saw cuts can be done on a tablesaw; the bandsaw keeps the operation saw and simple. The router table work requires two bits: a $\frac{5}{8}$ " round nose bit and a straight bit.

Shop-made knobs may not save you a lot of money, but they offer a wealth of advantages over the store bought variety. For starters, the knobs will better match the project, because the wood comes from the project's scrap and you can customize the knob's size to fit the scale of the piece. Plus, making your own knobs is a satisfying project by itself.

Start by ripping $1\frac{1}{2}$ " strips of wood from $1\frac{1}{4}$ " thick quartersawn stock. The blanks can be any length, although a minimum length of 8" is best for machining. Cut enough blanks to make a few extra knobs; you're bound to lose a few to test cuts along the way.

Lay out a centerline on the face of the blank. Then head to the bandsaw and tilt the table 15° . Set the fence and cut the bevels in two passes.



1

CENTERLINE



2

Take the beveled blank to the router table. Chuck a $\frac{5}{8}$ " core box or round nose bit in the router. Set the bit's height just shy of $\frac{3}{8}$ " for the first pass. Position the fence to leave a $\frac{3}{16}$ " edge below the bevel. Rout a groove along each edge. Head back to the bandsaw and crosscut the blank into $1\frac{1}{2}$ " squares.

Machining the remaining bevels and grooves on short little pieces, of course, is a bad idea. The solution is to reassemble the knobs in a line as before, but with their grain running in the opposite direction. Make a sled to hold the knobs from a piece of 2x4 squared up and ripped to the same width as the knobs. Make sure the knobs line up perfectly flush with each other. Mark the center of each knob face again to help set the bandsaw fence. Cut the bevels and

grooves as before. Cut the knobs free of the sled.

The knobs look their best when the base is smaller than the face. Trim back the base on the router table. A notched 2x4 that's been jointed flat makes the perfect guide block. Blowing out the back edge is a real issue on these cuts. Start with an end grain cut. Then, rotate the knob 90° clockwise, and cut the first long grain edge. Keep rotating the knob 90° clockwise after each cut. If tearout is still a problem, make smaller incremental cuts.

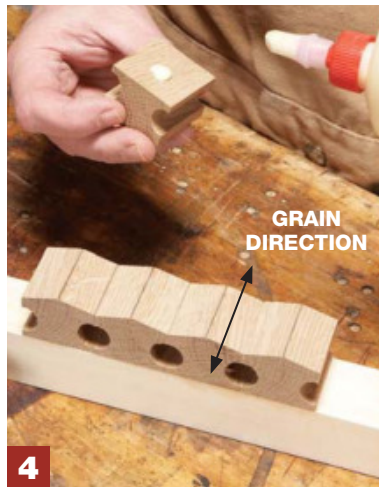
Finally, sand the knobs, starting with 120-grit paper. Round the corners and soften the sharp edges until the knob feels comfortable. **PW**

1 Start the knobs by cutting a pair of 15° bevels on the face of the blank. Set the fence so the bandsaw blade exits just above the marked centerlines.

2 Rout finger grooves along both sides of the blank. Make one heavy pass then a light clean-up pass to avoid tearout.



3



4



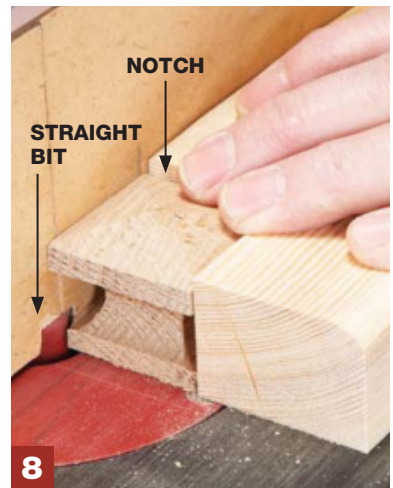
5



6



7



8

3 Crosscut the blank into 1 1/2" squares. A miter gauge ensures a square cut. There's no risk of kickback when you make this cut on the bandsaw.

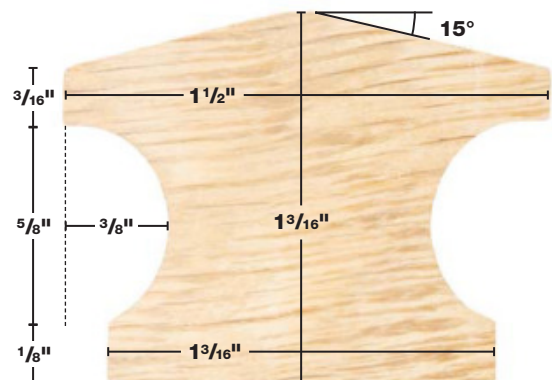
4 Glue the knobs onto a milled sled to machine the end-grain faces. Rotate each knob 90° from its original orientation and use a small dab of glue.

5 Cut the remaining two bevels on the knob faces. Once again, position the fence so the blade just misses the center mark.

6 Rout the remaining grooves in the knobs. Take light passes and use a slow feed-rate to avoid tearout as the bit enters and exits the cavities between the knobs.

7 Slice the knobs free of the sled. Set the fence so the blade is centered on the glue line.

8 Trim down the base with a straight bit and a zero-clearance fence. A block of wood with a notch slightly smaller than the knob, guides the knob safely through the cut.



Flocking

Take that special drawer or box to the next level.

By Teresa Audet

Flocking is a two-step process

that involves spraying tiny fibrous particles onto an adhesive-coated surface. Imagine spray-on velvet. This is a great medium for sprucing-up the inside of jewelry boxes, decorations or signage.

Types of Flock

The brand of flock that I use personally is called Flock-It (formerly known as DonJer Products). This company provides a few options for flock, but the one most will want to use is the Suede-Tex flock with rayon fibers. The undercoat adhesive is color matched to the flocking fibers, so ensure that the colors you are purchasing match. I recommend purchasing the Mini-Flocker Kit, which comes with the fibers, the undercoat adhesive, and the flocking applicator.

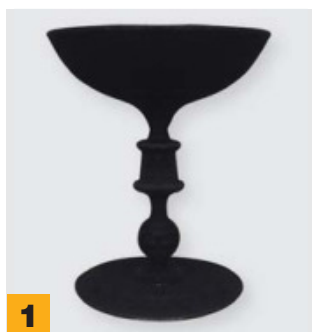
Flock-It also sells nylon fibers for outdoor projects and has a line called Soft Flock for smaller craft projects. The Soft Flock packages are the same fibers as the Suede-Tex rayon in smaller sizes and are a cost-effective way to sample a variety of colors. The water-based adhesive sold with the Soft Flock is for fabrics and figurines and is not recommended for functional applications such as jewelry boxes.

Surface Prep

The first step in flocking your piece is surface preparation. The flocking process will not cover up cracks or surface blemishes so it is important to start with a smooth surface. Sand and finish the surface you will be flocking. Finish the surface with lacquer, polyurethane, or anything that will seal the porous wood surface and allow finish to fully cure



The velvety-smooth texture of a flocked interior is hard to beat in a box or chest, though the process can be messy.



1-2 Two beautiful examples of more unique flocking applications. The glass vessel on the left was blown by Bradley Schillinger (and flocked by me). The object in image 2 is a ceramic piece made by Eileen Cohen with yellow flocking.

before flocking. Non-porous surfaces such as glass or plastic do not need to be sealed before flocking, but it would be helpful to scuff or sandblast the surface first to assist with adhesion.

I prefer to flock the bottoms of my floating-panel drawers before

glue-up, but some folks flock last, taping off the sides and top of the drawers. I have shown both processes in the photographs.

Set-Up and Safety

Prepare an area in a garage or shop to do your flocking as this is a messy



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3 The flocking kit includes fibers, color-matched adhesive and an applicator.

4 You'll need a mask, gloves, safety glasses, tape, cleanup rag and a brush for adhesive to round out your tools.



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5 Tape off any surfaces you don't want to be flocked. You can also flock drawer bottoms and other parts before inserting them in your finished pieces.

6-7 The applicator is easy to load. Use a spoon to put a generous amount of fibers into the bottom tube (the side without holes), then slide the top tube over it. Make sure to do this gently so you don't send a cloud of fibers into the air.



6



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process. Cover the table you are working on in newsprint or paper as you will be sweeping up any extra flocking to save for later. If your project is larger, I recommend spraying your flock inside of a large cardboard box lined with paper or a garbage bag to prevent the flocking fibers from going everywhere.

Wear safety glasses and a face mask when flocking as these tiny particles do not belong in your eyes or lungs. Work in a well-ventilated area and wear rubber gloves when working with the adhesive. Clean

up your paintbrush and tools with acetone or mineral spirits.

Loading the Applicator

Use a spoon to load the bottom of the cardboard flocking applicator tube—the side without holes—with the fibers. Use a generous amount of flocking fibers, filling about half of the tube. You will spray on more than needed and save the excess. Slide the top of the cardboard tube—the side with the holes—onto the bottom carefully. Do not accidentally send a cloud of fibers

into your face because it is unpleasant. Get your flocking applicator ready first then set aside for later.

Applying the Adhesive

Stir the adhesive well before using. Have an acetone rag handy in case of spills or drips.

Paint a generous coat of the undercoat adhesive onto the surface to be flocked. I prefer to use a soft bristled brush. The adhesive is similar to a thick oil-based paint. You want a thick coat of adhesive, but smooth out any big bumps or globs.



8 Apply adhesive to the entire surface. Again, be generous here. I use a soft bristle brush. You want a nice thick coat, but make sure to smooth any bumps or globs (as they can show through the fiber).

9-11 Apply the fibers. Hold the applicator about 8" away from the piece at a slight angle. Push the bottom tube into the top tube in short, twisting bursts to create a slight vacuum that pushes the fibers out.

12 You can clean up excess flock around your piece, but don't touch it until it dries (about 12 hours usually).



Work quickly around the entire area to be covered because the working time is only 10–15 minutes. Finish continuous sections at one time and only work on one drawer or surface at a time. Once the undercoat adhesive is applied in an even, generous layer, take off your rubber gloves and grab the prepared flocking applicator.

If you are working on a large surface, you can spray the adhesive through a paint sprayer or roll it on with a foam roller. Thin the adhesive with mineral spirits if spraying. Do not work in sections on larger pieces as the seams between the sections will show.

Spraying the Flock

Hold the applicator tube about 8 inches away from the work piece and spray downward at a slight angle

The important points when flocking:

Do not skimp on the adhesive, do not skimp on the fibers and resist the temptation to touch the surface before the finish has cured.





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13-15 Once your project has dried, you can gently tap off any excess fibers. The material isn't fully cured yet, so do this carefully.

16 If you've masked off any parts of your project, now is also the time to remove the tape (before the flocking is fully cured). Be careful not to touch the still-curing flocking.

17 You can use a soft brush to remove excess fibers from corners and other wooden surfaces, but don't touch the flocked surface. After it cures (72 hours) you can clean it with compressed air or a vacuum to remove any remaining loose fibers.

of air pushing out the flocking fibers. Spray the fibers all over the area to be covered, pumping with enough force to sink the fibers into the adhesive but not so much that you knock your project off the table. Try to aim your spraying so that the excess flock is contained within your spray box or paper-covered table. Cover with a generous coat of flocking fibers, more than you may think you would need.

Leave your project sit for at least 10–12 hours and most importantly: do not touch or move your project while it dries! The surface is very delicate as it is curing and can be dented or blemished easily.

Cleaning Excess

Sweep up any excess fibers back into the bag. If you've used a plastic bag in a box, you can remove the bag from the box and cut its corner to

pour it back into the flock bag. Paper table coverings can be gently folded and tipped into a funnel to assist getting the fibers back in the bag.

After your project has dried, tip it upside down over your paper-covered table and gently tap or shake the piece to remove any loose fibers. Use a soft brush to remove any excess fibers from the corners and the wooden surfaces. Save any excess fibers by sweeping them off of your paper-covered work surface and back into the bag. Be gently with the surface until it has completely cured after 72 hours. At that time you may use compressed air or a vacuum to clean your flocked surface. **PW**

Teresa Audet is a furniture maker and artist in Minneapolis. See more at teresaaudet.com.

to the surface being flocked. Push the bottom tube into the top tube with an up-and-down and slightly twisting motion, creating a vacuum

Block Plane Basics

This versatile hand tool should be every woodworker's first plane purchase.

By Logan Wittmer

As a “professional woodworker”

I often get asked what’s the best bang-for-the-buck tool by people getting into this craft. My response is always to ask if they have a good quality block plane. I know, it’s not the big, awesome aircraft carrier-like jointer plane. Nor is it the smoothing plane that makes sexy, fluffy shavings. But when it comes down to it, I feel like you get the most mileage out of a block plane, so that’s where I suggest you start.

Basic Design

Before we get into why I feel like a block plane is the most versatile plane in your shop, let’s talk about the physical traits of a block plane. In general terms, a block plane is a small plane (less than 7" long) that has a low blade angle, and the cutter is bevel-up. Usually, they will be between 1 1/2" to 2" wide. These can be coined as apron planes, standard angle blocks, English miter planes, low-angle block planes, pocket planes, or anything in between.

Now, I’m saying this in general terms because there is some debate on if the design, use, or the application makes it a block plane. But for the purpose of this article, we’ll focus on the smaller, bevel-up planes. (I do have one plane that technically isn’t a block plane, but it identifies as a block plane — we’ll talk about that later.)

In photo 1, you’ll see some features of a quality block plane. It consists of a body, a blade (usually bedded between 12 and 20°), and a lever cap. Higher-end models will have other features, such as an adjustable mouth, a depth-adjuster, and other add-ons. My first block plane was a vintage Stanley 110



shown in image 2. It’s about as bare-bones as block planes come. After using it for years, I can say this: get one with a depth adjuster.

Why They Work Well

There are a few aspects of block planes that make them work well where other planes might struggle. One is the ability to have a lower cutting angle that allows a block plane to effectively plane end grain. On a low-angle plane, the blade is bedded at 12°. When you add in a cutting bevel of 25°, you end up with an effective cutting angle of 37°. Standard angle block planes and

most bench planes have a cutting angle of about 45°.

Another thing that helps all planes work better is a tight mouth (scrub planes excluded). On a standard bench plane, the mouth is controlled by adjusting the frog. On a block plane, there is no frog. This design allows the blade to be supported all the way to the cutting edge (less chatter and a smoother cut). However, you can’t adjust a frog that isn’t there to make a tighter mouth. Instead, some block planes will have an adjustable mouth. This allows you to tighten the mouth for fine smoothing operations or open it up for heavier cuts.



The final thing that makes block planes work well is the fact that they're small and fit in one hand. This means they're nimble and can reach in tight areas and are excellent at tasks such as planing end grain, leveling joints, small spot smoothing, fitting doors, and the like.

New or Used

Now that we've talked about what makes a block plane, let's talk new versus vintage. Two of my favorite manufacturers are Lie-Nielsen and Veritas. They both make new block planes, roughly based on old Stanley patents. Vintage block planes are, as



1 A block plane is made up of three main pieces: the body, the blade and the lever cap. This plane also has an adjustable mouth and a depth adjuster.

2 This vintage Stanley 110 doesn't have a depth adjuster. It still works, but it's harder to adjust.

3 A sharp block plane is great for trimming end grain. I use a shooting board for support when I can.

4 For wider end grain trimming, it helps to skew the plane and keep pressure on the toe.





5 This specialized rabbeting block plane has a blade that runs all the way to the edge of the body, so you can use it to clean up tenons and rabbets.

6 The small size and light touch of a block plane is very useful in tuning joinery and joints.

7 A specialized tothing blade can do the heavy lifting on wild grain.

a rule of thumb, quality. They may need a little fettling to get them in tip-top shape, but are usually available for a song and a dance.

Tuning

Getting a block plane ready for use follows the same tactics as any plane. The sole needs to be flat. This can be accomplished by lapping it on sandpaper on a flat surface. Next, the blade needs to be razor-sharp. Personally, I free hand sharpen on a set of Arkansas oil stones, but you'll probably get the best results using a honing guide.

The final key is to make sure that the lever cap is free of paint, dust, chips, etc. This will make sure you get firm pressure on the blade without chatter.

Most modern block planes (from reputable manufacturers) will come ready to use out of the box. Some new "budget" planes will still need some work.

Block Planes in Use

Now that you have a ready-to-use plane in hand, let's talk about using it. There are a few areas where I really like using my block plane and it's my first choice—end grain, chamfering, refining joinery, and spot smoothing.

End-grain

Paring and trimming end grain is best done with the lowest angle block plane you have. I use two different approaches here.

For narrower tasks, like cleaning up the end of a rail or stile, I like to use my shooting board with my block plane on it. You can see this in image 3. This only works with planes that have parallel sides.

For wider stock, I'll clamp it in my leg vise. The key is to keep firm pressure on the toe as you plane. I find that skewing the plane will help with the tough end grain. In both instances (shooting board or vise), I always add a slight back chamfer to the stock to avoid chipping out the far side.



8

8 This small wooden plane made by Bill Carter is a prized possession. Though technically not a block plane, its size means I use it for all the same tasks I'd use any other block plane for.

Chamfering

Chamfering is probably my number one block plane task. It's just so convenient to reach into my apron, pull out the plane, and quickly put a chamfer on parts (begone loud, dusty router tables!). I usually eyeball a 45° and make a couple of passes until the chamfer is as wide as I need it. Alternatively, if it's a critical chamfer, I will curl my fingers around the plane and use them as a "fence" to help guide the plane. Start with chamfering the end grain first, then the long grain. That way, any chip out from the end grain cuts will be removed with the long grain chamfer.

Joinery

Tackling joinery is probably the broadest use of a block plane, at least in my shop. I have a rabbit block

plane that I use for everything from fine-tuning rabbets to trimming tenons and everything between.

My smaller low angle plane is my go-to for flushing joints as well. When leveling a rail and stile or the top edge of a drawer for example, I tackle the joint from a 45° angle (photo 6). This shearing angle avoids cutting cross-grain on one of the workpieces. While I'm talking about doors, There's no other tool better suited (in my opinion) for fitting doors and drawers. Holding a door in the face vise, I can quickly make a couple of trimming cuts to bring the drawers to the perfect size (or to shape if something's out of square).

Smoothing Cuts

Finally, the block plane is a perfect (miniature) smoother. With a couple of swipes, it smooths out milling marks from the edges of boards without breaking out the number 7.

There are also instances where a block plane might be the best plane for smoothing. In particular, when you're working on curved pieces, such as a cabriole leg or smooth-

ing out a spoon. The small sole of a block plane allows you to follow the curve very well and is a great mid-way tool between shaping and finishing. Unconventional? Sure, but it works well.

Some manufacturers, like Veritas, make toothing blades (photo 7) for block planes. Equipped as such, they can quickly deal with any tear out from wild grain, leaving just a few tooth marks that require a card scraper pass or two.

These smoothing operations, in particular, are where I like to bring in my small plane from Bill Carter (photo 8). Yes. Technically it's a smoothing plane and not a block plane. But in my shop, it identifies as a block plane because I use it for all my block plane tasks (except paring end grain). It fits in one hand or in my apron pocket and is agile enough to reach into hard-to-get areas. Hence, block plane. **PW**

Logan Wittmer is a hand tool enthusiast and the assistant editor of Woodsmith magazine. When he's not wrangling his kids, he's wrangling tools.



PROJECT #2010

Skill Level:

Advanced

Time: 1 week

Cost: \$500

PHOTOS BY AUTHOR

Bow Arm Rocker

This modified design builds off a classic Morris chair.

By Willie Sandry

Inspiration for the next project

can come from many sources, but for me, all it took was a trip to an antique furniture dealer. Legacy Modern is a boutique dealer in Portland, OR specializing in arts and crafts furniture, and they happened to have an original Morris chair that caught my eye. It was a Gustav Stickley #336 Morris chair, and I thought it would be the perfect starting point for a Morris rocker.

So, I took detailed measurements from the original chair and created a CAD drawing. However, I wanted a rocking chair rather than an armchair, so I had some additional work to do. To my knowledge, Gus Stickley never produced a bow arm Morris rocker. So, I surrounded myself with rocking chairs to ferret out the keys to good rocker geometry.

I acquired several rocking chairs — from antique to reproductions — to test and measure. I discovered that despite the varied size and style of these chairs the rockers were nearly universal. I chose the rocker radius I liked best an amalgamation of two of my favorite rockers, which turned out to be $r=44"$.

The first thing you notice about the antique Gus Stickley Morris chair is the organic shape of the bowed arms. Next perhaps you'll see the side seat rails are set at a dramatic angle. This pitches the seat backwards, making it the most comfortable chair I've ever perched in. Usually the seat rail angle and slip seat angles are independent from one another. With this design, both are set at the same angle, which results in a finished cushion that is parallel with the side seat rails. Although angled joinery adds some complexity, I think it's a design element worth preserving.

Two Bending Forms

You'll need two different bending forms: one for the bow arms, and another for the rockers. The radius of the bow arm form is 74" (the form bulges $2\frac{3}{4}"$ over a 40" span),



1 Surround yourself with rockers. Sit in more than a couple rocking chairs and measure up each version you encounter. See which dimensions and attributes will create a comfortable rocker for you.

and the radius for the rocker form is 42" (the form bulges $5\frac{1}{6}"$ over a 40" span). The arms can be steam bent, but the tighter radius of the rockers require them to be glued laminations. A common structural failure on steam-bent antique rockers is of splitting the wood.

To make the best use of time, start with the steam-bent armrests. The armrests need to steam for 60 minutes and stay clamped in the form for 24 hours. To set the bend, remove the armrest from the form and expose it to dry heat for 24 hours. During this step, it's helpful to apply a ratchet strap around the armrest that holds the curved shape, while still allowing air to circulate. I used my lumber kiln to apply the dry heat, but a pair of heat lamps works just as well. Whatever you do to the first armrest do the exact same to the next one. The goal is to create two identical curves.

March On with the Legs

We'll build this as a standard Morris chair first, then trim the legs to make it a rocker. (This gives you one last chance to bail out at the end or stay on course for a rocking chair.) Additionally, the extra leg length is helpful when it comes time to permanently set the rocker angle.

My preferred method for laminated legs with through tenons is to start with 10/4 stock and add thin veneers on two faces. This gives the best of both worlds — quartersawn figure on all four sides — as well as no visible glue line in the exposed tenon. Mill rough leg blanks to $2\frac{1}{2}"$ wide x $2\frac{3}{8}"$ long, and glue $\frac{1}{4}"$ thick veneers on two faces. This will result in a leg blank that's a little oversized, but you'll have better luck with the glue joint if you stick with $\frac{1}{4}"$ thick veneer strips. Now plane the blanks to a finished size of $2\frac{1}{4}"$ square which will leave each veneer about $\frac{3}{32}"$ thick.



2

2-3 Start with the armrest projecting one inch beyond the form and clamp it in place. Note the arched form is elevated on blocks to allow access for the clamps.

Cut the legs to rough length, and lay out the mortises. Despite the seat rails being angled, all the leg mortises are straight and square. We'll deal with the angles when it comes time to tenon the side rails. Chop the leg mortises, 14 in all, with your preferred method. Since the mortises for the seat rails are $5\frac{1}{2}$ " long, dividing them into two smaller mortises will help preserve leg strength. I left 1" of solid wood between the divided mortises, which are each $2\frac{1}{4}$ " long.

Right to the Rails

The front and rear rails have standard, square tenons. Also, this chair design doesn't splay outward from back to front as many chairs do. Instead, the side rails angle downward, and require angled tenons. The easiest way to cut this type of tenon is to angle the ends of the rail first, then cut the tenons with a dado blade. If you have a board wide enough to yield a narrow side rail, plus a wide side rail, here's a little trick. Start with a rail blank sized $\frac{7}{8}$ " thick x $8\frac{1}{2}$ " wide x $27\frac{11}{16}$ " long. Angle both ends at 5.5° to make a rhomboid shape (this removes about



3

$\frac{13}{16}$ " length from opposite corners). You'll cut the tenons with two rails still connected as one board. Install a full dado stack, and use the rip fence as a reference to set the tenon length.

Then rip the narrow rail free and complete the tenon shoulders at the bandsaw. This method ensures your side rails will have consistent angles and has the added benefit of a great looking grain match.

There are a couple more steps to get the tenons fitting properly into the legs. Divide the wide tenons to match the leg mortises. This is a pretty easy task if you turn the rail up on end and pass it over a dado blade. Finally, miter the ends of the intersecting rails so they won't interfere with one another.

Next drill a pair of $1\frac{1}{2}$ " deep holes, one in each rear leg, to receive the backrest pivot pins. The center of these $\frac{5}{8}$ " diameter holes need to be located $15\frac{3}{8}$ " from the bottom of the leg and centered on the thickness of the leg.

Armrests

Now mark the tenon locations atop the front legs. Then dry-assemble the chair and set an armrest on your mark. While holding the armrest in position alongside the front leg, mark where the underside of the armrest intersects the rear leg. The schematic diagram shows that the

long tip of the shoulder on the rear leg should be approximately $20\frac{1}{4}$ " from the floor. Ultimately, the rear legs need to conform to the shape of your armrests, so some variation is expected here.

With the height of the rear legs established, go ahead and complete the tenons atop the legs. I used a fine-toothed dado blade and miter gauge to cut these tenons at the table saw. The tenons are $1\frac{3}{4}$ " square and should project $\frac{1}{4}$ " above the armrests. Once the tenons are formed, set the armrest on the shoulders, and transfer the mortise location directly from the tenons. With the armrest situated so close to its final position, there's no confusion where to locate the mortises. Cut the armrest mortises with a mortiser or by hand. The front mortises are square to the face of the armrest, while the rear mortises are angled. When cutting the rear mortise, it helps to support the armrest with a curved wood block. This will keep the armrest from flexing, and also helps to minimize chipout. If you can't control chipout sufficiently with a support block alone, you may need to transfer the mortise location to the underside and score the perimeter with a chisel. Final fitting of the mortises is done with files and sanding sticks. It's helpful to turn the armrest 180° from its intended position to isolate each



4



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4 Gang a few legs together and glue $\frac{1}{4}$ " thick veneer strips on each side. Thick clamping cauls help ensure a good bond.

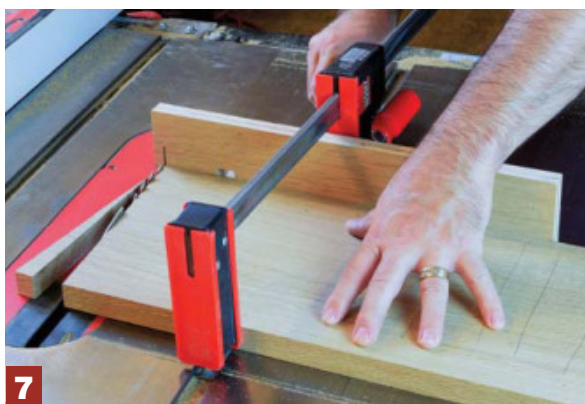
5 The seat rail mortises are $5\frac{1}{2}$ " long, so I divided them into two smaller mortises. First, cut mortises to a depth of $1\frac{3}{4}$ "

6 Then add a 1" spacer block to the mortiser's depth-stop, to limit the depth of cut to $\frac{3}{8}$ ". Then clean out the area between the two mortises. This lets you preserve the depth stop setting as you proceed to the next leg.

7 Start with a 'rail blank' and angle both ends to 5.5° . Secure the blank to a miter gauge with a clamp and make the angled cuts at the table saw.

8 Then switch to a full dado stack, and with your miter gauge still angled to 5.5° , form wide tenons on both ends of the blank. Once the tenon cheeks are complete, you'll rip the narrow rail free.

9 The bandsaw is a quick and accurate means of trimming the tenon shoulders. Complete all four angled side rails in this manner.



7



8



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10 Mark the location of the 1" square notch in all wide tenons. With a dado blade and miter gauge setup on the table saw, turn the rail up on end to make the notch in two passes.

11 The shoulder on the front leg is fixed at 22 5/8" from the floor. Position the bow arm on your line, and mark where it intersects the rear leg. While you're at it, mark a line above the arm and a cut-line that's 1/4" taller.

12 An exception to the rule. Instead of cutting the mortise first with the arm-rests, you'll cut the tenon first. Use an angled miter gauge and dado blade to handle two sides of the tenon.

13 Return the miter gauge to 90° and cut as close to the shoulders as possible.

14 Then switch to a combination blade and angle the arbor to 12°. Trim the sliver of waste that remains with this step-up.

15 Position the armrest so the front face is level and support it with a curved wooden block. Stay inside your layout line and refine the mortise with hand tools.





16

Once you have the armrests fitting nicely, the rest of the work proceeds rather quickly.

16 Fine tune the mortises with files and sanding sticks. Once the front mortise is sized independently, start working on the rear mortise. Undercut the mortise wall slightly to make installation easier.

17 Rough cut the arched seat rails at the bandsaw, before fairing the curve with a spokeshave and sandpaper.

18 An oscillating belt sander with tilting table makes quick work of forming the pyramid shape atop each leg. Work through the grits to smooth the facets.

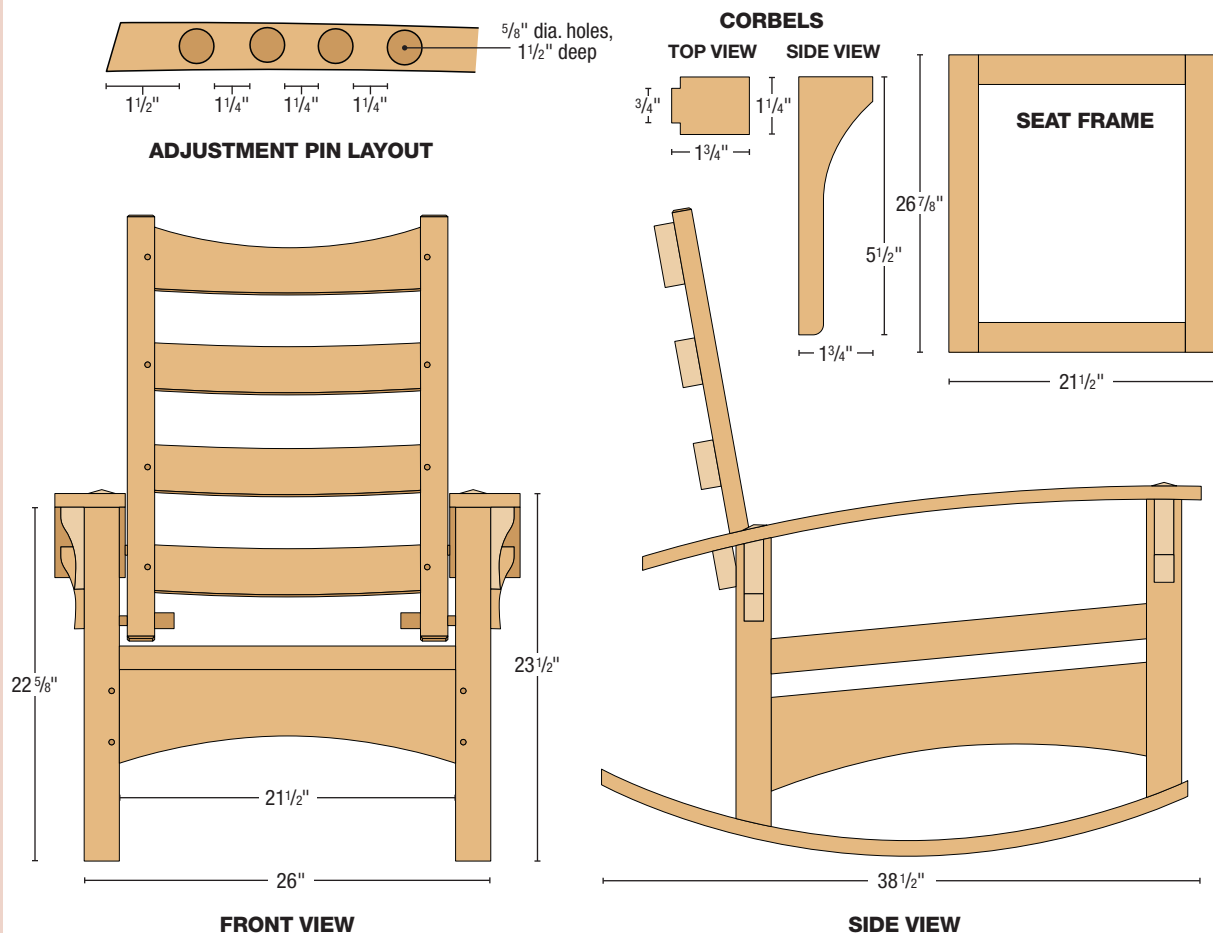


17



18

Bow Arm Rocker



mortise and tenon joint. Once the front mortise slides over the front leg tenon, move on to the rear mortise. Make small adjustments and test your progress frequently. Back-bevel the mortise walls slightly to sneak up on a snug fit.

When building Morris chairs, I feel like it's all downhill once the armrests are fitted. While many steps still remain, much of it is just busy-work. Trim the armrests to a finished length of 36". You'll make the cut from the back of the armrest at a 12° angle. Now you're ready to drill a series of four 5/8" diameter holes in the

armrests for adjustment pins. Then complete the tapered cut at the outer back edge of the armrests.

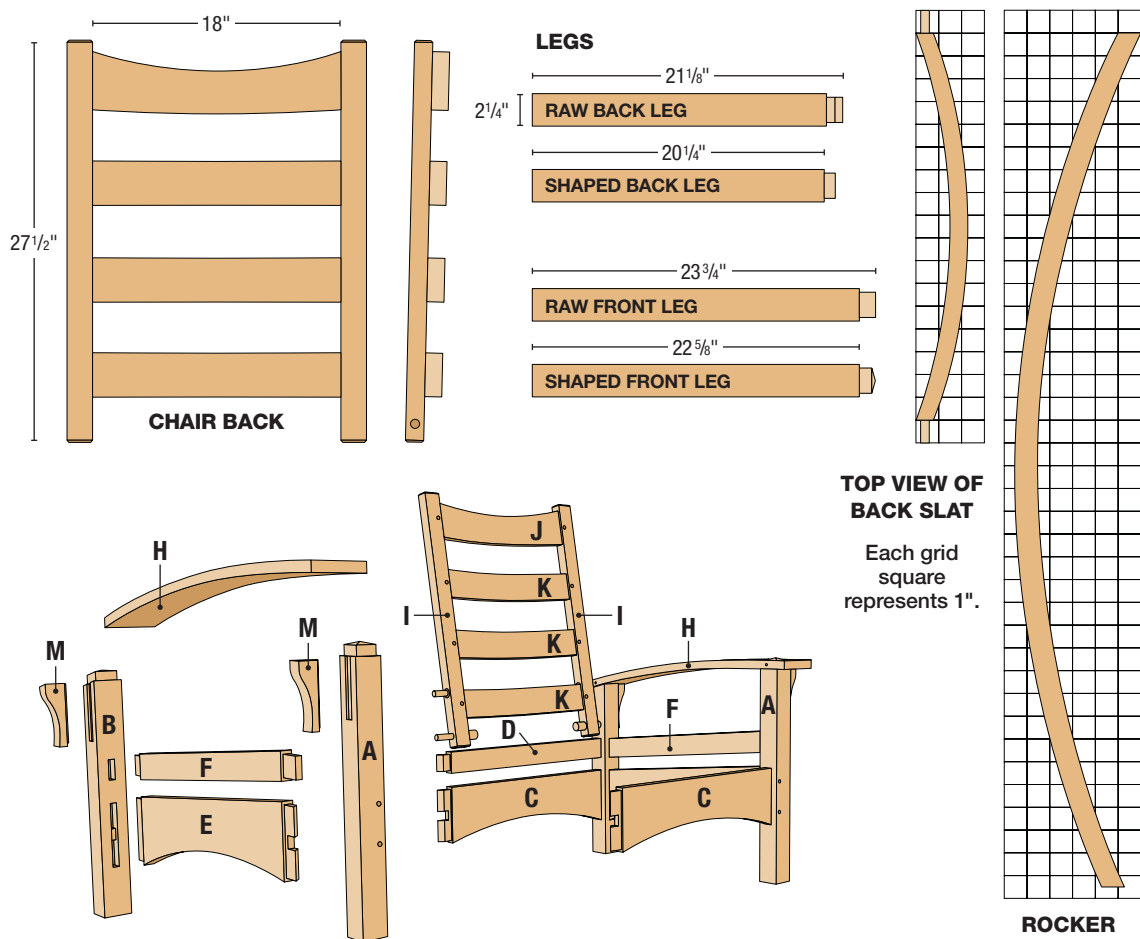
Rout a groove in each leg to receive the corbels. These grooves are 3/4" wide and 5" long, and just 3/16" deep. Make the four corbel blanks and form a shallow stub tenon on each. Once the corbels fit nicely in the groove go ahead and cut them to final shape. Ease the edges of the parts you've made and give everything a thorough sanding.

One of the final details is to chamfer the tops of the legs in a decorative pyramid shape. While

there are several ways to accomplish this, ranging from a chop saw to block plane, I haven't found an easier way than sanding them to shape. I routinely use an oscillating belt sander to gradually form the pyramid shape. A tilting table on the sander combined with a miter gauge helps guide the operation. Start with 50 or 60 grit sandpaper and work up through 120 grit.

Rockers are Bent Laminations

So, this is your final chance to leave it is a Morris chair, or forge



Cut List

No.	Item	Dimensions (inches)			Comments
		T	W	L	
2	A Front legs	2 1/4	2 1/4	23 3/4	22 5/8" to shoulder
2	B Rear legs	2 1/4	2 1/4	21 1/8	20 1/4" to long tip of shoulder
2	C Front/rear seat rails	7/8	6	24 1/4	21 1/2" shoulder-to-shoulder
1	D Rear cushion rail	7/8	2 1/4	24 1/4	21 1/2" shoulder-to-shoulder
2	E Side seat rails*	7/8	6	27 11/16	
2	F Side cushion rails	7/8	2 1/4	27 11/16	
4	G Corner braces	7/8	4	4	
2	H Armrests	1 7/8	4 5/8	38	Trimmed to 36" L x 4 1/2" W
2	I Backrest stiles	1 1/4	1 3/4	27 1/2	
1	J Backrest rail, top	2	4	19	3/4" thick once shaped
3	K Backrest rails	2	3	19	3/4" thick once shaped
2	L Rockers**	1	2 5/8	40	
4	M Corbels	1 1/4	1 3/4	5 1/2	

*Once ends are angled, length = 26 7/8" measured 'long-to-short'

**8 layers of 1/8" strips; finished size 37 1/2" L x 2 1/2" W x 1" D

Supplies List

No.	Item
2	Pivot pegs: 5" L overall, 1" dia. section is 1 1/4" L; 5/8" dia. shaft is 3 3/4" L
2	Adjustment pegs: 3 3/8" L overall, 1" dia.; 1 5/8" L, and 5/8" dia. shaft is 1 3/4" L
2	Washers for pivot pegs: 2" dia., drilled for 5/8" dia. hole. Thickness approximately 1/2"
8	Corner brace screws: #8 x 2" L, square drive pocket-hole style
4	Mounting slip seat screws: #8 x 1 1/2" L, square drive pocket-hole style
-	Selection of oak dowels: 1/4" and 3/8" dia. dowel for pinning M&T joints 5/8" and 1" dia. dowel for backrest adjustment/pivot pins 3/4" dia. for attaching rockers

19 The rockers are laminated from eight $\frac{1}{8}$ " thick strips. A piece of $\frac{1}{4}$ " plywood is used as a caul to distribute the clamping force evenly.

20 Once the legs are angled to final length, glue the side assemblies together. Use spacer blocks between the rails to prevent the angled joints from racking.

21 Next make an angled clamping aid from your leg cutoffs and a scrap board. Secure the leg cutoffs to the board so they align with the legs. This greatly simplifies the task of clamping the armrest in position, for a stress-free assembly.



19



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21

on to complete the Morris rocker. Or perhaps one of each? Use your second bending form to laminate the rockers. Cut $\frac{3}{16}$ " x $2\frac{5}{8}$ " strips on the bandsaw, and plane them down to $\frac{1}{8}$ " thickness. The strips are about 40" long, and you'll need eight layers for each rocker. Try to cut them consecutively from a thick plank for the best grain match. If that's not feasible, arrange the layers for the most consistent look.

When I was building the MDF rocker form, I used four $\frac{3}{4}$ " layers and added some scrap pickets to act as a fence. Screw the pickets to the form and cover any exposed areas with packing tape to keep the glue from sticking.

The diameter of the rocker form accounts for minimal springback that is typical with standard yellow

PVA wood glue. If you choose to use a specialty glue or epoxy, it may alter the finished radius of your rockers. Use a 3" wide smooth paint roller to apply glue to one face of each strip of oak. Lay a strip of $\frac{1}{4}$ " plywood (also covered in packing tape) on top of the laminated strips as a clamping caul. Start clamping at the center of the form and work outwards as you go. Leave the rockers clamped in the form overnight, and once cured, dress them at the jointer and rip them to finished width. Position the rockers next to the legs and mark the final leg length. Disassemble the chair and trim the legs to your line.

Side Assemblies

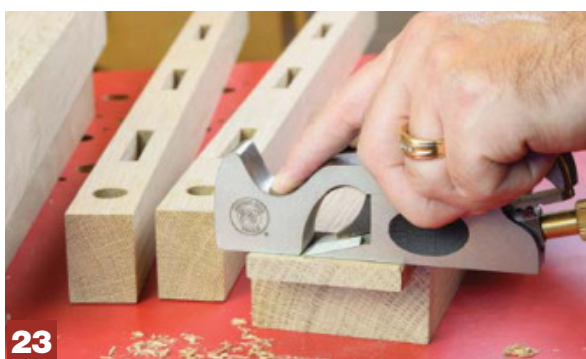
Glue up the side assemblies with two legs and two rails each. The armrests can be attached in a sepa-

rate step, once the other clamps are removed. Next clamp the rockers in position and drill for dowels with a $\frac{3}{4}$ " brad point bit. Then use an age-old technique to attach the rockers: wedged dowels. I have a Limbert rocker from 1908 that used the very same technique (more than a century later, it's still rocking). Slit the dowels on the distal end, to receive a small wedge. Drive the dowels through holes in the rockers and add the wedge to permanently affix them to the legs. Trim the dowels and give things a final hand sanding.

When these side assemblies have cured, connect them with the front and back rails. Drill the armrest joints for $\frac{1}{4}$ " dowels to hold everything in place. Likewise, the lower mortise and tenon joints are drilled for $\frac{3}{8}$ " dowels. Glue the corbels in



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22 Clamp the rocker firmly in place to drill $\frac{3}{4}$ " holes. Temporarily remove the rocker to apply glue to the end grain and reinstall the clamp set-up. Drive the dowel in place first and add the wedge last.

23 Use a shoulder plane to shave offset tenons to final size.

24 Once the joinery is complete, cut the curved backrest rails at the bandsaw.

place, adjusting the angle of the rear corbel to fit the armrest.

Ladder Back

The backrest consists of only 6 parts; two uprights and four rails. Start by making the two uprights, which are $1\frac{1}{4}$ " thick x $1\frac{3}{4}$ " wide x $27\frac{1}{2}$ " long. Lay out and cut the mortises in the uprights, making note that the top rail is wider than the rest. You'll need one $3\frac{1}{2}$ " long mortise and three $2\frac{1}{2}$ " long mortises in each upright. These mortises are all $\frac{3}{8}$ " wide, and 1" deep.

The easiest way to make the curved backrest rails is to start with $\frac{8}{4}$ stock. Lay out the offset tenons and curve the rails planning for a finished thickness of $\frac{3}{4}$ ". Complete the tenons on each rail with a dado blade and miter gauge setup at the table saw. Once all the tenons are complete, start shaping the curves at the bandsaw. Finish the rails by sanding

the curves smooth, front and back. Keep moving things along by drilling holes for the pivot pins and gluing the backrest sub-assembly together.

Final Details

Whether you're planning to tackle the cushions yourself or not, you'll need to make a frame for the slip seat. Size the frame $\frac{1}{4}$ " smaller than the opening in all directions to allow room for the cushion material. The seat frame uses half-lap joinery, which is a strong and traditional joint for this application. Glue the four parts together, and round over any sharp edges to protect the upholstery.

Four corner blocks are required as well. Pre-drill and counterbore the corner blocks, before permanently installing them on the chair. Mount the corner blocks as low as possible, so the seat height can be adjusted with ledger boards as needed.

Now make the pivot pins and adjustment pins. Either turn them on a lathe or make them from oak dowels. In the latter case drill a 1" diameter dowel to receive a $\frac{5}{8}$ " diameter dowel and glue them together. The final parts required are a pair of hexagonal wooden washers which help to center the backrest between the armrests. The wooden washers are 2" diameter with a $\frac{5}{8}$ " diameter hole.

Apply the finish of your choice and turn your attention to the upholstery. The seat cushion is layered from three different densities of form and is about 7" thick overall. The backrest cushion is a single piece of soft 3" foam, wrapped in polyester batting. For detailed information on building your own cushions, see page 60. **PW**

Willie Sandry makes Arts & Crafts furniture in Washington.



PROJECT #2011

Skill Level:

Intermediate

Time: 2 days

Cost: \$75

Textured Jewelry Box

Turn a single board into a heirloom.

By Teresa Audet



Jewelry boxes are some of my favorite pieces to make. There is so much versatility in the design and use! And, they give you a taste of all kinds of woodworking processes (though on a smaller scale). This project is a quick and easy way to make good use out of one board of wood. With relatively simple joinery, this is a cost-effective piece to make in batches for sales or gifts.

Grain Selection & Layout

When you are inspecting a piece of wood for this project, think about grain selection—what do you want to be the outside of your box? What do you want the drawer fronts to look like? I like to roughly draw out on a piece of paper exactly where each piece on the cut list will come from so I know I haven't overlooked any pieces.

I picked a nice clear section of grain to use for the carcass—being sure to label what side I want facing out. Since we will be milling the wood thin, you will want to keep your pieces in longer sections and ensure you have extra for things like drawer handles and splines. It is not fun to get nearly finished with and realize you need another 3" of something. Lay out extra material to test saw set-

ups on wood of the same dimension.

When working with thin stock, it is best to leave everything rough-milled to be slightly thicker than needed and stack the boards between stickers to prevent warping. Resawn lumber especially likes warp and twist after opening up. Ideally, you would mill your wood and cut joinery in the same day.

Cutting the Carcass

We'll start with the carcass piece, milled to $\frac{3}{8}$ " thickness, and the pieces for the back and shelf, milled to $\frac{1}{8}$ " thickness. Rip the carcass piece to $5\frac{1}{16}$ " wide but keep at the 25-26" length.

To cut the groove that will hold the back piece, I'm using a table saw with a flat-topped saw blade. Drop the height of the blade to $\frac{3}{16}$ " and adjust the rip fence to $\frac{3}{16}$ ". Run the bottom edge of the piece along the fence and the inside of the piece down against the table to cut a groove. Test both of these settings

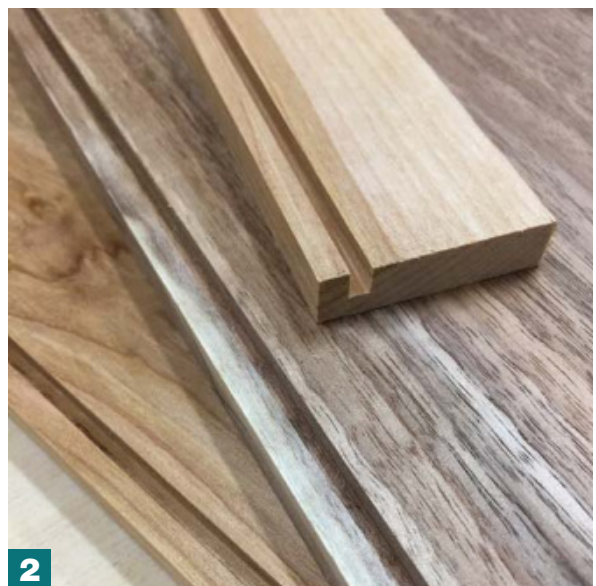
on a piece of scrap wood before cutting into your final piece.

Set up a miter sled on the table saw to cross-cut the carcass pieces into the four lengths, at 90° for now. Mark the outside face of the board with triangles or lines to help line up the grain after the piece has been cut into shorter lengths. First, cut the very end of the board off to square it up, and then use that cut end against the stop block. Working on the right-hand side of the sled, set a stop block and cut the first piece to $7\frac{1}{8}$ ". Leaving your first block in place, set a second stop block and cut the next piece to $5\frac{1}{8}$ ", removing this stop block after this cut. Cut another piece at $7\frac{1}{8}$ " using the first stop block. The remaining piece will be your last $5\frac{1}{8}$ " piece which you can leave long for now.

Cut the Miters

Set the saw to 45°. Cut one side of each piece to 45°, taking care not to cut off more than necessary but not

- 1 Begin by ripping your $\frac{3}{8}$ " stock to $5\frac{1}{16}$ " wide. Even though you'll be breaking this board down into four pieces, keep it one piece (26" long) for the time being.
- 2 Next, cut a $\frac{3}{16}$ " deep, $\frac{1}{8}$ " wide groove $\frac{3}{16}$ " from the back edge of the board. This will house the back.





3



5



4

3 Use a crosscut sled to cut the carcass pieces to length on the table saw. Start by squaring up one end.

4 Use two stop blocks (one set at $7\frac{1}{8}$ " and one at $5\frac{1}{8}$ ") to keep the top/bottom and sides consistent. You'll be swapping out the $5\frac{1}{8}$ " block as you cut, to keep the grain continuous.

5 Set the blade to 45° to cut the miters. Use the stop blocks, cut the top and bottom, then the sides.

leaving a flat edge uncut. Set a stop block to cut the last side to 7", marking your piece at the correct length and slowly testing your cuts until you get to the right size. Cut both the top and bottom before moving the stop block. Repeat this step for the sides at 5".

Tape the box together to test the fit and to measure the inside dimension. Lay out each piece facing down and line up the top edges with a straight edge. Put two pieces of masking tape on each corner seam, making sure the bottom groove is lined up correctly

on the inside. Gently fold the box into itself and tape the last seam to close. Test the fit of your box; the corners should come together forming a 90° angle with no gaps along the seam.

Measure the inside dimensions of your box—it should be $6\frac{1}{4}$ " wide by $4\frac{1}{4}$ " high by $4\frac{3}{4}$ " deep. If your box ended up being smaller than this, you will have to recalculate the size of your back and shelf pieces. Take the piece milled at $\frac{1}{8}$ " and cut it to the final dimensions of $6\frac{9}{16}$ " x $4\frac{9}{16}$ " for the back piece and $6\frac{9}{16}$ " by $4\frac{3}{4}$ " for the shelf piece.

Routing the Shelf Dado

Label each piece of the carcass, noting the top, bottom, left and right sides. On the sides, label the front edge and the top edge. Make a pencil mark at both $1\frac{13}{16}$ " and $1\frac{15}{16}$ " down from the inside of the top edge. Set a marking gauge and mark $\frac{1}{4}$ " in from the front edge at the point it intersects the pencil marks. This is where we will cut the stopped dado for the shelf piece.

For these small boxes, I prefer to work with a handheld trim router and set up a jig so that the workpiece is facing me. In the setup



6



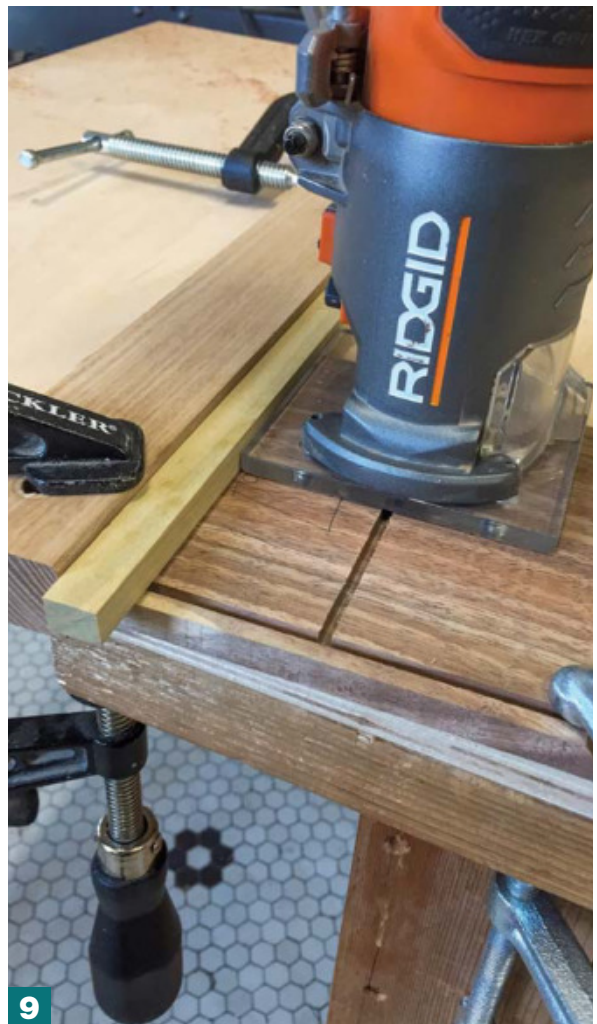
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8

6 Use a marking gauge to mark the end of the stopped dadoes on the interior of the sides.

7-9 Using a router to cut the $\frac{1}{8}$ " wide dadoes takes a little clever jiggling on sides that are already mitered. I use a straight fence to register the mitered edge. Then, I ripped a thinner piece of wood that covers the miter. That's the piece you'll fine-tune to make sure your router base has a good reference and lines up with your dado layout. You'll mirror this operation for the other side.



9



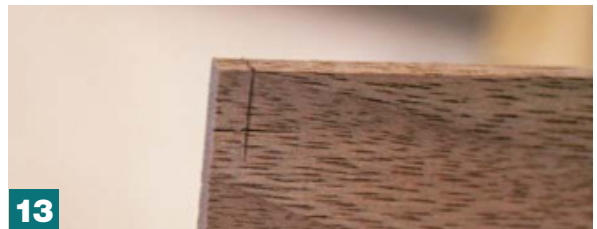
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10 Rout out the bulk of the dado, stopping just shy of your end mark.

11 Square up the ends of the dadoes with a chisel.

12 You should have two mirrored sides, with the stopped dadoes toward the front of the box.

13 Mark and cut out the two corners of the divider so that it fits in the stopped dado.

14 Before assembly, I give the inside front edges of the sides and top/bottom a small chamfer with a plane.



15

15-17 With small boxes like this, tape is usually all the clamping I need. I do a dry assembly first to make sure all the miters fit nicely. I also use this as an opportunity to fine tune the fit of the back and shelf, making sure to allow a little wiggle room for wood movement.



16

picture on page 41, I have clamped a long, straight piece of wood to the edge of a table to act as a fence. After testing a few different layouts on scrap wood, I found a $\frac{1}{2}$ " spacer gave me the right distance to work with the base of my handheld router. Use a c-clamp that clears the router or woodturner's double-sided tape to secure the work piece down. The depth of the cut should be about the same as the depth of the groove for the back piece (which was $\frac{1}{8}$ " deep).

Test the cut on a piece of scrap wood before cutting your material. Cut the dado in both side pieces, one at a time. Be sure to hold the top edge against the fence each time. The dado should end at the marked line $\frac{1}{4}$ " in from the front edge and at the groove for the back on the opposite edge. Drop the running router bit into the wood while holding the front edge against the fence. Go slowly and be sure you are cutting into the blade.

Fitting Stopped Dado

Square off the round edges of the dado with a small chisel. On the shelf piece, use the previously set marking gauge to mark $\frac{1}{4}$ " in from the front edge down along sides of the shelf piece and then $\frac{1}{8}$ " along the face to cut a notch out to fit into the stopped dado.

Chamfering Inside Edge

Using a pencil or a marking knife set to a shallow cut, mark along the grain $\frac{1}{16}$ " in from the front and inside edges of all four carcass pieces. Use a handplane to chamfer the inside edge of the box, removing the material between these two marked lines. These chamfers should line up in each corner with no uneven sides. Plane the front edge of the shelf piece to the point where it meets the new chamfer on the sides.

Test the fit of the back and shelf pieces by re-taping the box together.



17

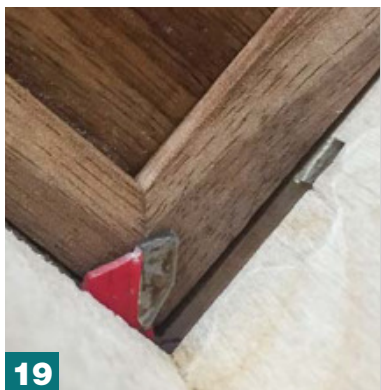
Carefully check the fit, ensuring that the mitered edges still close without bulging out and there are no gaps in the corners. Keep wood movement in mind, the back piece should have a bit of space to swell and move along the grain. We don't want things too tight.

Gluing the Carcass

Sand the inside of the carcass pieces before gluing it together. I like to put a light coat of oil/wax mixture on



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18 After the glued up case has time to set, it's time to cut the splines. I do that with a cradle jig on the table saw.

19 Set a flat-topped blade to cut 1/2" deep into the corner of the box.

20 I cut the middle splines first, then adjust the fence for the outside splines.

21 Test fit the spines for fit, then glue them in place.

22-23 Cut the splines flush. A bit of tape on my saw raises it just enough to protect the box from saw marks.

the inside surfaces before glue-up because the finish resists glue and makes it easier to wipe away squeeze-out on the small inside pieces. Do not get finish on the miter joint edges or inside the grooves as the glue will not stick. Alternatively, you could lay a piece of masking tape on the wood just where the seams will meet, to catch any glue squeeze-out.

Get everything in place before you start spreading your glue. Have your tape ready and your wet rag on hand. As before, line up your pieces using a straight edge and tape the backs together, then flip it over and use a paintbrush or your finger to spread

a generous amount of glue into the miter joints. Do not put glue in the dado for the back piece, and you don't need a lot of glue in the shelf dado. Fold the box into itself, making sure to put the back and shelf pieces in as you do. Use a wet rag to wipe away the glue from the inside seams. Put two or three pieces of strapping tape along each mitered seam and check everything for square. Now, do not touch or move your piece while the glue dries!

Cutting the Splines

Once the glue has set (I usually wait at least 2-3 hours or more), you can

cut the grooves for the splines in the carcass piece. Use a spline jig and a flat-topped table saw blade to cut the three splines in each side. Use a piece of scrap wood to test the height of the saw blade using the spline jig. The height of the blade determines the length of the cut, which should extend 1/2" from the corner on either side.

Mark 3/4" and 7/8" from the front edge and line up the table saw blade between those two marks. Set a stop block here and cut four splines at this dimension, making sure to check your stop block for square against the spline sled. Keep the front edge along

the stop block and turn the box after each cut until you have cut all the way around the box. Flip the box around and use the same stop block to cut the splines using the back edge of the box against the stop block. Repeat the process until you have a total of eight spaces for splines. Mark $\frac{1}{16}$ " from either side of the center and again line up with the saw blade and set the stop block to cut the center spline grooves.

Gluings the Splines

Take your piece of $\frac{1}{8}$ " material set aside from making the back and shelf piece and test it's thickness against the grooves. It should be a snug fit but you should be able to get it in and out at this point without too much effort. The pieces will swell a bit with the glue.

Crosscut the spline stock small sections using the bandsaw or a handsaw. Prepare extra spines

in case any break or drop on the floor while gluing up. Use a small paintbrush to brush wood glue into the inside of the spline grooves and onto the splines and gently tap each piece into place, making sure that each piece is fully seated at the bottom of the groove. Wipe up any excess glue on the outside of the spline joint and check for gaps in both sides of each spline.

Set aside to dry for an hour or so before using a flush-cut saw to trim the excess. If you don't have a flush-cut saw, you can run a piece of masking tape along either side of your saw so that the teeth won't dig into the box while cutting off the splines. Cut the corner part first so the delicate end grain doesn't pop out there.

Now you can sand or scrape the outside of the box and prepare for carving. The box should be sanded to 320 and then dusted off or planed and scraped.

Carving the Outside

When drawing out the area for the decorative carving, I like to do a few carving samples on scraps of wood and look at the patterns against the nearly-finished box. I freehand draw directly on the box the area that I want to carve, stepping back often and looking at the box from multiple angles until the balance feels right.

Gently clamp or wedge your box onto your bench so it does not move around – you can put rags or white Scotch-Brite pads inside the vise jaws to prevent scratching. Use a sharp #5 or #7 gouge to create the scalloped texture decoration. Hold the tool in your right hand and brace yourself against the work surface with your left arm, holding your right hand with your left. Move in slow, steady motions — try to create a rhythm that will help your hands automate moving the same distance and taking the same size scoop with each step.



24

25 Lay out the pattern for the texturing in pencil. I aim for something organic and interesting that plays off the grain of the box.

26 After some test cuts on scrap, gently clamp the box to your bench and start cutting the texture. I use a sharp gouge and use slow, steady motions.

27 As you work your way through, be methodical and try to take the same level of cut each time.

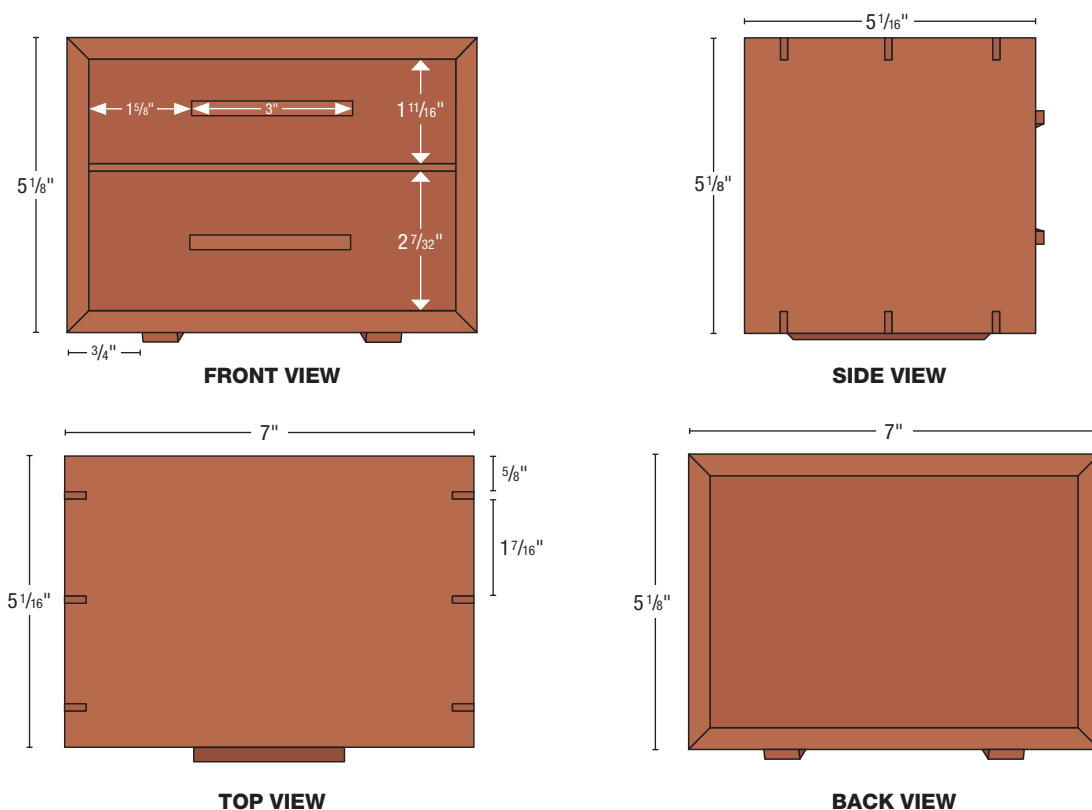


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26

Textured Jewelry Box



Move the blade's edge across the surface in a left-to-right slicing motion as well as a front-to-back cutting motion to achieve the cleanest cut. Each scoop should be one movement of the gouge to keep things the same size. Move in rows, finishing one linear row before going to the next, overlapping the circular scoops of the gouge to create hexagon shapes.

Carry the lines around to the other sides of the jewelry box to continue the carved pattern around the sides. You don't necessarily have to do the whole bottom surface, but I like to carve an inch or two onto the bottom for a little surprise for attentive viewers.

Keep your tools sharp and strop often. A sharp blade and a steady, shallow cut will leave a smooth

surface that will not require any additional finishing. A dull gouge will leave streaks in your scallops and a rough surface. Be consistent with your pressure, depth of cut, and distance between cuts for an even pattern. Use caution around the mitered corners and the end-grain splines. Once the carving is complete you can lightly buff the surface with a white Scotch-Brite pad to knock down any edges and smooth out the carving.

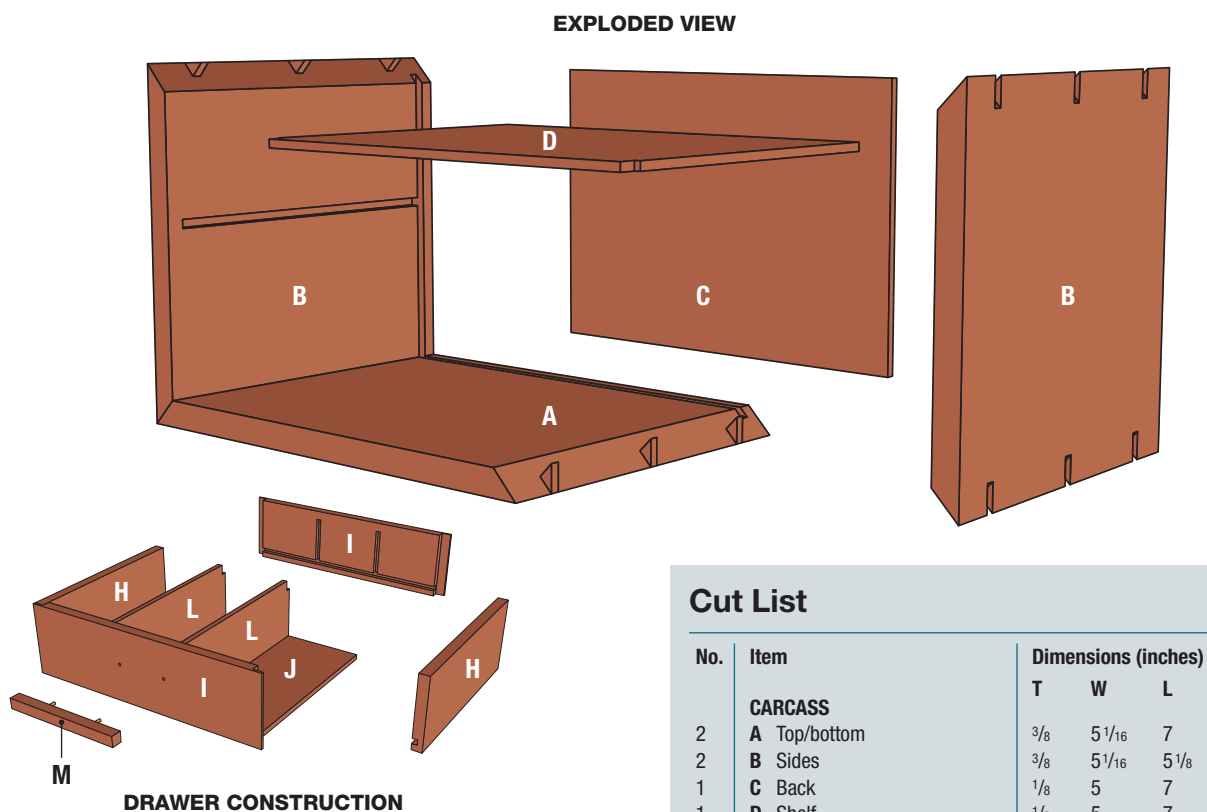
The Drawers

Mill your drawer stock to its final $\frac{1}{4}$ "-thick dimension and widths of $1\frac{13}{16}$ " and $2\frac{1}{4}$ ". You will want to test fit the height of your drawers with scrap wood to ensure there is about $\frac{1}{32}$ " of space between the top of the drawer pieces and the inside

of the box. Allow enough room for the wood to move over the seasons. While the pieces are still at their 20" length, cut the groove that will capture the drawer bottom. Carefully lay out your pieces and label the outside faces and the bottom edges, and decide which piece will be the drawer fronts.

Since we are using $\frac{1}{8}$ " plywood for the bottoms we will use one pass on the table saw to cut the groove. Set the table saw fence to $\frac{5}{32}$ " and the height of the saw to $\frac{5}{32}$ " and test both settings on a piece of scrap wood from the drawer stock. Cut a groove in the bottom of both drawers.

Set up the table saw miter sled to cut the drawer parts to lengths listed in the final cut list. ($6\frac{3}{16}$ " and $4\frac{5}{8}$ ") Carefully measure the



Cut List

No.	Item	Dimensions (inches)		
		T	W	L
CARCASS				
2	A Top/bottom	3/8	5 1/16	7
2	B Sides	3/8	5 1/16	5 1/8
1	C Back	1/8	5	7
1	D Shelf	1/8	5	7
2	E Feet	1/4	5/8	4
DRAWERS				
2	F Top drawer sides	3/8	1 3/8	4 5/8
2	G Top drawer front/back	3/8	1 3/8	6 3/16
2	H Bottom drawer sides	3/8	2 1/4	4 5/8
2	I Bottom drawer front/back	3/8	2 1/4	6 3/16
2	J Drawer bottoms	1/8	4 1/8	5 7/8
2	K Top drawer dividers (opt.)	3/8	1 11/16	4 1/2
2	L Bottom drawer dividers (opt.)	3/8	2 7/32	4 1/2
2	M Drawer pull	1/4	1/4	4

*Also needed: 1/16" polished brass rod at minimum length of 1 1/2"; two 3/8" long wood screws

inside of the carcass at this time and tweak the measurements as necessary. We want to leave about 1/32" of space on either side of the drawers and at the top edge to allow for wood movement. Use these margins to determine the size of your drawer parts. If you are correctly following along with these dimensions, your parts will be 6 3/16" x 4 1/2".

The drawer joinery details are shown on above; take note of how this will go together before starting to cut your drawers apart. Cut your first end square, and then use a stop block on the miter sled to cut all the drawer parts of the same length at once (that's four at each length). Be sure to have some excess material for testing later on.

Next, rip the pieces for the drawer

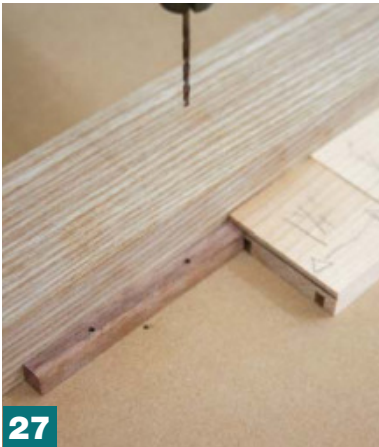
pulls and the feet. You should be able to get this from the scrap you've accumulated. You need two pieces at 1/4" x 1/4" x 2 3/4" for the drawer pulls and two pieces at 1/4" x 5/8" x 4" for the feet.

Drawer Joinery

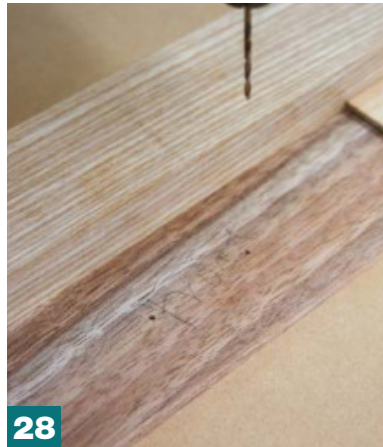
Set up a 1/4" dado blade on the table saw to cut the rabbet joints for the drawer sides. The height should be set at 3/16". Set up a stop block on the right hand side of the miter sled so that you are cutting 1/4" off of the sides of the 6 3/16" pieces. Test the settings with a piece of scrap wood

from the drawer stock. Cut both sides of both drawer front and back pieces, eight cuts in total.

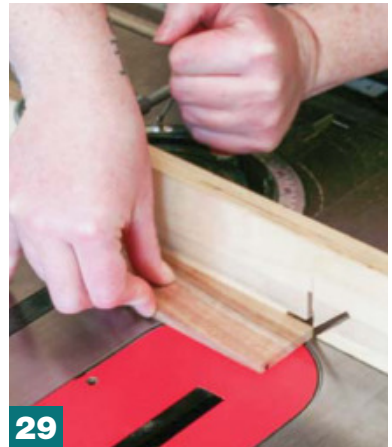
Now you should be able to fit your drawer pieces together using masking tape and test the fit into the carcass. Fold over a piece of masking tape and leave it sticking out of the drawer to use to get the drawer in and out since there are



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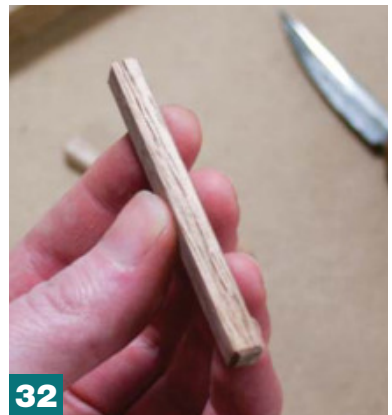
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27 The handles for the drawer boxes are pre-drilled for a bit of brass rod to be used as standoffs. I use a drill press for this delicate work.

28 Repeat for the drawer fronts.

29 The boxes are joined with rabbets. I use a dado stack and miter gauge to cut the rabbets. The top drawer is completely open, but I added dividers to the bottom drawer, held in place with dados.

30 Fit the drawer bottom and glue up the drawers. I prefinish the interior of the drawers, making sure to tape off any glue surfaces.

31 When clamping the drawer, keep in mind too much clamping pressure can warp these small parts. Use only enough to draw the joints tight.

32 I use a carving knife to add a little detail to the drawer pulls, reinforcing the organic shapes of the jewelry box.

no pulls yet. The drawers should fit with just a bit of wiggle room without large visible gaps at the sides but should not take effort to push in. We're looking for close to $\frac{1}{32}$ " of space between the sides and top. Remember that the tape is taking up some of the space and that you can always take a handplane to the sides after glue-up if it is too tight or glues up out of square.

Once you have test the fit of the drawers and made any corrections to your cuts, you can determine the size of the bottom panels. The bottoms will be the inside dimension of the drawer plus $\frac{1}{4}$ ". Mine measure $5 \frac{15}{16}$ " x $4 \frac{3}{8}$ ". I prefer to finish drawer bottoms before glue-up, so at this point I am moving to the finishing room to finish and flock the drawer bottoms. I have also sanded and finished the inside of the drawers before glue up, taking care

to not finish any part of the rabbet joint that will be glued.

Drawer Dividers

The optional drawer dividers are made from $\frac{1}{8}$ " stock milled earlier in this process. The height of the drawer dividers should be the same or just under the height of the inside of the drawer. This should be a height of $1 \frac{1}{2}$ " for the top drawer and $1 \frac{15}{16}$ " for the bottom drawer.

We will use the same process with the handheld router that we did to cut the dado for the shelf piece in the carcass. Setting up a jig to cut the between $1 \frac{7}{8}$ " and 2" from each edge of the long drawer sides to divide the drawer into three widths. Stop the cut $\frac{1}{4}$ " from the front edge and cut the divider piece to create a stopped dado that is invisible from the top of the drawer. Repeat the cut on the bot-

tom drawer to create two asymmetrical rectangles.

Drawer Pulls

Before gluing up the drawer fronts, we will mark and drill two holes at $\frac{1}{16}$ " diameter by $\frac{1}{8}$ " deep for each drawer pull. Have your drawer pull stock ready so you can drill both sets of holes at once. Set up a stop block on the drill press so that the first hole is drilled at $\frac{3}{4}$ " away from the side of the piece and in the center along its width. Make a $1\frac{1}{4}$ " long spacer from scrap wood to drill holes in both the drawer fronts and pulls exactly the same distance apart. Drill the first hole in the drawer front using the stop block, and then use the spacer to move the piece over $1\frac{1}{4}$ " to drill the second hole. Drill the holes in the drawer pulls in the same way, drilling the first hole with the stop block then using the spacer against the stop block for the second hole.

Drill these holes slowly as to not allow the thin drill bit to bend, and set a stop or use a piece of tape on the drill bit to ensure you do not drill all the way through either hole.

Sand and finish your drawer pulls. I like to use my carving knife to facet the edges of the drawer pulls and carve a bit of the back off for a nice grip for your fingers.

Using a hack saw or wire cutter, cut four pieces of $\frac{1}{16}$ " polished brass rod to $\frac{3}{8}$ " lengths for the drawer pulls. Buff the brass with fine scotch-brite pads before cutting to length. I prefer to glue on pulls after the drawers have been finished or at least glued up, but you may do so at any time.

Drawer Assembly

Once all of your drawer parts are ready, it is time to glue up. Get everything you need ready and test all of your clamps dry before gluing, including a wet rag and wooden cauls so the clamps don't bruise the wood. In the same manner that we glued up the carcass, we



will use wood glue over the rabbet seams and avoid getting glue into the groove for the bottom. Be sure to get enough glue on all the surfaces of the rabbet joint and clamp together with the bottom piece and optional drawer dividers in place. I used four clamps on the top drawer and eight clamps on the lower drawer. Check the drawers for square using a small square or by measuring the distance between opposite corners. Wipe away any excess glue with a wet rag and allow it to set for several hours. At this scale the glue joint is strong enough so I don't pin the rabbets.

The Feet

Get the two pieces set aside earlier for the feet ($\frac{1}{4}$ " x $\frac{5}{8}$ " x 4"). Cut each end at 45°, setting a stop block to ensure they are both the same length. Drill $\frac{1}{8}$ " holes through the feet at 1" in from either end and centered along the width. Mark $1\frac{1}{4}$ " in from either outside edge of the bottom of the box and line both

33 Apply finish to the outside of the box. I used Tried and True Danish Oil.

feet along these parallel lines. Use two $\frac{3}{8}$ " long wood screws in each foot to secure the feet to the box.

If any part of the drawers sticks or is too tight, use a handplane or sanding block to thin the piece until it fits. Use a block plane and knock down the highest edges of the back of the drawer and the sides near the back to leave room for wood movement but keep the drawer face tight.

The drawers, drawer pulls, and feet should all be sanded to at least as high as 320 grit. The box should already be sanded and buffed after carving. Finish the box with your oil of choice; I prefer Tried and True Danish Oil or Wipe-On Poly. **PW**

Teresa Audet is a maker in Minneapolis. See more of her work at teresaaudet.com



■ Plywood Office Suite

Build a modern workspace with just a single sheet of plywood.

By Dillon Baker

PROJECT #2012

Skill Level:

Beginner

Time: 1 day

Cost: \$150

Creating your own space

seems to be a rite of passage for most first-time homebuyers. Albeit, it's often easy to become disillusioned, overzealous and even unrealistic about the amount of work it takes to transform your entire space. Coming from someone who is constantly trying to decipher a barrage of concepts and new project ideas, finding a starting point is always the most difficult facet.

After occupying my new home for the better part of 6 months I figured it was finally time to tackle one of my many planned projects. For me, when starting a project, it is imperative to do some pre-planning to help avoid your space from becoming one of those abandoned projects that is indefinitely incomplete. They are the project(s)/room(s) in homes that become closets for the unwanted and just another space to ultimately avoid.

After much deliberation, deciding on the room I am declaring as my office seemed like an obvious candidate. The room needed to be a space I could spend extended periods of time in, and ultimately one that could be used as a creativity incubator (but also a place to just sit and be). The room is modest, approximately 160 square feet and equipped with two windows. Considering the size of the space (or lack thereof), it's important to address not only the challenge of what to place within

it, but where/how you place it. This left me with the conclusion that the first sensible pieces of furniture an office needs are a proper work surface with an ample amount of storage. Let's get started.

Cutting Your Pieces

Start by cutting all your plywood pieces to size. All that is required

for this project is one 4'x8' sheet of Baltic birch plywood. I like to start by cutting my largest lengths/widths first. This approach allows your sheet of plywood to become more manageable in size at a much quicker rate. If you do not have access to a table saw, using a circular saw with a straight edge and a few supports will suffice.



1



2

1 With your parts cut to size, focus on the details to turn a series of boxes into something more refined. I settled on rounded corners as a defining feature. Measure in 1 1/2" from each side to find the center of your arc.

2 Use a compass set to 1 1/2" to lay out the curve. Use the 1 1/2" center point as the center.

3 Cut close to the curve with a jig saw, make sure to stay in the waste side of the line.

4 Finally, refine the edge with a sanding block.



3



4



5



6



7



8

5 Next, I add 1½" holes in the center of each arc. Use the center you marked previously and a 1½" Forstner bit in a drill press.

6 Add a small ⅛" roundover to all exposed edges. This will take a little planning ahead, but it's easier to do this to your parts while everything is disassembled.

7 Pre-drill and countersink screw holes for all your joints. You'll be filling these holes with ⅜" plugs, so make sure they're deep enough.

8 I use pocket hole screws for the back ledger boards to keep things looking clean on the front.

When laying out your cut list, it's important to consider the sequence in which you cut your individual pieces. For example; the shelf lengths are equal to the length of the desk so it's wise to crosscut your sheet to the 42" measurement, then proceed to cut the individual pieces down to their respected widths. This methodology and system of cutting ensures the overall accuracy of your pieces while simultaneously cutting down on the amount of times you need to adjust your fence.

Once the tops are cut, I move onto the desk sides, dividers and shelf brackets. With the remain-

ing material leftover from the 42" cut for the desk/shelf tops, I cut the ledger/mounting boards for both shelves as well as desk. There is an optional drawer that can be constructed from the leftover ¾" material, however, I used scrap ½" plywood that was laying around to maximize drawer space. Now that your pieces are cut, it's time to move on to the joinery.

Simple Joinery

The joinery used for this project is as simple as counterboring holes, and then proceeding to use screws followed by ⅜" wooden plugs. I know this is a far-cry from the per-

fect marriage of two exceptionally cut joints. However, the objective of this project should be reflected in both the accessibility of its construction as well as its design. There is no finite equation for the layout of the screws just so long as they are spaced evenly enough to ensure sufficient lateral tension. For the desk, I found center on the width of the board, and then proceeded to measure 1" in from either side. This gave me three points of contact for every perpendicular intersection on the desk.

When it came to the layout of the screws on the shelf, I followed my previous method by measuring 1"



in from the sides. The only difference here is that the measurement began where the contact point of the bracket met the top. This is a result of the bracket being shorter in width than the shelf top. Since the shelves are much shallower than the desktop, two screw locations were exchanged for the three. Now that all your contact points are laid out and drilled, it's time to switch our attention to the ledger boards. These were installed last in the construction using pocket screws. By substituting pocket screws, this allowed for maximum surface contact without the need for the screws having to be concealed.

All in the Details

Now that all our pieces are cut and have been laid out and drilled for all our joinery, it's time to give the plywood a personality. Even though Baltic birch plywood is lauded for its many refining qualities, it often times still requires a degree of manipulation to set it above the rest. Inspired by Waterfall furniture of the 1930s and 40s, distinctive rounded drops were added to all the edges of horizontal surfaces. This feature not only drastically softens the edge, but also allows the surfaces to act as an organic 'extension' of which they are mounted.



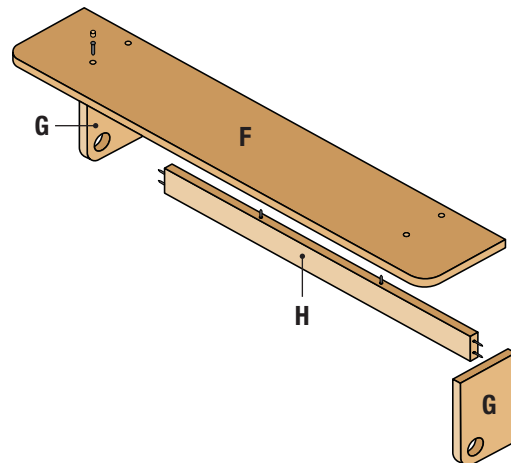
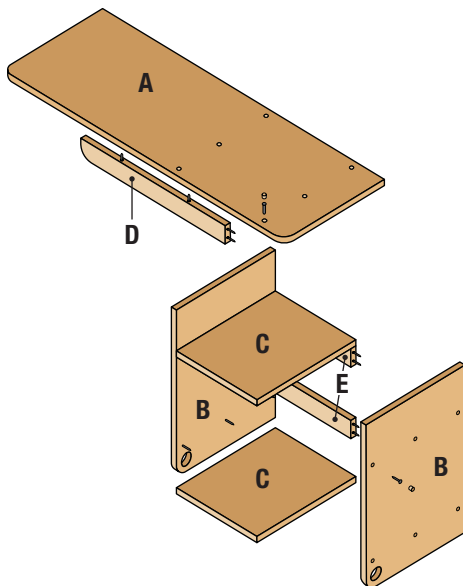
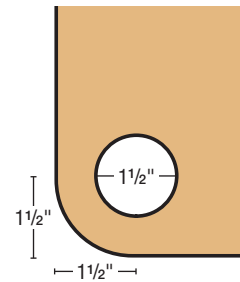
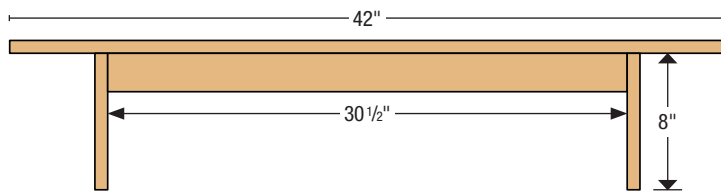
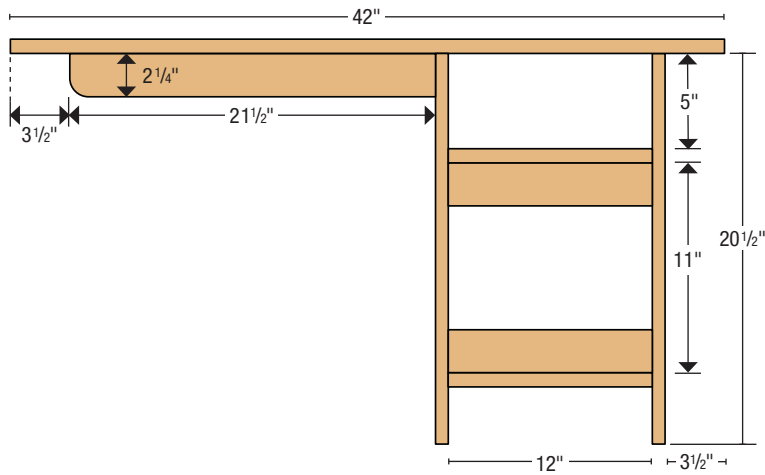
9 With all the prep work done, it's time for assembly. The desk and shelves are just screwed together (no glue). Assemble the understructure of the desk first.

10 Attach the top to the desk.

11 With the shelves, attach the tops to the supports.

12 Then, attach the ledger boards to the desk and shelf assemblies.

Plywood Office Suite



Cut List

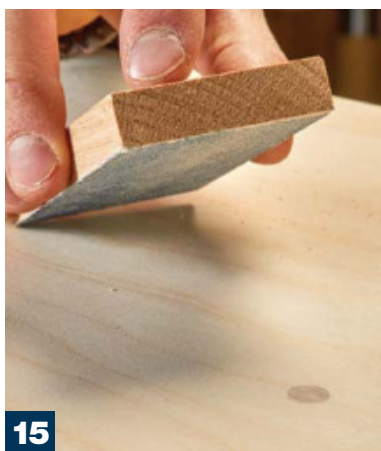
No.	Item	Dimensions (in.)		
		T	W	L
DESK				
1	A Top	3/4	15	42
2	B Sides	3/4	14 3/4	20 1/2
2	C Shelves	3/4	12	14 3/4
1	D Ledger board	3/4	2 1/4	21 1/2
2	E Short ledger boards	3/4	2 1/4	12
SHELVES				
2	F Top panel	3/4	8	42
4	G Sides	3/4	5 1/2	8
2	H Ledger board	3/4	2 1/4	30 1/2



13



14



15

13 Once you have everything assembled, add the wood plugs to cover exposed screws. Add a dab of glue, and hammer a 3/8" dowel in. Pay attention to grain orientation to help them blend in as much as possible.

14 I wait for the glue to set up for about 30 minutes, then come back and use a flush trim saw to cut the dowel flush.

15 A quick hit with the sanding block and the surface is ready for paint.

Another defining design element that was added is the use of circular cutouts that contour the exaggerated radii of the panel's edges. These cutouts offset the flat opaqueness of the material and give the piece a sense of visual continuity. Once these two design elements were addressed it was time to dress/profile the edges. Since plywood is prone to splintering, I like to give the hard edges either a 1/8" chamfer or round over profile. This not only saves your fingers and the piece, it visually

complements all the other design elements included in this project.

Assembly/Finishing

One of the great benefits of using screws as joinery is the ability to work with partial constructions when applying your stain/finishes. Since there are a couple of tight spaces within the desk's storage, this accessibility was paramount. For the paint application I went with a 'furniture grade' latex paint which is great due to its low VOC

count as well as cure density.

I first started by attaching both cabinet sides to the top, along with all three ledger boards. This allowed for better access to the interior when applying the paint. After the paint was applied to the interior, I proceeded to attach the two horizontal dividers that make up the desk's storage. After these were in place, and the two shelves were assembled, I could continue with the application process. Once the paint had cured, there was one more liberty that needed to be taken; something didn't feel right.

After concealing all the layers of finely laminated birch in paint, the need to sand to it back felt imminent. Due to its core being free of voids, exposing the edges of the plywood not only highlights the material's construction, but also makes for a great way to add visual contrast to the piece.

Now that the piece is complete, its ready to mount in its new home. The anchoring system you choose will be contingent on the substrate to which it is applied. My home is filled with its original lath and plaster walls, so toggle bolts were my fail-safe to ensure a firm connection between the piece(s) and the back side of the lath. **PW**

Dillon Baker is a furniture builder and project designer who calls a craftsman house in Des Moines home.

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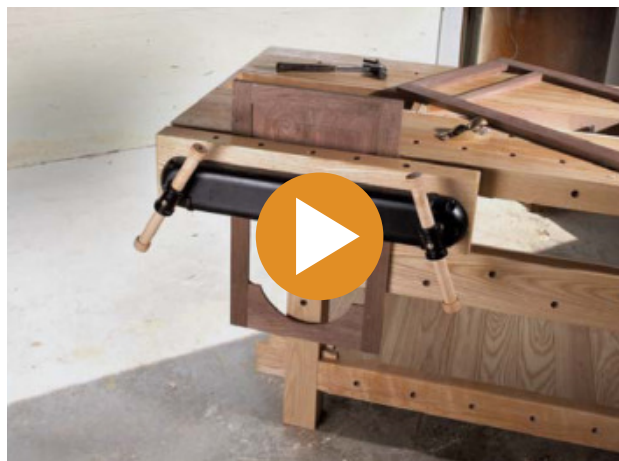
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Feeds & Speeds for CNC Routers

Understanding the importance of chip load calculations.

By Chris Fitch

If you have spent time using handheld routers then you have developed an intuitive sense for what is the ideal feed rate and speed for the cutter. The feedback is immediate and tactile. You can feel if the bit is chattering as it cuts, hear if the router is bogging down and you know to back off the feed rate and increase the bit speed. If you smell burning wood from cutting you know to increase the feed rate and perhaps slow the router speed down. Changes can be made on the fly to obtain a cut of the best possible quality. A CNC router also needs to run at an ideal feed rate and cutter speed but making changes while running isn't generally an option. The right feed and speed need to be programmed into the toolpath before the machine is ever turned on. So how do we determine the best feed and speed without this tactile feedback? The answer is with chip load calculations.

Determining the right speed and feed combination through chip load calculations can seem intimidating when learning to operate a CNC router but once you're familiar with the basics it's not that hard. Your goal is to find a combination that produces the largest chip—the most efficient cut. Large chips mean increased productivity, reduced heat buildup and therefore longer bit life. Most of us hobby woodworkers don't think much about maximizing bit life but CNC routers often run for many hours to complete a project. Fewer individual cuts at cooler temperatures prevents premature dulling of the bit (all of which saves time and money!).

So where to start? At the root of determining the speed and feed for your project is knowing the



1

1 Shown here is a close up of the CNC router cutting with small chips and dust flying – a symptom of poor cutting.



2

2 Here is an example of a clean cut with big chips – this is what you should aim for when you're programming your feed rate.

$$\text{Chip Load} = \frac{\text{Feed Rate (inches per minute)}}{\text{RPM} \times \text{No. of Flutes}}$$

OR

$$\text{Feed Rate} = \text{Chips Load (RPM} \times \text{No. of Flutes)}$$

chip load number. The chip load is simply the size of the chip that the bit creates. You may not know this, but most router bit manufacturers offer chip load numbers online for their bits matched with commonly used materials such as hardwood, softwood, plywood and laminates. Once you have the recommended chip load number it's time for some math. While the math is straightforward, the easiest way to tackle it is to use a chip load calculator. Chip load calculators are often included in the software that controls

your CNC router. If not, there are many available online. The inputs needed are the chip load number, the number of flutes that the router bit has and the speed of the spindle or router to give you a feed rate. If your CNC uses a single speed router then enter the stated speed less 1000 rpm. A router under load will not turn at the stated speed. If your router is variable speed or if you have a spindle on your machine 18500 rpm is a good place to start for most smaller bits. For those of you who want to see the calculations

the math is in the two formulas on the previous page.

As with any power tool setup test cuts are a good idea. They give us the opportunity to fine tune and verify

machine settings. Before you make a few test cuts to verify the feed and speed combination, though, let's talk about the depth of cut. The depth of the cut does not alter the chip load, speed, or feed rate but too deep a cut can cause your machine to bog down and if the bit is overloaded bit deflection can result and produce a ragged cut or lead to a broken bit. A good rule for most hobby CNC machines using 1/4" shank bits is to set the depth at no more than 1/2 the bit diameter. Larger more rugged CNC routers can handle a bit depth closer to the full diameter of the bit.

The test cuts on your CNC router should make chips (not dust), not bog down your machine, and produce an edge

that is of good quality. Let's look at a couple of scenarios: If the test cut produces more dust than chips try decreasing the rpm (if you have a variable speed router or spindle), increasing the feed rate or using a router bit with fewer flutes.

If the test cut seems overly aggressive and makes a rough cut, then try increasing the rpm, decreasing the feed rate or using a router bit with more flutes.

Your results play a bigger role than just one specific project. Having completed the chip load calculations and test cut it's a good idea to enter the information into your CNC router's software tool database. Within the tool database, the same size and type of bit can be saved multiple times for different conditions.

As an example, a 1/4" upcut two flute bit can be saved with the feed and speed rates for cutting hardwood, another copy can be saved for cutting plywood and so on. In time you will develop a library of bits with the feed and speed information ready to use for your next CNC router project. This information can also help you set up cuts for other bits that are close in size.

As you gain experience with your CNC router, you will start to gain that intuitive sense that you already have with a handheld router. Listen to the sound of the router, feel the vibrations of the machine, watch the size of the chips and be on the lookout for any signs of excessive heat. With experience on your CNC router, what "feels" right generally is and this will allow you to fine tune cuts with confidence. All good cuts require the right feed, the right speed and the best way to start is with chip load calculations and a couple of test cuts. **PW**

Chris Fitch is the creative director of Woodsmith and an enthusiastic user of CNC routers (including having built one from scratch out of plywood).

Fablab Speed and Feeds Calculator

1) Tool Geometry

Tool Diameter = (inches) [Details](#)

Number of Flutes = (integer) [Details](#)

2) Processing Parameter (see tables below)

Surface Speed = (feet/min) [Details](#)

Chip Load = (inches) [Details](#)

3) [Calculate](#)

Spindle Speed	output	(rpm)	Details
XY Feed Rate	output	(inches/min)	Details
Plunge (Z Feed) Rate	output	(inches/min)	Details
Stepover	output	(inches)	Details
Stepdown	output	(inches)	Details

Tool Database

Tool List

- Imperial Tools
 - End Mill (0.1875 inches)
 - End Mills
 - End Mill (0.125 inch)
 - End Mill (0.25 inch)
 - End Mill (0.5 inch)
 - Ball Nose
 - Ball Nose (0.0625 inch)
 - Ball Nose (0.125 inch)
 - Ball Nose (0.25 inch)
 - V-Bits
 - V-Bit (60 deg 0.25")
 - V-Bit (90 deg 0.5")
 - V-Bit (90 deg 1.25")
- Form Tools
- Engraving
- Specialist
- Drills
- Metric Tools
 - End Mills
 - End Mill (2 mm)
 - End Mill (3 mm)
 - End Mill (6 mm)
 - End Mill (12 mm)
 - Ball Nose
 - Ball Nose (3 mm)
 - Ball Nose (6 mm)

New ... Copy ... Delete

New Group Import... Export...

Tool Info

Name: End Mill (0.25 inch)

Tool Type: End Mill

Notes: Baltic Birch Plywood

Geometry

Diameter (D): 0.25 inches

Cutting Parameters

Pass Depth: 0.25 inches

Stepover: 0.075 inches 30.0 %

Feeds and Speeds

Spindle Speed: 18500 r.p.m

Feed Rate: 100.0 inches/min

Plunge Rate: 30.0 inches/min

Tool Number: 1

Apply

OK Cancel

Leather Upholstery

Knowing the techniques will help you, even if you aren't doing the sewing yourself.

By Willie Sandry

For a woodworker, upholstery can be intimidating. It's hard to know what you want, until you can clearly explain the finer points. Even if you have no intention of doing the actual upholstery work yourself, it's helpful to familiarize yourself with upholstery styles and terms so you can order precisely what you want from an upholsterer. We'll use the bow-arm rocker (page 28) as an example.

Frame and Foam

You'll need a simple wooden seat frame, sized $\frac{1}{4}$ " smaller in all directions than the chair opening. The frame is made from 2" wide x $\frac{7}{8}$ " thick hardwood and joined with half-laps. Round over the inside and outside edges of the seat frame with

a $\frac{1}{4}$ " router bit to protect the upholstery. Now add jute webbing to the seat frame. The only special tools you need for this step are a webbing stretcher, and magnetic tack hammer (or staple gun). Fix one end of the webbing and stretch it across the seat frame. Work from the roll of Jute webbing to minimize waste.

For optimal comfort, the foam is a lamination of three different densities. The top layer of white foam is 2" thick and medium soft. The white foam is sold by retailers and upholstery suppliers as 1834 foam. The first two numbers indicate the foam density, which is 1.8 lbs. per

cubic foot in this case. The last two numbers are the indentation load deflection (I.L.D.) and indicate the firmness. The next layer is 3" thick blue foam that is medium firm. The blue foam is sold as 1845 upholstery foam. The bottom layer of seat cushion is 1" thick, and the type of foam used here is less critical. I used 2955 pink foam for this thin bottom layer.



1 Weave jute webbing to form a solid, yet forgiving base for the seat cushion. Attach the far end of the webbing and draw it together with a webbing stretcher.

2 Attach webbing with #12 upholstery tacks. Stagger the position of the tacks to avoid splitting the wood.

3 Orient the webbing face down and add a layer of 1" thick, firm foam to fill the void. Glue the foam to the webbing with spray adhesive.

Batting and Seat Cover

I use upholstery batting (Dacron) for two main reasons. The first is to soften square edges and begin to shape the foam. The second reason I like polyester batting is the subtle loft it adds to cushions. You can make the cushions however you want. Once you develop your formula, the next project gets a little easier.

Backrest Cushion

The backrest cushion is very soft 1818 foam in a 3" thickness. Cut the purple foam to a 26" long x 21" wide and wrap it with a single layer of high loft batting. The batting is attached to the foam with spray adhesive. This is a good starting point for the backrest stuffing. If you want a fuller look to your cushion, simply add another layer of batting. Make a slip cover sized for the backrest foam plus batting. You don't want the slip cover to com-



4 Trim the blue and white foam sandwich to the same size as your seat frame at the bandsaw. Then use an electric turkey knife to cut the bevel on the front edge of the cushion to help form a bull-nosed effect once the cover is installed. Finally, glue the foam to the seat frame with spray contact adhesive on both mating surfaces.

5 Add one layer of high-loft batting. Gently stretch the batting and attach it with a pneumatic staple gun.



6 Sew strips of piping and staple it to the top plate of the seat. Then staple a side panel to the assembly you just built. The staples help hold the leather in place as you sew. (Remove them before installing the seat cover.)

7 Position the side seat panel over the top plate, with a length of piping in between. Using a 1/4" cording foot on the sewing machine, sew the seam. Back-tack to lock in your stitch and repeat the process on the other side. Once finished, pull it over the Dacron-wrapped cushion like a fitted sheet.



8 Starting at the center rear of the seat, place two temporary tacks. Then stretch the front to the inside of the wooden seat frame. Attach one side, then the other, always starting with two temporary tacks. Once you confirm that the cover is centered, permanently attach it with staples.

9 The last step for the seat cushion is to attach a non-woven cambric fabric as a dust cover. Fold the edges under and staple the dust cover to the bottom of the seat.



press the foam much, so measure for a somewhat loose fit.

Many material types work for slip covers, but my favorite is shiny black polyester fabric. One side has a slippery feel, and it's this quality that makes it a great material for slip covers. Close the slip cover with an invisible zipper or light duty garment zipper, and set the cushion aside while you work on the leather backrest cover.

Leather Straps

A pair of leather straps are used to hold the backrest cushion in place. These straps are optional, but they truly add a finishing touch to any Morris chair. Start with strips of leather 10" long x 2 3/4" wide. Since the straps will be folded four layers thick, the leather will need to be thinned first. A specialty skiving knife would work to thin the leather, but I used a woodworking approach. I simply held the strip of leather against an oscillating belt sander. A length of dowel holds the strips of leather against the abrasive, while keeping your hands well clear of the belt. Thin the leather to about half its normal thickness and apply contact cement to the suede side of the leather. Let the glue tack up for a few minutes, then fold the leather in half. Pound the seams flat with a hammer and fold the strip in half once again. Sew down both edges to complete these sturdy and attractive straps with no exposed edges.





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10 Wrap all sides of the backrest foam with a single layer of polyester batting. Attach with spray adhesive, and pinch the sides closed.

11 Start by applying contact cement to the suede side. Then fold the backrest strap in on itself. Hammer the edges flat, and fold the strap in half again. The strap is about $\frac{5}{8}$ " wide and four layers thick. Align the edges flush with small office clips and sew down both strap edges.

12 Center a zipper on the bottom of the cushion panels and hold it in place with sewing clips. Make sure the "show side" of the zipper is facing down and sew it to the leather.

13 Topstitch the zipper. This step is optional, but adds strength and a finished appearance to the zippered cushion. Turn the zipper under the leather and topstitch with a zipper foot on your sewing machine.

Backrest Zipper

One of the first steps of the backrest cushion is to add a zipper tape. I use YKK brand zippers in the #4.5 size. It's actually just zipper tape that your order by the yard. Remember to order some matching zipper pulls and cut the zipper tape extra-long for now. Make center notches in your leather panels and zipper tape and center the zipper on the panel to sew it in place. Topstitch the zipper if desired, you'll quickly proceed to the next step. Now close the $1\frac{1}{4}$ " x $1\frac{1}{4}$ " notches in all corners of the backrest panels. You'll sew the notches closed with a simple blind seam and a $\frac{1}{2}$ " seam allowance.

Piping the Backrest

Cut $1\frac{3}{4}$ " wide strips of leather to make the piping. Join strips together as needed to achieve the roughly 80" of piping required. Plan where the piping seams will land for the best look. Typically, you'll have a piping seam on each side of the

cushion, down near the armrests. Some people tackling their first leather upholstery project are overly concerned about seams in piping. They will look fine as long as the joints are symmetrical. In other words, you may have enough piping length for only one seam. However, it may look better to have two seams, with one on each side, just below the armrests.

Piping and Planning

To sew the welting cord into the leather strips initially, I prefer using a zipper foot. It may seem strange that a cording foot isn't used to sew the cording, but I'll try to explain my logic. Imagine sewing the cording in the leather strips, then sewing the cording to the front panel, then sewing the front panel to the back panel. That's a lot of perforation in the leather, and every series of holes potentially weakens the seam and may be visible in the finished product.

So instead I start with a zipper foot and set the machine for maximum stitch length. The cording is essentially sewn with a basting stitch to minimize perforations. Everything else is attached temporarily with staples, until the perimeter of the cushion is sewn.

Build Faux Box Cushion

This style of backrest cushion is a faux box cushion, because it fits the shape of the foam well, however, it only has one central seam. You're close to the finish line now, as you staple the piping to the front panel. Next staple the straps in place on top of the piping. To avoid excessive thickness, the ends of the strap should straddle the corner seams. Even so, you'll have a seam that is 4 layers thick, and increase to 6-7 layers briefly as you round the top corners. Make sure your sewing machine and needle can handle the thick leather by testing on scraps.

These techniques are not ex-



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14 Cut 1 1/4" square notches from all four corners of both backrest panels. Mark a 1/2" seam allowance and sew up the short seam. Do plenty of back-tacking to lock in the stitch. You may need to trim the seam allowance near the end of the seam, to help it lay flat. Once sewn, these seams help the leather conform to the shape of the cushion.

15 Cut a few nicks in the piping where it bends around the corners to make the cover bend smoothly. Use a "plier stapler" to temporarily attach the welt cord to the front panel. Keep the staples toward the edge of the seam allowance, well clear of the stitch line.

16 Position the strap on either side of the corner seams and align the edges even with the heavy-duty office stapler and 3/8" staples.

17 Focus on aligning the corner seams and center marks as you staple the front and rear panels together. Complete the backrest cover by sewing the perimeter with a 1/4" cording foot.

Material List:

- 1 hide of leather; 50-55 s.f. 2-3oz thickness (0.8-1.2mm)
- 5/32" Piping/welting cord
- 1834 foam for top layer of seat cushion: 2" T x 22" W x 25" L
- 1845 foam for bottom layer of seat cushion: 3" T x 22" W x 25" L
- 2955 foam for base foam, sized to fit inside the seat frame
- 1818 foam for backrest cushion: 3" T x 20" W x 26" L
- High loft polyester batting; approx. 2 yds.
- 92 weight bonded nylon thread
- Dust cambric: 27" W x 27" L
- Staples T50 x 3/8" L
- #10 and #12 upholstery tacks
- Red strip Jute webbing

clusive to the leather, and most of these processes can be applied to fabric as well. Of course, you would pin or clip fabric instead of stapling it. You may even be able to manage a fabric upholstery project with a domestic sewing machine. For sewing leather, it's advisable to use an industrial walking foot sewing machine. They feed material with feed dogs below, as well as a walking foot from above. If you don't have an industrial machine, try to borrow one or take a project-based class where equipment is provided. That's what I did for my first foray into leather upholstery, and it was well worth the time invested.

Marking & Cutting Leather

Accurate marking and cutting of the leather panels is important to get your project off on the right foot. Make drawing templates from large sheets of construction paper

or other suitable material. Use the templates to layout the pieces on your leather hide for the best yield. I recommend using a special leather marking pen for tracing around the paper templates. A leather pen allow you to clearly mark on the show face of the leather, while still being easily removable.

On large pieces such as these, I use heavy duty 8" leather shears. You'll find household scissors aren't up to the task and won't cut a straight line in leather. For the smaller pieces such as the leather straps, you could use a rotary cutter.

Sewing leather projects may seem intimidating at first, but with a little practice, you'll be tacking all sorts of upholstery projects. **PW**

Willie Sandry has sewn quite a few cushions for his Arts & Crafts furniture, though he's still partial to woodworking.

Destroy to Create

When needs change, there's no shame in repurposing.

By Collin Knoff

I have a confession to make:

I don't do nearly as much woodworking as I should. As someone with limited time and resources, I like to do things once, the correct way, and not have to worry about it again. This philosophy can cause some trouble when it comes to projects though. Unless I know exactly what I need and where I want to put it, I tend to hold off building things.

The kid's playroom is a perfect example. When I bought my house, I needed somewhere to put all of the art supplies and games, so I picked up a large IKEA armoire from a friend that was moving and stuck it in the space. In some ways, it was perfect: it had drawers with built-in organizers, shelves for games, and I could close the doors to hide the chaos. However, it was nearly 8 feet

tall and dominated the corner of the room, and the top half was entirely unusable for the kids. After using it for a year or so, I decided it was time to make some built-ins that would be more functional and fit the space better.

As I started designing in my head, I realized that I didn't want to put built-ins over the dilapidated paneling, so I would probably want to install drywall instead. And then I thought about the additional lighting I wanted to add, the condition of the floor, and before I realized it I had mentally gutted the room to the studs just to install some cabinets. The idea was set aside, and the armoire continued to tower over the room. Every time I went back to the drawing board with the idea, I found myself in a similar predicament: it would cost too much time to do it right, and it was too expensive to do a temporary job. Then one day I realized I had been looking at the solution the entire time: the armoire itself.

In the armoire, I had everything I needed—plenty of wood, shelves, drawers, and organizational dividers. I simply had to break it down and rebuild it into two smaller cabinets. I took out the tape measure, and much to my dismay realized that none of the dimensions matched a standard cabinet; it was too wide and too shallow. At this point that philosophy of perfection crept back into my head. Might as well wait and just build it correctly.

But no, not today! Today I was going to do some woodworking, and it didn't matter if it wasn't permanent. I took stock of what I had, to see what I could do with a minimum investment. The first thing that I

decided to do was keep the same basic dimensions, so I could reuse the shelves, drawers, and useful dividers. I chose the standard 36" countertop height for its ubiquity and for the fact that it was tall enough to fit everything I wanted underneath. I settled on a laminate counter for the tops (inexpensive and durable). At first I considered ripping the counters to a narrower depth, but then realized it made more sense to keep them full depth and simply trim in the cabinets with a bit of hidden dead space at the back. The extra counter space would be nice, and I could reuse the countertops on a different project in the future if desired.

Then it was time for action. I took the carcass out to the garage. The track saw made for quick work, and scrap lumber and a handful of pocket screws completed the assembly. I brought the completed cabinets back to the playroom for test fitting and ran into one last problem—there was an outlet on one of the walls on the side of the cabinet. After some thinking, I decided to leave a small gap so a power strip can be run out. The extra space was also the perfect size for some poster board that didn't have a home. I picked up a piece of white prefinished shelving to trim in the extra space for the countertop depth so it would match without having to paint. The total cost of the project was a mere \$12 for twice the functionality and half of the eyesore. Plus I was able to spend a quality afternoon in the shop. Now before I can call the project completely done I still need to build doors for the front. Maybe I'll head to IKEA. **PW**

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Collin Knoff is Popular Woodworking's digital editor.



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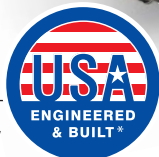
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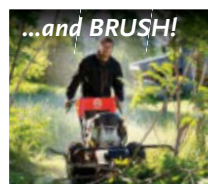
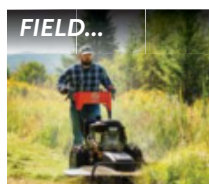
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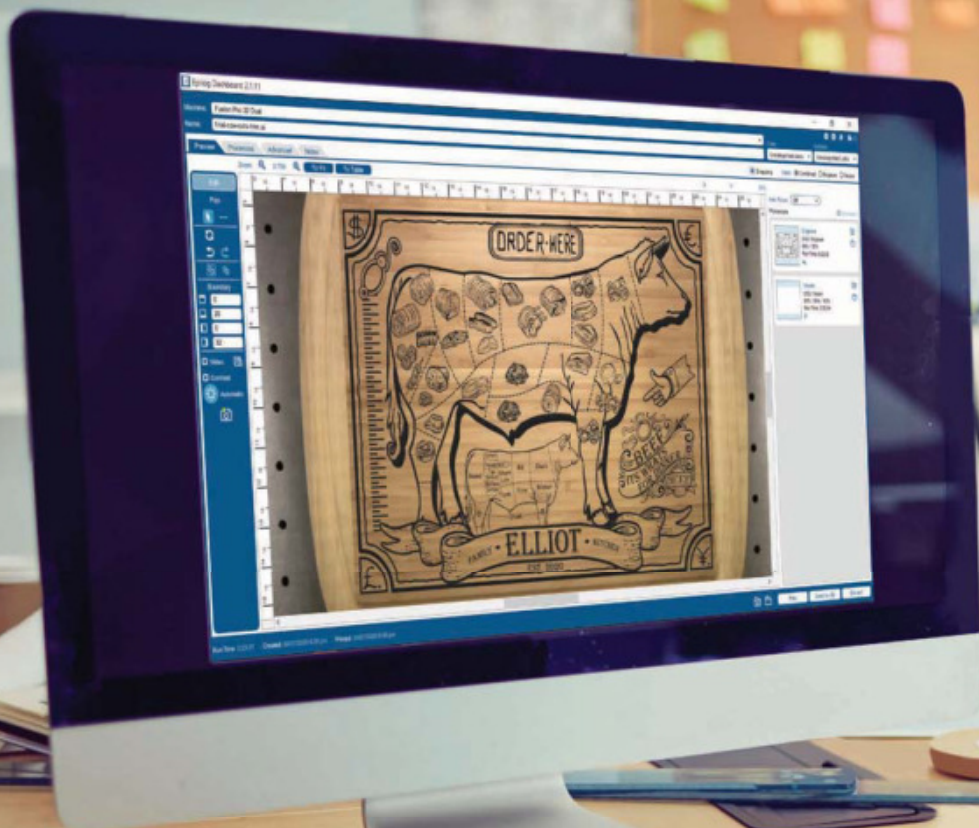
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