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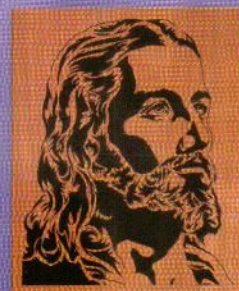
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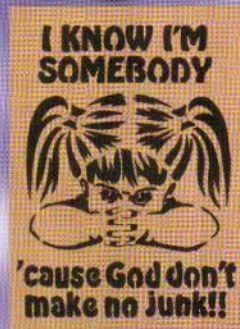
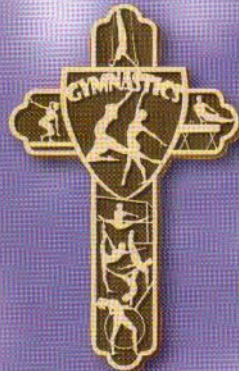
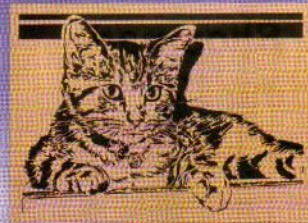
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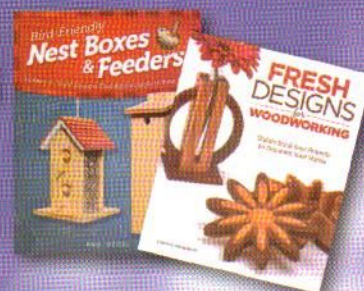
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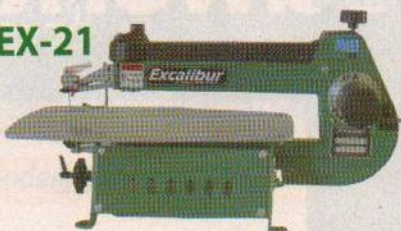
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IN THIS ISSUE

DEPARTMENTS

- | | |
|---------------------------------------|--|
| 4 <i>Editor's Note</i> | 78 <i>Scroll Saw Basics</i> |
| 6 <i>Letters to the Editor</i> | 79 <i>Coming Features</i> |
| 8 <i>Reader Gallery</i> | 79 <i>Ad Directory and Classified Ads</i> |
| 10 <i>Info Exchange</i> | 80 <i>Sawdust</i> |
| 12 <i>Product Review</i> | |
| 14 <i>Shop Notes</i> | |

FEATURES



18 A Puzzling Business

By Kathleen Ryan
Student's scroll saw business helps pay for college



20 Marine Life Intarsia

By Janette Square
Colorful wood and simple shaping combine to make an attractive wall hanging



25 Marquetry Box with Magic Lid

By Allan Longroy
Disappearing joints make this beautiful box the perfect canvas for a marquetry scene



30 Shark Bait Kinetic Sculpture

By Clayton Boyer and Forrest Burnett
Amaze viewers with these irregularly shaped working gears

25

Use veneer to create colorful box lids.





41 Celtic Knot Projects

By Dan Bowe

Combine scrolling and carving to create a woven look in wood



48 Making a Wooden Gear Clock

By Brian Law

Our simplest clock ever—make quick and easy gears with a shopmade jig



62 Intarsia Mountain Lion

By Kathy Wise

Use hardwoods to capture the elegance of this elusive forest king



66 Wooden Dragonfly Decorations

By David Griffin

Make a variety of projects by enlarging or reducing the patterns



72 Making a Tropical Fish Box

By L. Kim Braa

Mosaic lid embellishes a standard stacked-ring hardwood box

PATTERNS



35 Noah's Ark Intarsia

By Janice Smith

Combine plywood and paint to make a charming vignette



38 Up, Up, and Away

By Dale Helgersen

Use dyes to embellish a simple segmentation string toy



46 Sea Life Photo Frame

By Alison Tanner

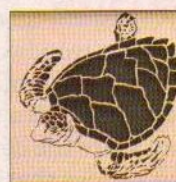
Playful design uses magnets to make a free-form frame



60 Freestanding Insect Puzzles

By Judy and Dave Peterson

Easy-cut puzzles will remind you of summer all year long



70 Sea Turtle Fretwork

By Theresa Ekdorn

Simple silhouette captures the essence of a splendid creature



76 Carousel Horse Clock

By The Berry Basket

Painted or plain, this project brings home the fun of a country fair

ON THE WEB WWW.SCROLLSAWER.COM

Bonus Pattern

Freestanding Insect Puzzles, p. 60

Complete the set with a free dragonfly puzzle pattern.

Videos

Making a Wooden Gear Clock, p. 48

Shark Bait Kinetic Sculpture, p. 30

See the clock and sculpture in action.

Detailed Instructions

Making a Tropical Fish Box, p. 72

Download step-by-step instructions for making a stacked-ring box.

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First, the bad news. Dirk Boelman, the owner of The Art Factory and one of the organizers of the Midwest Scroll Saw Trade Show, one of the few scroll saw shows in America, recently announced that he has cancelled the show for 2013. He said, "We need to take some time to re-think, re-group, and see if we can do some things differently than we have been doing in the past." Dirk is not cancelling the show permanently, nor is he looking to pass the reins to anyone else. Instead, he invites scrollers' thoughts and ideas for the show and looks forward to working on it again next year. "Ultimately, a year off will hopefully help us create a better show in August 2014," he said. Please contact Dirk with your ideas at 800-566-6394 or e-mail dirkdraws@centurytel.net.

And now for some good news. You may remember that in the Holiday 2012 issue (Issue 49), our publisher, Alan Giagnocavo, mentioned that he misses getting together with woodworkers and would like to invite all of you to visit us here in Pennsylvania. We have tentatively scheduled our next Open House for Spring 2014. Please get in touch (800-457-9112 or editors@scrollsawer.com) and let us know what you'd like to do and who you'd like to see—we'll take it from there. Look for details in upcoming issues, on our website (www.scrollsawer.com), in our e-newsletter (sign up via the website), and on Facebook (search for the magazine).

If you're looking for shows to attend in the meantime, the North Eastern Ohio Scroll Saw Picnic will be May 18–19. Look for info at www.northeasternohioscrollers.yolasite.com. And, if you happen to live near Iowa, please come say hello to me at the Midwest WoodFest in Amana. I'll be there August 23–25 and look forward to meeting readers and seeing some great woodworking in person. Learn more at amanaartsguild.com/woodfest.html. Plus, if you know of a scrolling show—or a carving show with a strong scrolling presence—please drop us a note and share the details. We can run an announcement ahead of time and we love sharing your show photos and stories when it's all over.

And if you'd really rather stay home but you still want to see some great scrolling projects, please surf over to our website for a link to the 2013 Best Project Design Contest. Great ideas have been pouring in, and we editors have chosen our favorites in each category. Now it's your turn—visit www.scrollsawer.com/scroll-saw-contests.html to vote for the People's Choice Award winners. Voting is only open from April 15 to May 1, so cast your ballot today. Be sure to enter your e-mail address for a chance to win a free subscription just for voting. Then, check back in the Fall issue to see the Best Project Designs of 2013!

Mindy Kinsey
kinsey@FoxChapelPublishing.com

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SUMMER 2013

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VOTE NOW!

Great ideas have been pouring in for the 2013 Best Project Design Contest. The editors have chosen their favorites in each category and posted them to our website. Now it's your turn—visit www.scrollsawer.com/scroll-saw-contests.html to vote for the People's Choice Award winners. Be sure to enter your e-mail address for a chance to win a free subscription just for voting. Then, check back in the Fall issue to see who you have named the Best Project Designs of 2013!

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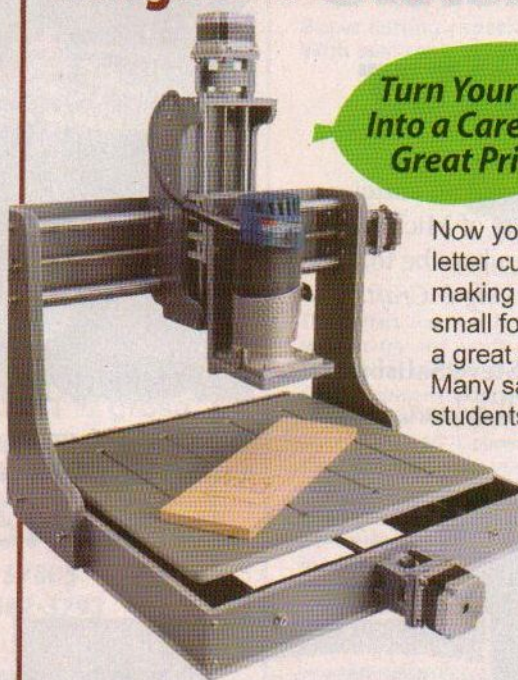
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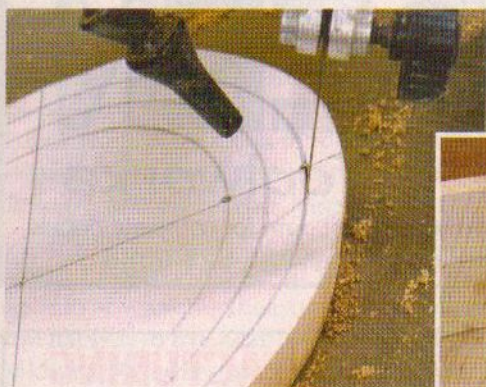
Homemade Scroll Saw

I saw this old homemade scroll saw at an antique mart this past fall in my home state of Michigan and thought you might enjoy it. I subscribe to, use, and love *Scroll Saw Woodworking & Crafts*. Keep up the great work.

Steve Salisbury
Wayland, Mich.



The ingenuity of scrollers is evidenced by rare finds like this, from the materials and machine designs to the power harnessed to run them.



Cutting Bowls

I attempted to cut an oblong bowl using a pattern from *Scroll Saw Woodworking & Crafts*. I have also tried another oblong bowl pattern and discovered a difference in degrees between your pattern and the second one I attempted to make. Does the thickness of the wood or the space between the oval lines determine the degree angle of the cut? Or do both affect the angle of the cut? Is there a chart that would tell me the degree of cut, and if so, how do I get one?

Dale Henderson
Harlingen, Tex.

Technical Editor Bob Duncan responds: Any number of things can affect the cutting angle for a bowl project. First, a shallow angle will make a bowl with steeper



Many variables come into play when making a stacked ring bowl.

sides, while a more dramatic angle will make a more open bowl. But changing the thickness of the wood can also change the angle needed to ensure the rings stack neatly. The size of blade you use and, as you mentioned, even the space between the lines can affect the angle.

Unfortunately, with all of these variables, it's difficult to come up with a chart like you are requesting. We provide guidelines, but this is one of those situations where you have to experiment with different angles and find what works for your project.

SET IT STRAIGHT

To contact General International, the manufacturer of Excalibur scroll saws, visit www.general.ca or call 888-949-1161.



Fox Hunt

Sean Garcia of Stockton, Calif., and James M. Poppe of Taylor, Mich., were randomly drawn from the participants who located the fox in our last issue (Spring 2013, Issue 50). The fox was located in the Bed Box article on page 40, in the Step 6 photo.

Find the fox in this issue, contact us, and tell us the page number and location. Two readers randomly selected from all correct replies will receive a \$25 Fox Chapel Publishing gift certificate. Entries must be received by June 1, 2013, to be eligible. *NOTE: The contest fox is an outline drawing that would face left if his feet were on the "ground" (other foxes appearing in SSW&C don't count).*

Send your entry to SSW&C, Attn: Find the Fox, 1970 Broad Street, East Petersburg, Pa., 17520, or enter online at www.ScrollSawer.com.

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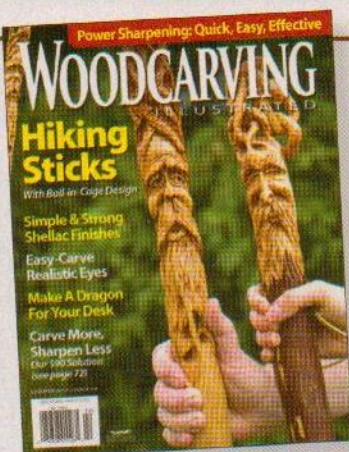
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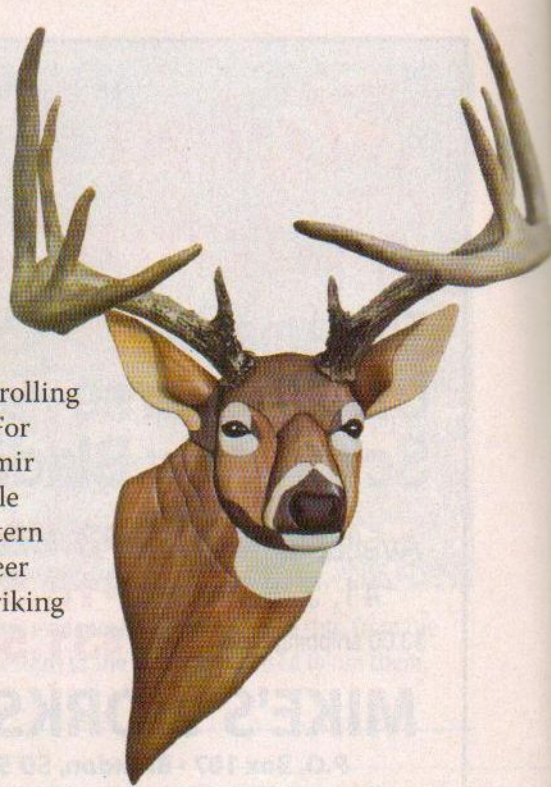


Farm Scene ▲

Muriel Mayne of Belgium created these farm figures from pine based on patterns by Fred and Julie Byrne. Muriel stained the pieces with a non-toxic finish and sealed them with acrylic varnish.

Hunter's Trophy ►

Amir Ghavam of Ottawa, Ont., Canada, has been scrolling for about six years. For his latest project, Amir combined a Judy Gale Roberts intarsia pattern with a real pair of deer antlers to make a striking wall hanging.



Don Quixote Intarsia ►

Luis Martinez of Aguadilla, Puerto Rico, created this original intarsia design from cedar, poplar, and guaraguao wood, which is a local hardwood similar to mahogany.

◀ Scroll Saw Vase

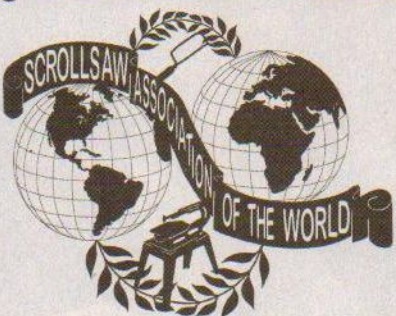
Armando Sergio of Carrara, Italy, reinterpreted a Patrick Spielman pattern to create this vase. Armando cut the layered rings from obeche.



Share Your Latest Work!

Send a slide, professional print, or digital image (300 dpi minimum) with 100 words about you and your piece. Include your hometown, the name of the pattern maker, and a list of wood and materials used. Send to Reader Gallery, Scroll Saw Woodworking & Crafts, 1970 Broad Street, East Petersburg, Pa., 17520, or e-mail editors@ScrollSawer.com.

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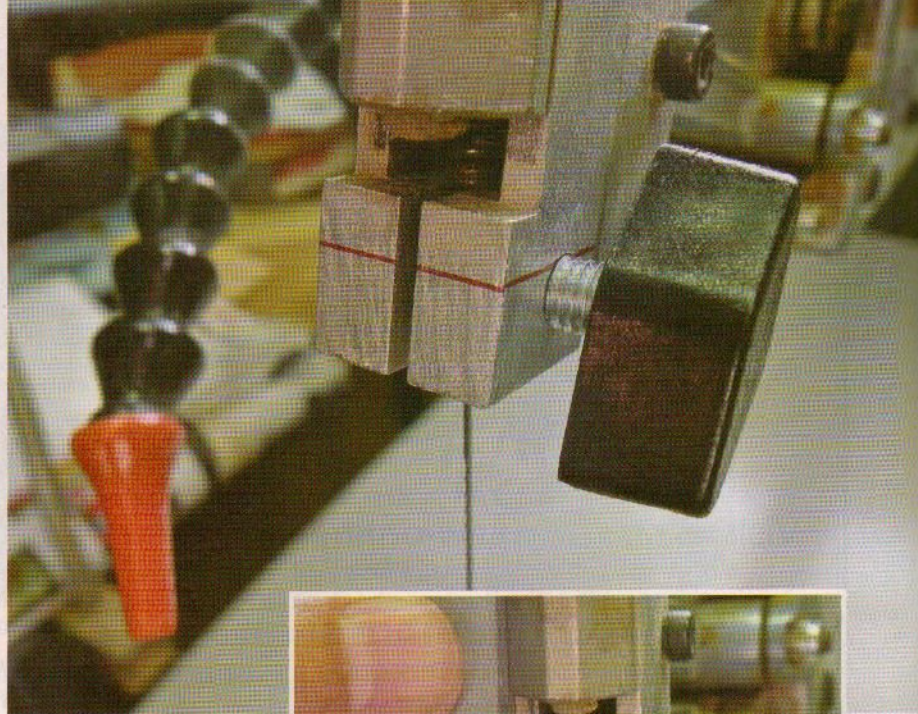
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Easy Top Feeding

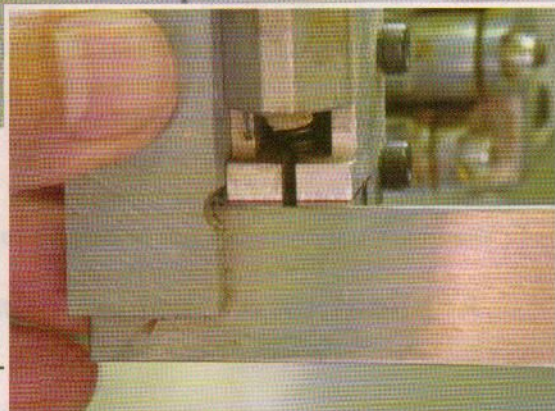
Delvaughn Willis
of Winchester, Ind.



I like to top feed with my saw. If the blade is too high in the top blade holder, there may not be enough blade to clamp in the bottom holder. To help me position the blade in the holder correctly, I used a permanent marker to draw a line across the top of the blade clamping screw in the top holder. If I align the end of the blade with this line when I install the blade, I'm sure to have enough room to clamp the blade in the bottom holder.



Mark the top blade holder with a blade end guide and you'll always position the blade properly.

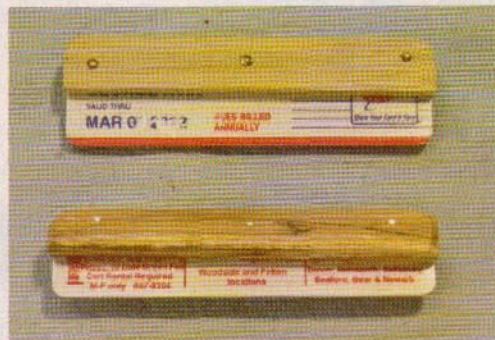


Smart phone apps can tell you the exact angle of your saw table.

Shop-made Squeegees

George Ivan of Felton, Del.

Cut old gift cards and credit cards into strips. Clamp the strips between pieces of wood that you have shaped to be easy to hold. I lock the wood pieces together using brads or small screws. After you apply a pattern to a blank, use the squeegee to smooth the wrinkles out of the pattern.



Squeegees made from credit cards remove pattern wrinkles.

Determining Table Angles

Rolf Beuttenmuller of Bellport, N.Y.

The Wixey digital angle gauge is popular for setting the angle of a scroll saw table, but the batteries are always dead when I want to use mine. I found two apps for a smart phone or an iPod Touch that work the same way. Both apps are available in the Apple and Android app stores. For more information, visit www.ihandysoft.com.

If you just want to be able to return your table to level, use the free iHandy Level app. You can simply set the device on the saw table and adjust the table until the app tells you it is level.

To be able to set your table to a specific angle, you'll need to spend \$1.99 for iHandy Carpenter, which includes a protractor, plumb bob, ruler, and two levels. To use it, start with a level table, place the device on it, and then adjust the table until the app indicates you have reached the desired angle.

TOP TIP in our Summer issue wins a copy of *Woodimals: Creative Animal Puzzles for the Scroll Saw* by Jim Sweet. Send your tips or techniques to Bob Duncan, Fox Chapel Publishing, 1970 Broad Street, East Petersburg, PA 17520, or Duncan@FoxChapelPublishing.com

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Rockwell BladeRunner

The Rockwell BladeRunner is a great addition to a small shop. The tool does the job of a bench-top band saw but also has the ability to cut steel, aluminum, and even soft tile. It can act as a rough table saw when it comes to ripping or cross-cutting wood. It comes with a bracket to attach it directly to the wall, so the BladeRunner will not take up valuable bench space.

Most inexpensive bench-top band saws struggle to cut wood over 2" thick, which is also the thickest wood the BladeRunner can cut. However, the BladeRunner cuts better and doesn't bind up as much as a bench-top band saw. Because the BladeRunner uses T-style jigsaw blades, it cuts faster and straighter than a scroll saw.

Additionally, the miter gauge on the BladeRunner allows it to cut angled pieces. The angled cuts are not as smooth and straight as those cut with a table saw or miter saw, but with a little sanding, the cuts will create reasonably tight miter joints for projects such as picture frames.

By positioning the miter gauge in the slot perpendicular to the blade and locking it in place, you can use it as a rip fence and resaw stock up to 2" thick. You can change the angle of the fence to cut tapered pieces. A circle-cutting jig, sold separately, locks into the miter gauge slots to cut a perfectly round circle. This makes it easy to rough out gears and other round projects, such as the round backing board for the *Shark Bait* article on page 30. Again, the cuts may not be as clean and smooth as those made by a table saw, and the saw kerf of the BladeRunner is larger than that of a band saw, but the tool adds capacity in a shop that may not have space for multiple full-sized tools.

Using a "scrolling" jigsaw blade, you can cut reasonably tight curves to rough out a project before cutting the details with a scroll saw. Additionally, the saw's jigsaw blades can be fed through blade-entry holes to make inside cuts without cutting in from an edge like you would have to do with a band saw.

The machine has a 1 1/4" (32mm)-diameter dust-collection nozzle built into the top of the saw arm. This nozzle collects some dust, but the action of the



The Rockwell BladeRunner functions as a band saw, jigsaw, and table saw in one compact unit.

“The BladeRunner is like three benchtop tools in one—perfect for a small shop.”

blade also drives dust toward the bottom of the saw.

Although it acts similar to a jigsaw, I compare the use of the BladeRunner to that of a router table. While you can do a number of projects with a handheld router, it's often easier and safer to use a router in a table. Likewise, you can use a jigsaw for most of the cuts that you would make on a BladeRunner, but it is easier and safer to make those cuts with a BladeRunner. Obviously, a large piece of wood would be difficult to balance on the BladeRunner table.

In general the BladeRunner will not replace a full-size band saw and it isn't as accurate as a table saw. However, especially given the system to attach the BladeRunner to the wall, the tool packs a lot of power and usefulness into a small space.

The Rockwell BladeRunner is sold at many home improvement stores. The MSRP is \$129, and the circle cutting jig is an additional \$29.95. Visit www.rockwell.com to find a local retailer or to order a BladeRunner.

Excalibur EX-21 30th Anniversary Edition

The EX-21 30th Anniversary Edition cuts with the high quality and low vibration that you expect from an Excalibur, and it features Excalibur's standard tilting head. It also has a slick black paint job.

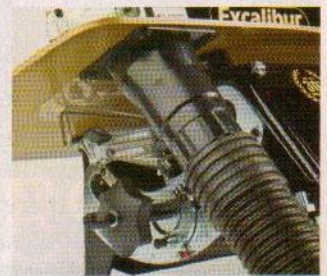
What makes this saw stand out is its innovative under-the-table dust collection port. The port is connected to a clear plastic shroud attached under the table's blade hole, which is surrounded by an array of small holes drilled through the table. When you attach a shop vacuum or a dust collector to the dust port, the sawdust is sucked through the blade hole and surrounding holes.

When in use, the system collects a surprising amount of dust. I was concerned that the suction would interfere with moving the blanks around on the saw table, but that was not the case. Other users reported problems with the clear plastic shroud working loose, but it was easy to lock it in place with a bit of double-sided tape.

The clear plastic shroud makes it slightly more difficult to top-feed the blade. Instead of the larger hole to feed down through, you need to feed through a hole just larger than the blade. And, over time, tilting the saw head from side to side or using large blades will cause the blade hole in the plastic shroud to enlarge. But, even as the blade hole gets larger, the system still picks up the majority of the dust.



Excalibur's EX-21 30th Anniversary Edition has an innovative dust collection system.



The plastic shrouds can be replaced. Due to the dust collection nozzle under the left side of the table, the head can only tilt 40° to the left.

The MSRP for the EX-21 30th Anniversary Edition is \$849.99, and it comes with a stand and a foot switch. Extra clear plastic dust collection shrouds are available for \$6.12. The table with the dust collection system is also available separately to fit any Excalibur saw.

The Dremel Moto-Saw can be clamped to a table or used freehand like a coping saw.



Dremel Moto-Saw

Dremel recently released a redesigned version of their Moto-Saw electric coping saw. The new version allows you to attach the coping saw to a plastic table, which can be bolted to a bench and then functions like a mini scroll saw. The tool uses 3" (76mm)-long pin-end blades and features a non-adjustable quick tension system. The blades are available from Dremel.

For the most part, if you have a scroll saw, you don't need this tool. When separated from the table the coping saw feels a bit unbalanced, but it could be useful for cutting excess wood from blanks too large to fit on a scroll saw table. Online reviewers love the tool for trimming crown molding.

The Moto-Saw retails for \$99. To find a local vendor, visit www.Dremel.com.

Super Sanding Tips

Reduce the time you spend sanding and produce a flawless finish

By Bob Duncan

Nothing affects the final finish as much as sanding does," says furniture maker Mark Love. That is true regardless of the finish you apply. But there are all sorts of questions about sanding: What is the best sandpaper to use? Do I really have to use all these grits? What is the highest grit I should sand to?

Buy Colored Sandpaper

Ironically, sandpaper in shades of brown—the color of sand— isn't the best choice because it dulls and clogs quickly. Instead, choose paper in rainbow colors, like Norton 3X, Klingspor PS33 Stearate, 3M 216U Gold,

3M SandBlaster, and 3M Pro Grade. The manufacturers use the colors to draw attention to their best products, which are made with premium aluminum oxide abrasive that's graded for consistent size, applied in an open coat, resin-bonded to a flexible lightweight backing, and covered with an anti-clogging material.

When Do I Need a New Sheet?

The abrasive on the sandpaper wears away as you use it. Premium sandpaper lasts longer, but still needs to be replaced regularly. Save yourself time and frustration by grabbing a new sheet of sandpaper frequently.

Some people save old sandpaper to use in place of finer-grit sandpaper. While some of the particles have probably worn down into finer grits, not every particle will break down. That leaves you with some large grit mixed in with the finer grit—and the large grit will still leave large scratches. I recommend tossing the old paper and buying fine-grit paper.

Skipping Grits

If you're working with soft wood, such as pine, you can skip a few grits as you work through a

progression because the soft wood makes it easy to sand out the scratches from the coarser grit. I'll often start with 80 grit, move on to 120 to 150 grit, and finish with 220 grit.

For harder wood, such as maple or cherry, work your way up through the grits. The progressively finer grits of sandpaper quickly remove the deeper scratches from the coarser sandpaper. It takes a lot longer to sand out the scratches from 80-grit sandpaper in hard woods with 120-grit sandpaper; it's faster to move from 80 to 100 to 120 grit.

Always Finish Sanding by Hand

Hand sanding with the grain should always be your last step before applying a finish. Power sanding may be a real time-saver, but it rarely leaves surfaces that are entirely scratch-free. Hand sanding after power sanding aligns all the sanding scratches so that the grain will help hide them. Here are a few tips for hand sanding:

- Bearing down when you sand by hand is OK. In fact, it speeds up the process.
- Using a cork-faced sanding block helps to evenly distribute the sanding pressure.



Colored sandpapers are higher quality grades with premium abrasives, more flexible backing, and anti-clog properties.

- Start with the same grit size that you used for your last round of power sanding. If visible scratches from power sanding remain after hand sanding, switch to slightly coarser grit and start again.
- Sand diagonally, and change direction when you change grits. That way you can see when you've removed the scratches from the previous grit.
- Sand with the grain for the final, finest grit.

Sanding for a Stained Finish

Deep scratches from coarser grits of sandpaper and cross-grain scratches really show up when you apply a stain because the solid pigment particles concentrate in the scratches. Most stain manufacturers suggest you stop sanding at 220 grit, though, because those same solid pigments need a place to lodge, and they are too large to catch on the ultra-smooth surface created by the finest grits of sandpaper.

The exception is visible end grain. The pores that make up the wood grain are usually open in the end grain. Not only is the end grain harder than the long grain, so scratches take longer to remove, but these pores will soak up stain and make the end grain look darker than the other areas. Sand end grain to at least two grits higher than you sand the long grain. The finer grits help close the pores and remove deep scratches to help match the end grain color to the long grain color. The end grain will look better, too, because the annual ring structure will show clearly.

Sanding for an Oil Finish

Because oil finishes like Danish or tung oil usually soak into the wood, the finish itself will not fill

any scratches. For a smooth, clear finish, I hand-sand up to 400 or even 600 grit before I apply the oil. To give the piece a glossy finish, allow the oil finish to dry and then buff with 0000 steel wool before applying the next coat.

Sanding for a Film Finish

When I plan to apply a film finish like lacquer, varnish, or shellac, I usually stop sanding at 180-grit

sandpaper. I don't need to use finer sandpaper because film finishes build up on top of the wood and fill the scratches left by the slightly coarser paper. That said, I sand the dry finish between coats with 400-grit sandpaper to smooth and level the finish and remove drips and runs. After I apply the final coat, I buff the finish with 1,000-grit sandpaper and then 0000 steel wool.

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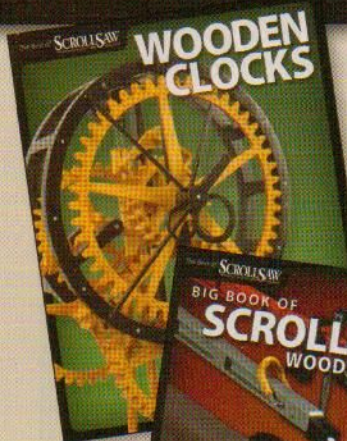
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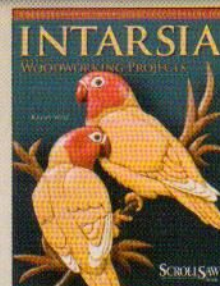
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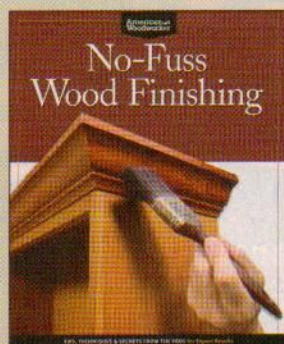
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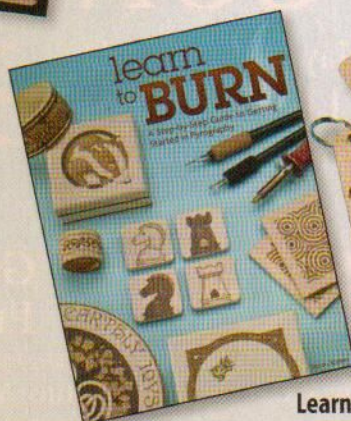
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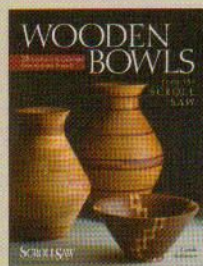
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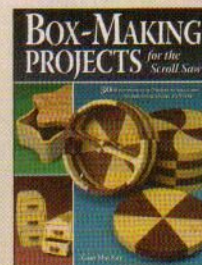
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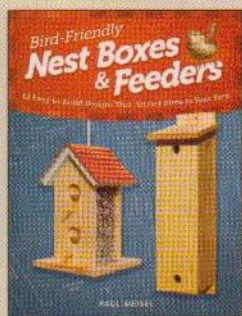
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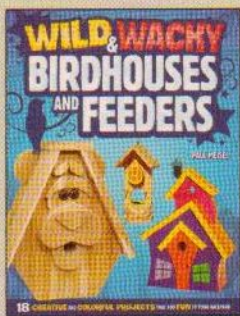
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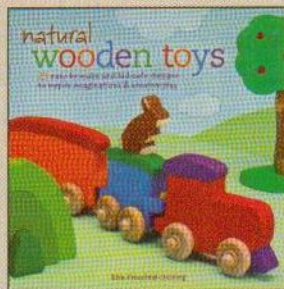
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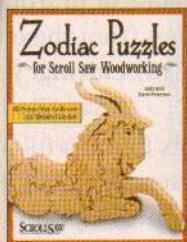
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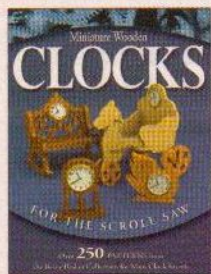
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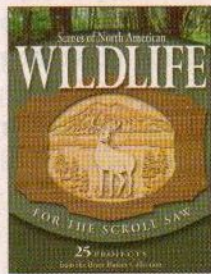
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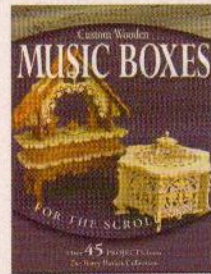


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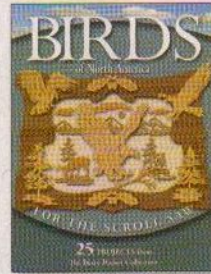


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A Puzzling Business

Student's scroll saw business helps pay for college

By Kathleen Ryan

Katie Whitaker, a 22-year-old college student from Pasadena, Tex., turned her love of jigsaw puzzles into a profitable scroll saw business. The business is so successful that it has helped pay her way through college.

In 2008, during her senior year of high school, says Katie, "I ordered a custom photo puzzle for my mom's birthday and became curious about how these intricate puzzles were actually made. After doing some research, I discovered the scroll saw. That marked the beginning of my passion for puzzle making."

Katie worked hard to save the first \$100. She also won a Home Depot coupon auction on eBay. Combining both resources, she purchased a Ryobi scroll saw. Then, Katie set up shop in a small corner of the family garage and got to work. "At that time I wasn't aware of the scroll community, so I taught myself how to use a scroll saw," Katie said. "I spent my entire senior year perfecting my scrolling, and I refused to give it up."

By the end of that summer, her business, Double Trouble Jigsaw Puzzles, had taken off, and puzzles were flying out the door. When it came time to pack up and leave for college, Katie toted her scroll saw along with her. "I convinced the school administrators

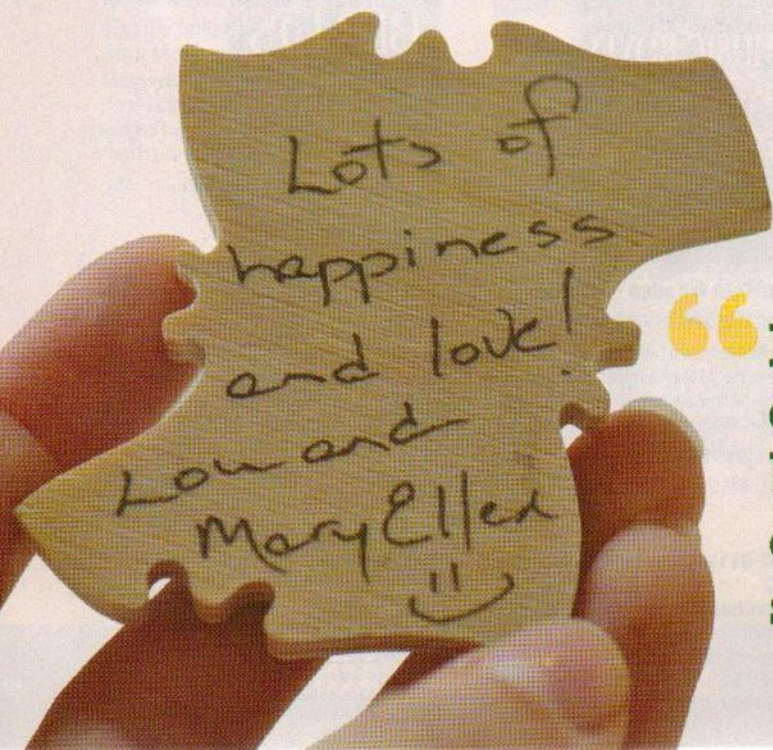
to make a work space available in the basement of the school," Katie explained. "I kept all of the inventory and packaging stuff in my room. It was quite a unique dorm experience!"

After her first year of school, Katie moved back home and transferred to a local college, where her business grew. She eventually acquired a DeWalt scroll saw, two Excalibur EX30 scroll saws, and additional tools and workbenches, filling the family's two-car garage.

Katie says one of her biggest challenges is being a full-time college student while working more than 60 hours a week, but that the rewards and benefits make it all worthwhile. "My business has forced me to come out of my comfort zone," she explained. "I love the sense of freedom when I sit in front of my saw and the satisfaction that comes from the end results. It took me years to perfect my cutting, yet the learning never ends."

The entrepreneur has found a niche she truly loves: wedding puzzle guest books. "I like that every puzzle order has a personal story and meaning behind it," Katie said. "I get to be a part of such a special day in someone's life, and I will do everything possible to make sure even the minor details are exquisite."

Katie cuts the puzzles from ¼" (6mm)-thick Baltic birch plywood. She offers three types: picture puzzles, shape puzzles, and rectangular puzzles. For photo puzzles, Katie adheres the photo directly to the wood. If a customer wants a colorful design or lettering, Katie hand-paints it using high-quality acrylic paint.

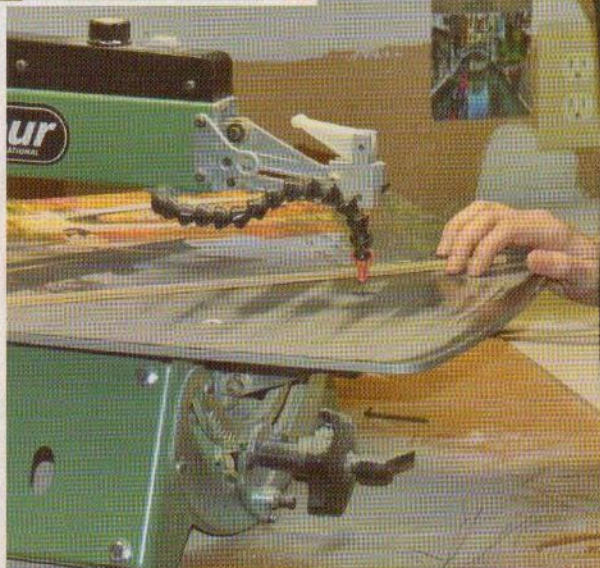


“I like that every puzzle order has a personal story behind it ... I get to be a part of such a special day in someone's life.”



Katie's puzzles were featured in *The Knot*, a national bridal magazine. Wedding guests sign the backs of the puzzle pieces to create an interactive guest book.

Katie Whitaker, age 22, has been scrolling since 2008.



Katie produces up to 60 puzzles each month. They range in size from 11" by 14" to 22" by 24" and include anywhere from 20 to 220 pieces, depending on the number of guests attending the wedding. Prices for the puzzles range from \$70 to \$770. Each puzzle is packaged in its own gift box, labeled and numbered accordingly, and then topped with ribbon to secure it for shipment. Guests sign the front or back of the puzzle pieces at the wedding.

"I truly believe you should be passionate about your work and love what you do. I feel so grateful because I know that not everybody gets a chance to enjoy their work day in and day out as much as I do," Katie said. "I also believe that word of mouth, exceptional quality, and impeccable customer service are the best forms of advertisement for any business. Being able to wow my customers with craftsmanship is very rewarding."

For more information or to contact Katie, visit www.iPuzzleU.com.

Katie offers several styles of puzzles, any of which can be personalized.



Marine Life Intarsia





Colorful wood and simple shaping combine to make an attractive wall hanging

By Janette Square

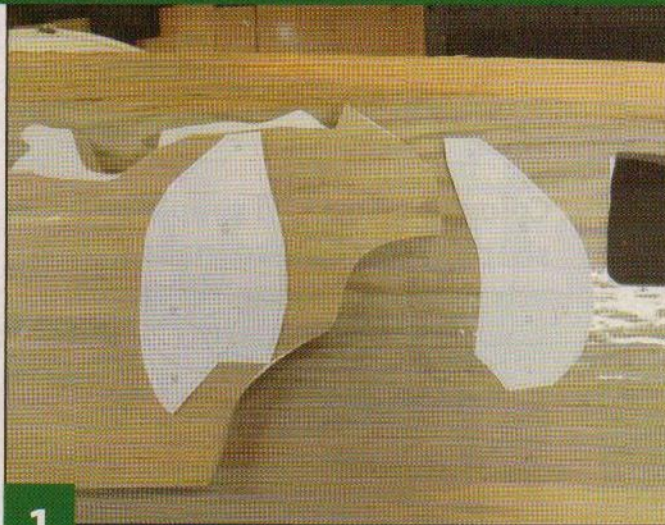
For a long time, I have wanted to create an underwater tropical fish scene. Ultimately, I hope to expand this design to create a large scene complete with coral reefs, numerous fish, shells, and other sea creatures. Until then, this smaller design is more practical and easier to make.

This may look like a difficult project, but with careful cutting and planning, it is much easier than it appears. The project really stands out because of the color and grain selections. The additional depth created by having the fish at different heights adds to the overall effect. Color and wood choices for this project are limitless. I encourage you to be creative by selecting the most interesting and colorful types of wood you can find. The wood sizes listed are the minimum amounts required. I recommend you have larger pieces if possible to give you leeway in selecting the optimal grain pattern.

A fun part of this design is that you can also take individual fish from the pattern to make smaller projects or add to the design by creating additional fish and hanging them separately on the wall around it. It's easy to copy a portion of the pattern in reverse for a fish going the opposite way. You can create an entire school of fish. The possibilities are endless!

You will need at least five copies of the pattern plus a master copy to assemble the pieces on as they are cut. Number the master pattern and label the pattern pieces to correspond. This will help you stay organized as you cut the pieces. As you remove the pattern from individual pieces, transfer the number to the bottom of that piece.

FISH: CUTTING THE PIECES



1

Transfer the patterns to the blank. Select the wood for the pieces and cover it with clear packaging tape. Cut the pattern pieces, apply spray adhesive to the back, and place them on the blanks. For areas with a consistent grain direction, such as the sides of the fish, transfer complete patterns to the blanks and cut the pieces apart. Drill $\frac{1}{4}$ " (6mm)-diameter eyeholes for the top and left fish, and drill a $\frac{3}{8}$ " (10mm)-diameter eyehole for the right fish.



2

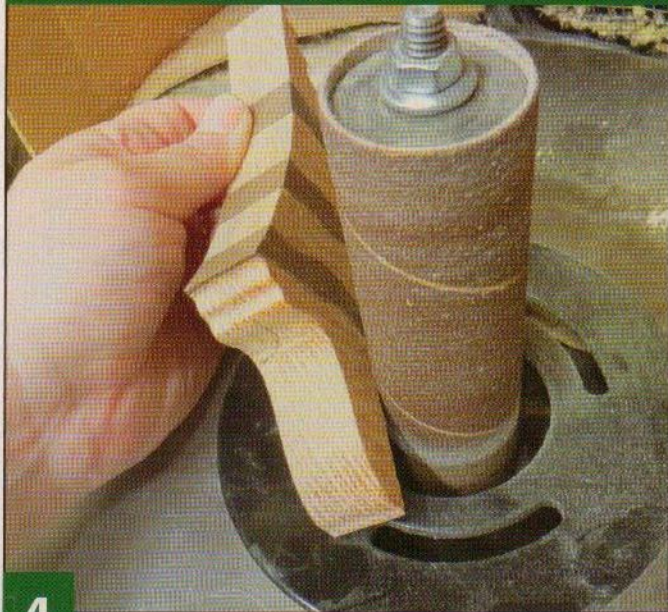
Cut the pieces. Cut the background pieces. Then, cut the fish pieces. Assemble the cut pieces on the master pattern. Determine where to use risers. Make the body of the fish higher than the top and bottom fins and high enough above the background to add depth. Make sure no risers will be exposed. Drill a blade-entry hole in the yellow fin piece and cut the circle. Cut the remaining pieces and place the cut pieces on the master pattern.



3

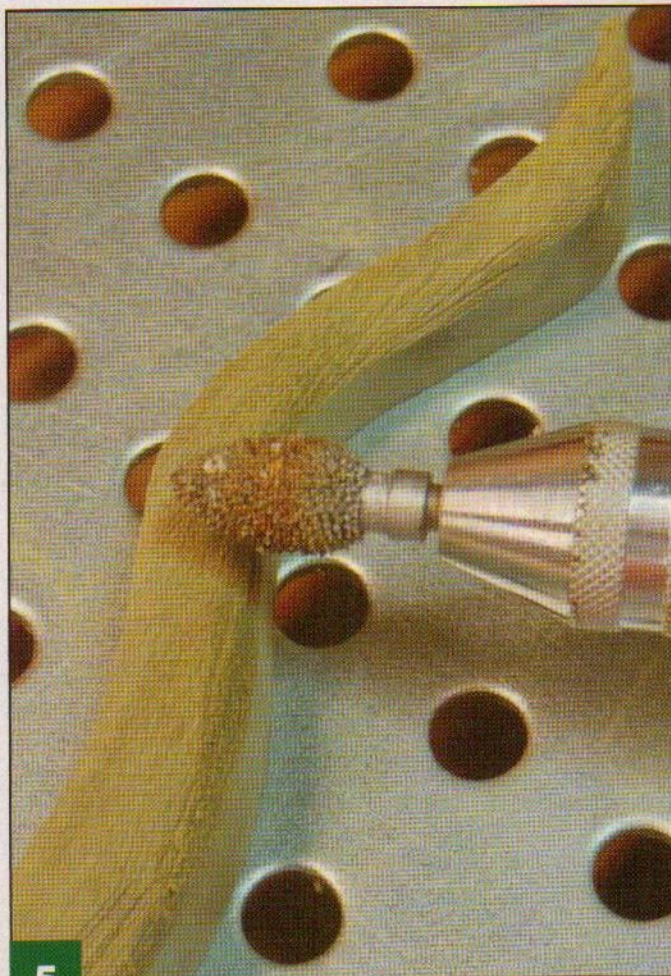
Glue together pieces to be shaped as one unit. Real fish are smooth, but these fish are made of multiple pieces. To get a smooth and realistic shape, edge-glue some sections of the fish together before shaping. This photo shows the fish divided into the sections I edge-glued together prior to shaping.

FISH: SHAPING THE PIECES



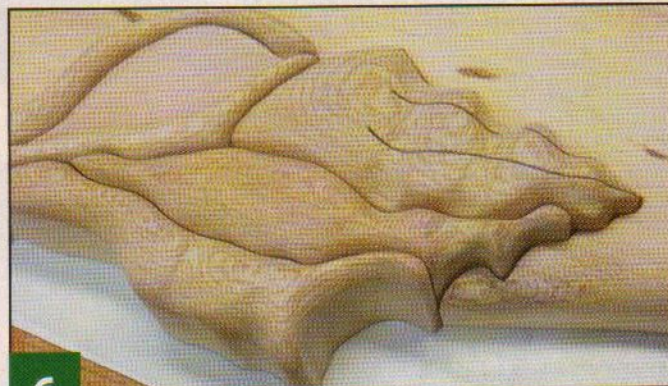
4

Shape the background and fish. Use a flexible drum sander to smooth the background and lightly round the edges. Roughly shape the larger fish sections with an oscillating spindle sander, which removes wood quickly. Use a $\frac{1}{2}$ " (13mm)-diameter spindle to add indents to the tail and side fins. Start with 100- to 120-grit drums on the flexible drum sander to refine the shapes of the pieces, and use a 220-grit drum aligned with the grain of the pieces to remove scratches. The fish body curves down to the fins, and the fins appear thinner than the body.



5

Shape the plants. Thin the plants so they are lower than the top fin of the right fish. Use a rotary tool with a carbide-point bit to carve waves and texture into the pieces. The dark green pieces should be thinner than the lighter pieces so they appear to be behind them. Soften carving scratches with a sanding mop, but leave most of them to add texture.



6

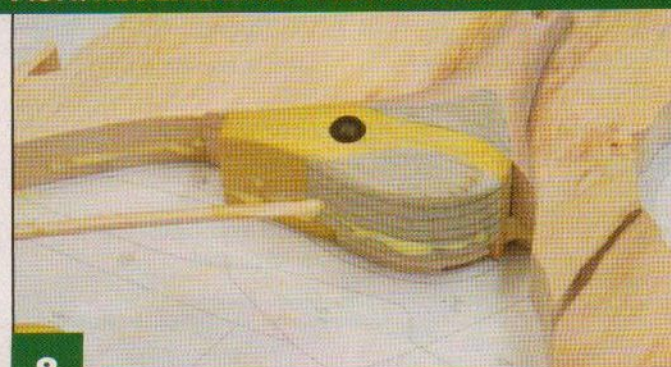
Shape the seashell. Use the technique explained in Step 5 to shape the elements of the seashell. Because seashells are usually smooth, use the edge of a flexible drum sander aligned with the grain direction or hand-sand the pieces to remove all of the scratches from the carbide-point bit.



7

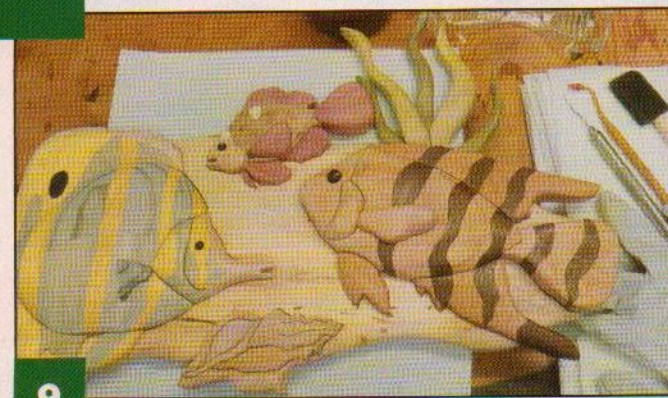
Finish shaping the pieces. Hand-sand each piece with 220-grit sandpaper to remove any remaining scratches, soften the edges, and make any final adjustments. Buff the pieces with a sanding mop. Cut the eye dowels to the approximate lengths and round one end of each with 220-grit sandpaper. Color the dowels with a black permanent marker.

FISH: ASSEMBLING THE PROJECT



8

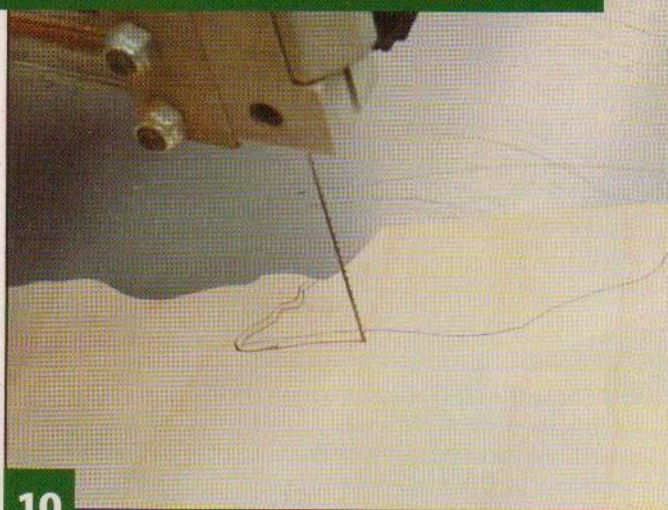
Glue the pieces together. Place waxed paper over the master pattern and reassemble the project on the waxed paper. Glue the eyes in place, adjust the height of the dowels, and trim off any excess. Then, apply a thin layer of glue to the bottom half of each piece and place adjoining pieces against each other, using the pattern as a guide. Glue the entire project together, and then use a skewer to add a dot of antique white acrylic paint as a highlight to each eye. Allow the glue to dry thoroughly.



9

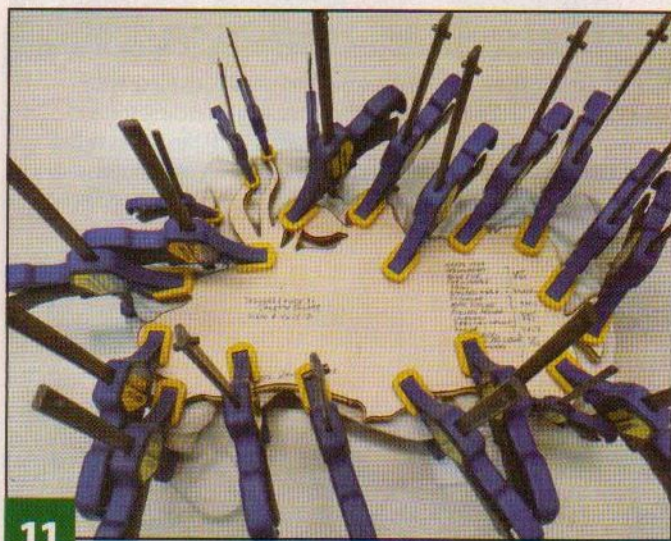
Apply the finish. Apply gel varnish to the front and sides of the project with a foam brush. Remove the excess with paper towels, and use compressed air to blow the finish out of the cracks. Use a clean paper towel over a rubber-tipped dental tool to remove excess finish from tight areas. Hold the project up to a light to make sure you've remove all of the excess finish. Use a sharp metal dental tool to remove excess finish from tight cracks. Allow the finish to dry overnight, and then apply a second coat.

FISH: ASSEMBLING THE PROJECT



10

Make the backing board. Orient the project on the backing board so the grain is vertical to add strength to the thin areas, such as the greenery. Slide graphite paper under the project and use an awl to trace the project and the open area under the top fish's tail onto the backing board. The awl fits into tight areas. Drill a blade-entry hole and cut $\frac{1}{8}$ " (3mm) outside the line in the open area below the fish's tail. Cut $\frac{1}{8}$ " (3mm) inside the traced line around the perimeter of the backing board. Make sure the backing board is not visible from the front. Sand the edges and back of the backing board.



11

Attach the project to the backing board. Color the edges of the backing board with a black wide-tipped permanent marker if desired. Use a fine-tipped marker to sign the back of the project and write the different varieties of wood used. Place the project face down on a soft surface and use a foam brush to apply wood glue to the top of the backing board. Carefully align the backing board and wiggle it around to get good glue contact. Use a soft cloth to protect the surface of the project as you apply clamps to the entire perimeter. Remove any glue squeeze-out, and allow the glue to dry overnight. Remove the clamps, and hold the project between your thumb and forefinger to find the balance point. Mark it with a pencil and attach the hanger to the balance point.

Materials & Tools

Materials:

- Baltic birch plywood: risers, assorted scrap pieces $\frac{1}{8}$ " (3mm) and $\frac{1}{4}$ " (6mm) thick
- Baltic birch plywood, $\frac{1}{8}$ " (3mm) thick: backing board, 13" x 20" (330mm x 508mm)
- Spalted maple, $\frac{1}{2}$ " (13mm) thick: sand background, 8" x 11" (203mm x 279mm)
- Dark green poplar, $\frac{3}{4}$ " (19mm) thick: dark plants, 3" x 8" (76mm x 203mm)
- Light green poplar, $\frac{3}{4}$ " (19mm) thick: light plants, 4" x 6" (102mm x 152mm)
- Quarter-sawn sycamore, 1" (25mm) thick: seashell, 3" x 6" (76mm x 152mm)
- Pink dogwood, $\frac{3}{4}$ " (19mm) thick: center of seashell, 1" x 3" (35mm x 76mm)
- Blue pine, two shades, $\frac{3}{4}$ " (19mm) to 1" (25mm) thick: left fish, 2 each 4" x 6" (102mm x 153mm)
- Yellowheart, 1" (25mm) thick: left fish, 5" x 9" (127mm x 229mm)
- Curly maple, $\frac{3}{4}$ " (19mm) to 1" (25mm) thick: left fish, 6" x 6" (152mm x 152mm)
- Ebony, $\frac{1}{2}$ " (13mm) thick: left fish, 2" x 2" (51mm x 51mm)
- Figured redwood, $\frac{1}{2}$ " (38mm) thick: right fish body, 4" x 11" (102mm x 279mm)
- Peruvian walnut, $\frac{7}{8}$ " (22mm) to 1" (25mm) thick: right fish dark body strips, 6" x 7" (152mm x 178mm)
- Lacewood, $\frac{7}{8}$ " (22mm) to 1" (25mm) thick: right fish top and bottom fins, 5" x 5" (127mm x 127mm)
- Maple burl, 1" (25mm) thick: top fish body, 3" x 4" (76mm x 102mm)

- Figured cherry, 1" (25mm) thick: top fish head, 2" x 2" (51mm x 51mm)
- Aromatic red cedar, 1" (25mm) thick: top fish head, 3" x 6" (76mm x 152mm)
- Basswood, 1" (25mm) thick: top fish white spots, assorted scraps
- Peruvian walnut, 1" (25mm) thick: top fish dark spot on fin, assorted scraps
- Dowel, $\frac{1}{4}$ " (6mm)-diameter: left fish, top fish eyes, 3" (76mm)-long
- Dowel, $\frac{3}{8}$ " (10mm)-diameter: right fish eye, $1\frac{1}{2}$ " (38mm)-long
- Spray adhesive
- Skewer
- Waxed paper
- Finish: clear satin gel varnish
- Paper towels
- Foam brush
- Black permanent markers: wide-tip, fine-tip
- Clear packaging tape
- Acrylic paint: antique white
- Sandpaper: 220 grit
- Wood glue
- Hanger

Tools:

- Blades: #1 reverse-tooth, #7 skip tooth
- Rotary tool with bits: flame-shaped carbide point
- Flexible drum sanders: 100, 220 grits
- Sanders: oscillating spindle, mop
- Air compressor (or canned air)
- Drill with bits: $\frac{1}{4}$ " (6mm), $\frac{3}{8}$ " (10mm)
- Dental tools: rubber tipped, metal pointed

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

Pattern for the **MARINE LIFE INTARSIA** is in the pattern pullout section.



Janette Square lives in Eugene, Ore. For more of her work, visit her website at www.square-designs.com.

Marquetry Box with Magic Lid

Disappearing joints
make this beautiful
box the perfect canvas
for a marquetry scene

By Allan Longroy



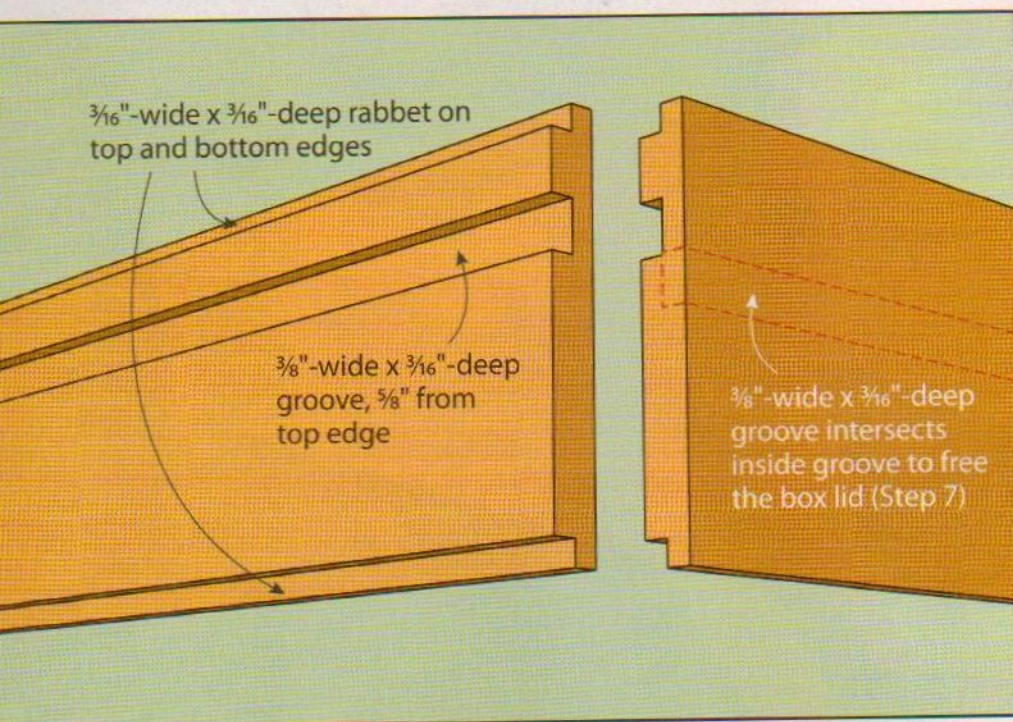
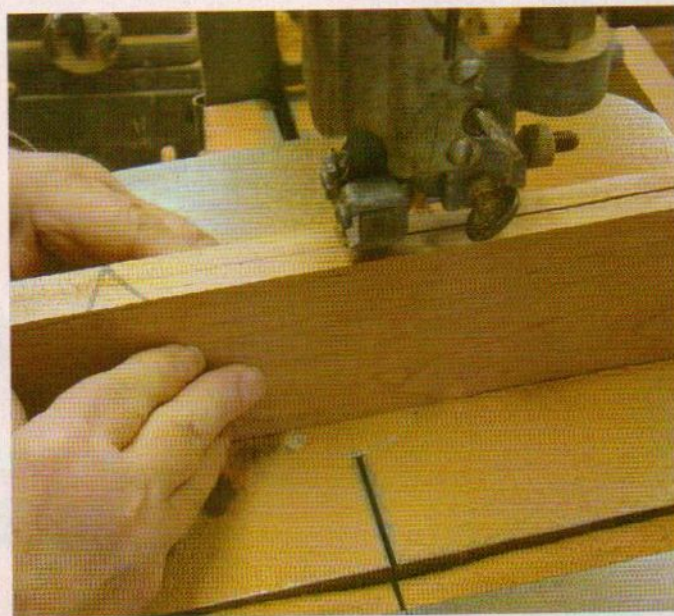
There are almost as many ways to make boxes as there are types of wood joints. In some cases, the box joints are a design element. However, I didn't want anything to detract from the marquetry lid, so I chose a simple design for this box. The sanded miters create invisible joints and the router technique makes a perfectly matched lid, which together allow the marquetry to shine.

Because the top and bottom of the box rest in rabbets, wood that expands or contracts can damage the box joints. I avoid that problem by using plywood under the marquetry and as the box bottom. The plywood resists expansion and contraction based on seasonal humidity. However, I pay as much attention to the inside of the box as the outside, so I hide the plywood with cherry veneer that matches the cherry of the box (see Step 1).

It is just as fast to make two boxes as to make one, so I have listed materials for two boxes. Simply repeat the steps as necessary with each blank to make the two boxes. Or, if you prefer, skip the box-making and apply the marquetry design to a premade box or plaque.

MAKING THE BOX

Step 1: Prepare the plywood. Cut $\frac{1}{4}$ " (6mm)-thick plywood to $4\frac{1}{2}$ " by 20" (114mm by 508mm) and glue a piece of cherry veneer to the plywood. Use several clamps and two melamine cauls to make sure the veneer is pressed firmly against the plywood. Sand and finish the cherry (see Step 15).



▲ Step 2: Prepare the lumber.

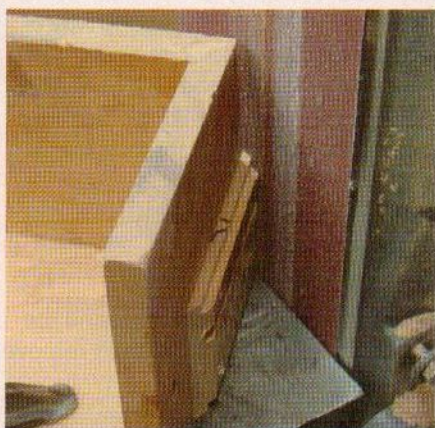
I resaw thick lumber to keep the color and grain pattern consistent. Plane the box blank to get a clean surface and mark the center of the 1" (25mm) thickness. Draw reference triangles in two places on the edge of the board. Cut along the centerline with a band saw. Plane the wood to $\frac{3}{8}$ " (10mm) thick. If you would rather not resaw, use two pieces that measure $\frac{3}{8}$ " by 3" by 20" (10mm by 76mm by 508mm).

◀ Step 3: Cut the rabbets and grooves.

Set a router table to cut a $\frac{3}{8}$ " (10mm)-wide by $\frac{3}{16}$ " (5mm)-deep groove $\frac{5}{8}$ " (16mm) from one edge on the inside surface of each piece. The inside surface of the box was the outside of the original blank. Position the grooves near the edges with the reference triangle. Sand and fully finish the inside surfaces and the grooves. Cut a $\frac{3}{16}$ " (5mm)-wide by $\frac{3}{16}$ " (5mm)-deep rabbet on both inside edges of the box parallel to the groove.



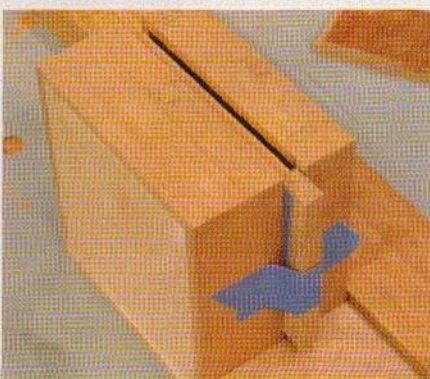
▲ **Step 4: Cut the boards to length.** Stack the two boards together as they were in the original 1" (25mm)-thick board (reassemble the reference triangles). At the same time, cut both boards to 9" (229mm) long plus the thickness of the saw blade. Save the cut-off pieces. Rotate the top blank end over end and put it on top (top photo). The outside surface is now up on both pieces and the reference mark is in front. Cut the boards to 4½" (114mm) to create four equal pieces. Move the top two pieces to the right and mark the corners to keep them in order, as shown in the lower photo.



▲ **Step 5: Making the miters.** If you cut the miters with a saw, the unsupported areas of wood will chip out. I sand the miters on a stationary belt sander using a shop-made jig that presents the blanks to the sander at a 45° angle. Adjust the miters until all of them are the same length and the box sides fit together tightly.



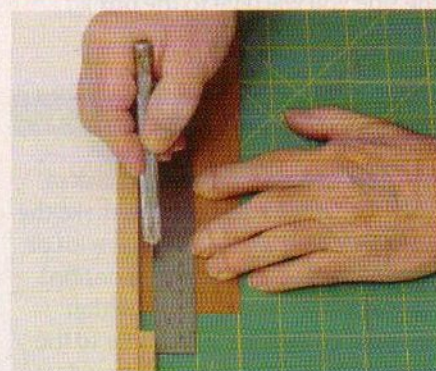
▲ **Step 6: Glue the box together.** Place four pieces against a straight edge with the outside surfaces up. Put strips of tape across the edges. Turn the pieces over and put glue in the miters. Roll the four pieces together and fasten the last miter together with tape. Use rubber bands to hold the pieces together while you check to make sure the box is square. Clean up any glue squeeze-out and mark the top (lower photo). Cut, glue, and clamp the plywood top and bottom into the rabbets with the cherry veneer on the inside. Apply wood filler to any gaps that would be visible on the outside after you apply the marquetry.



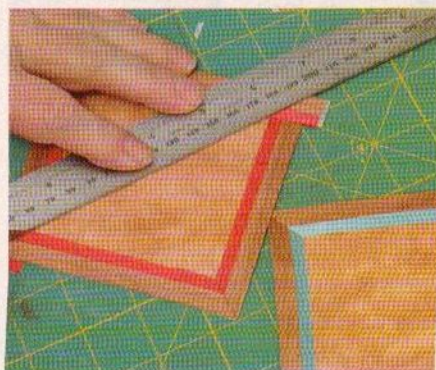
▲ **Step 7: Free the top.** On the router, set a ⅜" (10mm)-diameter straight bit 1" (25mm) from the fence and ⅜" (5mm) high. With the piece of scrap cut off in Step 4, check the depth of cut and distance from the fence to make sure the cut will separate the box lid. Rout the opposite sides of the box

first; you should see the separation of the top from the sides. Partially fill these grooves with ⅜" (10mm)-wide strips of wood to support the box as you cut the remaining sides. Sand the freshly cut surfaces.

MAKING THE VENEER BACKGROUNDS



▲ **Step 8: Cut the pieces for the veneer background.** Cut the two light-colored veneer background pieces to size, and then cut the eight strips of cherry veneer. Cut the four strips of red veneer and the four strips of blue veneer. Use blue painter's tape on the wrong, or back, sides to hold the cherry and red veneer strips together. Flip the pieces over, check the seam, and then apply veneer tape on the right, or front, side. Burnish the veneer tape with a brass brush. Press it flat to dry. Use the same process to attach the blue strips to the remaining cherry strips.

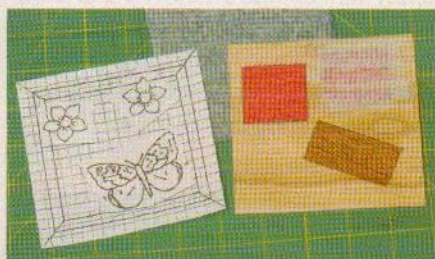


▲ **Step 9: Assemble the background.** Use blue tape on the backs of the pieces to attach the cherry/red borders to the four edges of the background veneer. Flip the pieces, check the seams, apply veneer tape to

the front, and burnish the tape with a brass brush. Remove the blue tape from the back and use an X-Acto knife to cut the miters. Use veneer tape on the front to lock the corners in place. Use the same process on the other background piece with the cherry/blue border. The front side of the veneer should be completely covered with veneer tape. Remove any remaining blue tape on the side you will glue to the box lid.

CUTTING THE BUTTERFLIES

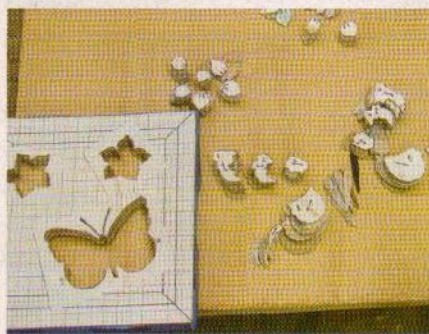
While it's possible to create a stack of all of the veneers you need to make the butterflies, this method wastes a lot of material, especially when the design needs pieces with a grain direction not parallel to or perpendicular to the grain of the background. To provide more flexibility, embed smaller pieces of veneer inside pieces of scrap veneer the same size as the background veneer. Then, stack together the pieces of scrap veneer and the background veneer and cut all of the marquetry pieces at one time. This method allows you to mix and match the pieces that are guaranteed to fit perfectly into the background.



▲ Step 10: Embed the veneer rectangles in the scrap veneer.

Cut a rectangle of colorful veneer somewhat larger than the butterfly part or flower. Pay attention to the grain direction arrows. Place a piece of graphite paper on top of the scrap veneer. Place a copy of the pattern on top of the graphite paper and place the colorful veneer in place on top of the pattern, again following the grain direction arrows. Trace around the colorful veneer. Cut the hole marked in the scrap and use veneer tape to attach the colorful veneer to the scrap

veneer. You can embed more than one colorful veneer rectangle into the scrap veneer as long as the rectangles don't overlap. Repeat until all of the colors are embedded in pieces of scrap veneer.



▲ Step 11: Cut the marquetry.

Create a stack of the scrap veneers and the two background veneers. Place thin cardboard, such as shirt cardboard, on the top and bottom of the stack and wrap tape around the stack to lock it in place. Use spray adhesive to attach a pattern to the top of the stack. Drill blade-entry holes just large enough for #2/0 blades and cut the parts; for the butterfly, I drill the blade-entry hole at the tip of one of the antennas. As you cut a section free, set it aside in the same pattern position in relation to the other cut pieces. Use the numbers on the pattern to identify the pieces.

COMPLETE THE MARQUETRY



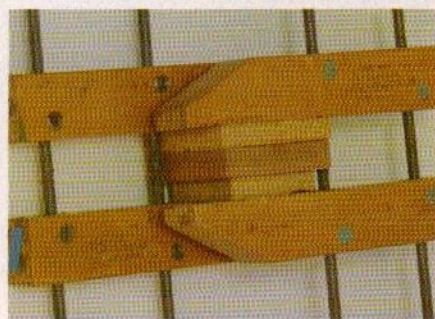
▲ Step 12: Assemble the marquetry.

Separate the stacks and apply blue painter's tape to the veneer-tape side of the background veneers. Place the background veneers face down (so the glue side is up) and place the inlay pieces in place (veneer tape down) inside the background. The blue painter's tape will keep the inlay pieces from moving around. Adjust the inlay pieces so the kerf is uniform around them.



▲ Step 13: Fill the saw kerfs.

Cover the glue side of the veneer with blue painter's tape, flip the background veneer over and remove the blue painter's tape from the veneer tape side. Lock the inlay pieces in place with veneer tape, burnish the tape, and then remove the blue painter's tape from the glue side. Use a spatula to force ebony-colored putty into the kerfs from the glue side of the veneer. Use coarse-grit sandpaper to remove the excess putty.

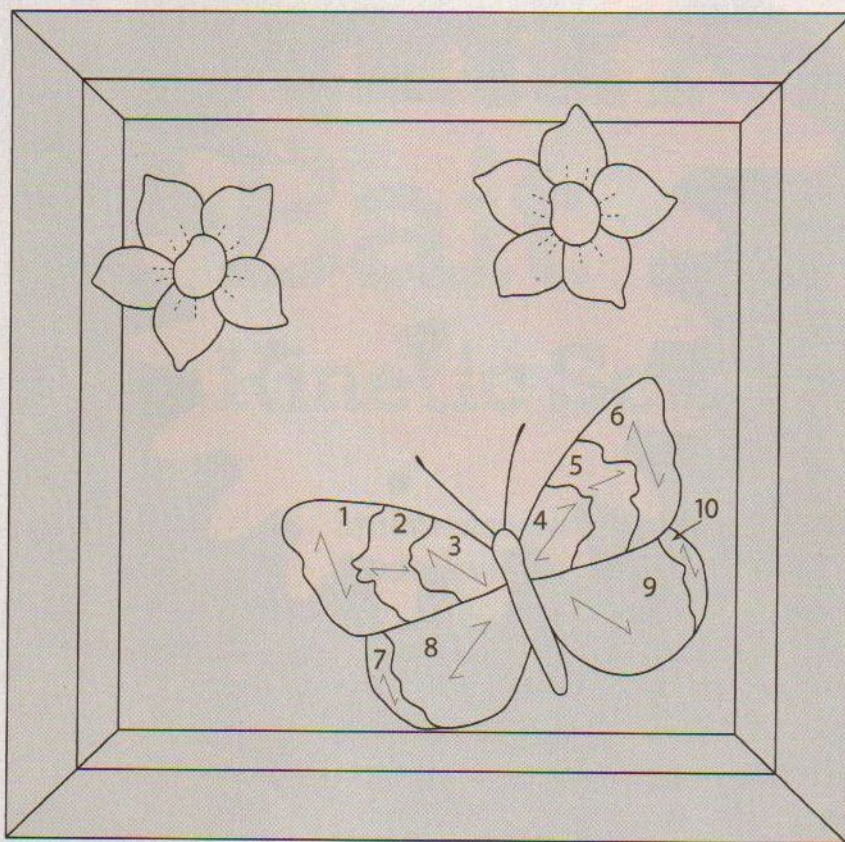


▲ Step 14: Add the marquetry to the box lid.

Apply glue to the box lid and quickly position the wrong side of the veneer on the box. Use a caul sized to fit inside the box lid and a caul sized to cover the top of the lid as you clamp the veneer to the lid of the box. Use a similar technique to glue and clamp cherry veneer to completely cover the bottom of the box.

Step 15: Finish the box. Sand the edges of the box flush. Carefully remove the veneer tape from the top. While you can wet the tape with water and scrap it off with a putty knife, I sand off the tape with the belt sander. Sand carefully because you can sand through the veneer. Round the edges of the top and bottom with a 1/8" (3mm)-radius round-over bit. Sand with progressively finer grits of sandpaper up to 220 grit. Apply two coats of pre-catalyzed lacquer and allow to dry. Apply paste wax and polish with 0000 steel wool.

Marquetry butterfly box pattern



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Materials:

- Cherry, 1" (25mm) thick: 3" x 20" (76mm x 508mm); OR cherry, 3/8" (10mm) thick: 2 each 3" x 20" (76mm x 508mm)
- Plywood, 1/4" (6mm) thick: 4 1/2" x 20" (114mm x 508mm)
- Cherry veneer: 4 1/2" x 20" (114mm x 508mm); 6 each 4 1/2" x 4 1/2" (114mm x 114mm)
- Scrap veneer: 8 each 4 1/2" x 4 1/2" (114mm x 114mm)
- Thin cardboard: 2 each 4 1/2" x 4 1/2" (114mm x 114mm)
- Light colored veneer: background, 3 1/2" x 3 1/2" (89mm x 89mm)
- Red veneer: border, 4 each 1/4" x 5" (6mm x 127mm)

- Blue veneer: border, 4 each 1/4" x 5" (6mm x 127mm)
- Cherry veneer: border, 8 each 3/8" x 5" (10mm x 127mm)
- Veneer scraps in assorted colors for the flowers and butterflies
- Veneer tape: white
- Blue painter's tape: 1" (25mm) and 2" (51mm) wide
- Wood filler: cherry; black (ebony)
- Wood glue
- Finishes: pre-catalyzed lacquer; paste wax
- Steel wool: 0000 grit
- Sandpaper
- Graphite paper
- Spray adhesive

*The author used these products for the project.
Substitute your choice of brands, tools, and materials as desired.*

Materials & Tools

Tools:

- Scroll saw and #2/0 blades
- Clamping cauls
- Band saw
- Thickness planer (optional)
- Router in router table with fence
- Router bits: 3/8"-diameter straight; 1/8"-radius round-over
- Miter saw, radial-arm saw, or table saw
- Disc or belt sander with 90° jig
- Rubber bands
- Brass brush burnisher
- Hobby knife
- Steel ruler
- Spatula
- Clamps
- Drill and assorted small bits



Allan Longroy is a retired university chemistry professor who lives in Fort Wayne, Ind. He is a self-taught woodworker who has won several awards. Allan has given a course in marquetry at the local Woodcraft store and he has given demonstrations at club meetings. Allan brings a new box for show and tell each month.





Shark Bait

Kinetic Sculpture

Amaze viewers with these irregularly shaped working gears

By Clayton Boyer and Forrest Burnett

Almost two million people have viewed my “These Gears Really Work?” video on YouTube. The video features more than a dozen non-circular, intermittent, or simply weird gears that at first glance look as though they should not work together—but they do! Forrest Burnett and I have transformed two of those weird gears into a wooden toy that is fun to build and operate, and amazing to watch. Forrest named it *Shark Bait*.

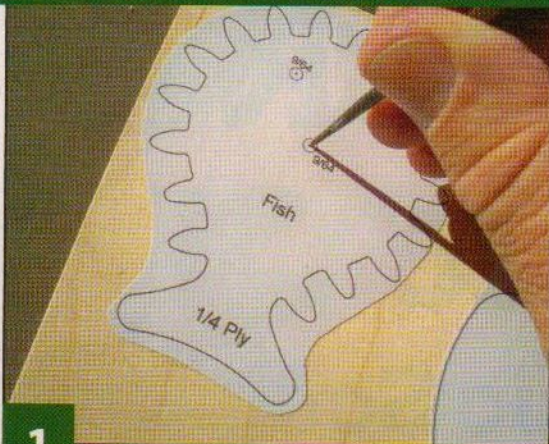
Because of their shapes, I named these two gears the fish and the urchin. They have a 2:1 gear ratio and an intermittent action, which means the fish gear travels twice as fast as the urchin gear, but for only one fish gear rotation; then, the gear sits and waits for the urchin gear to connect with its tail to begin rotating again.

Despite its complex appearance, each fish gear only takes about five minutes to cut from ¼" (6mm)-thick plywood. The whole project can be created in under an hour, excluding the painting. You can leave the project unfinished or apply a clear finish. Forrest developed an easy and attractive method to finish the project with a finish sprayer. You could also use spray paint, washes of acrylic paint, or an airbrush.

I invite each of you to send me pictures of your completed *Shark Bait* kinetic sculptures. I would like to share your creations with the world through my Flickr link. Please send your pictures to moalanikai@yahoo.com.

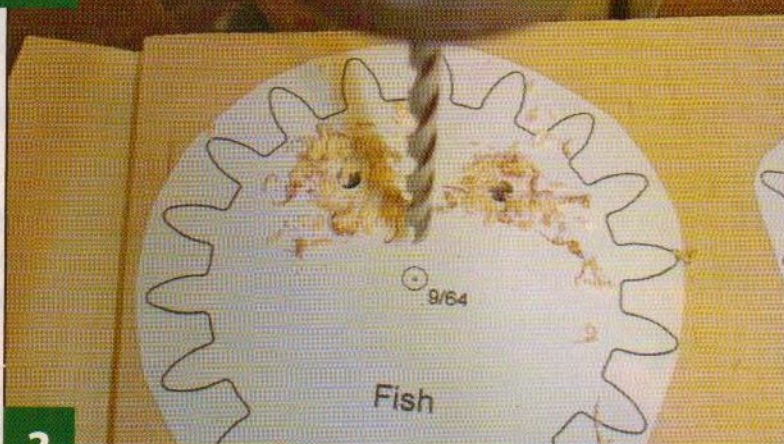
ON THE WEB See a video of the Shark Bait kinetic sculpture in motion.
www.scrollsawer.com

SHARK BAIT: CUTTING THE PIECES



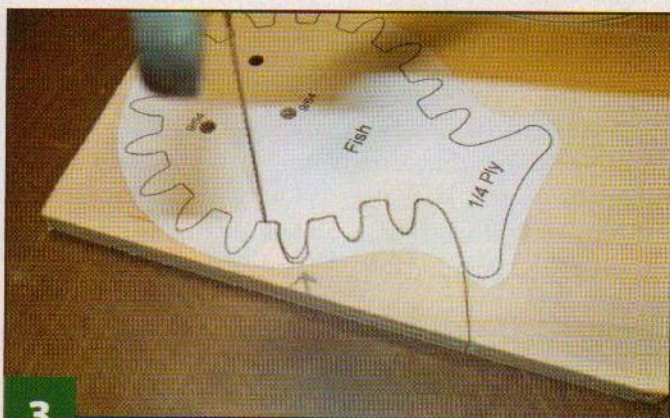
1

Prepare the blanks. Cut the patterns for the gears, shark overlay, and base and apply spray adhesive to the backs. Attach the patterns to the blanks, and then press a sharp awl into the center of each hole to be drilled. The dimple you create helps align the drill bit exactly.



2

Drill the holes. For increased accuracy, use a $\frac{9}{64}$ " (3.5mm)-diameter brad-point bit to drill the holes in the centers of the gears and for the fishes' eyes. Then, drill the $\frac{3}{4}$ " (19mm)-diameter finger hole in the urchin gear. You could also drill a blade-entry hole and cut the finger hole with a scroll saw. For the base, drill the $\frac{5}{64}$ " (2.25mm)-diameter pilot holes where indicated and drill the hanging hole from the back.



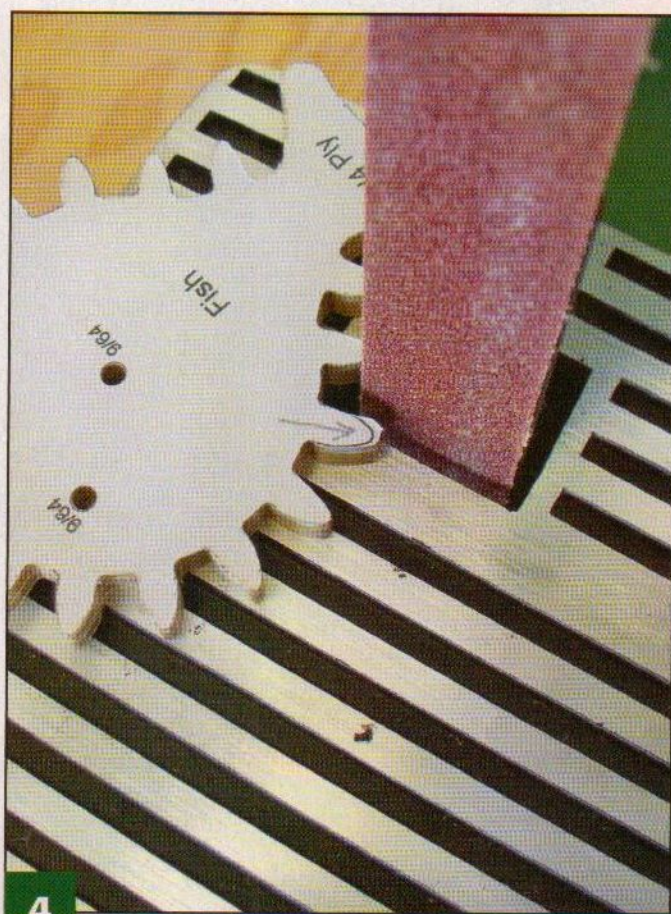
3

Cut the gears. Cut to the line when cutting the teeth. This means cut the teeth so there is no black pattern line remaining on the teeth; it is also called splitting the line. Pay particular attention to the dedendum (the valley between the teeth); it is difficult to clean this area up with sandpaper. Then, cut the shark silhouette.

TIP

FINISHING GEARS

For wooden clocks, I recommend against using any finish on the wheels. I especially avoid getting any finish on the surfaces where the gear teeth meet (see Scroll Saw Woodworking & Crafts Spring 2011, Issue 42). Because this project is a hand-driven machine, we do not have to worry as much about the finish gumming up the mechanism. However, try to minimize the amount of finish you get on the sides of the gear teeth. Our first experiments showed that excess finish on the tooth sides created less than optimal movement of all the gears.

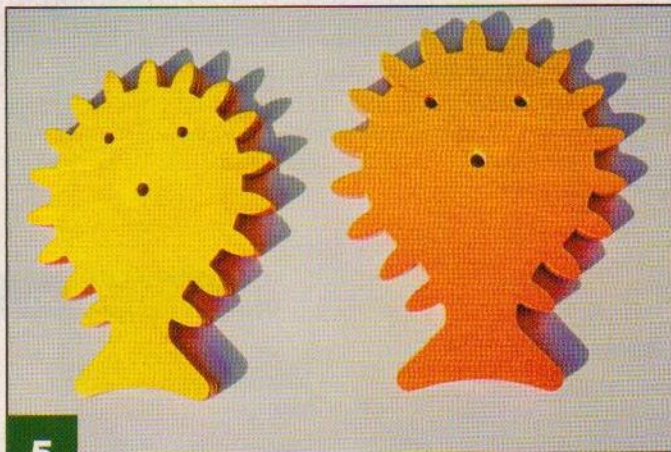


4

Touch up the teeth. The addendums (the protruding part of the teeth) are easy to touch up with a bench sander. I often cut away from the lines on these pieces and sand them to their final shape. Round the sharp edges of the shark with sandpaper. Soak the blanks in mineral spirits to remove the patterns and use a paper towel dipped in mineral spirits to remove any remaining adhesive. Allow the blanks to dry thoroughly.

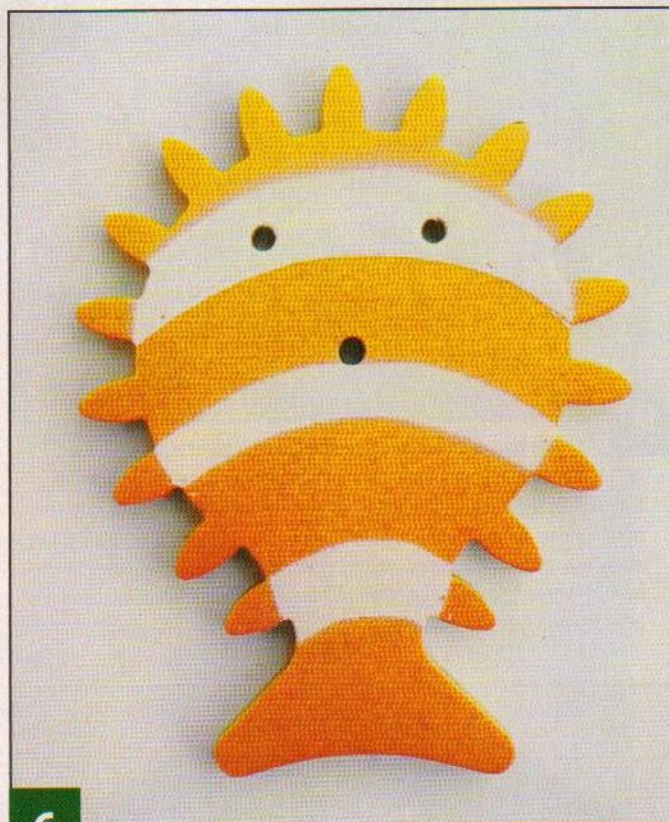
SHARK BAIT: PAINTING THE PIECES

Lay out all of the parts. Thin the sanding sealer enough so it sprays easily. Apply two medium coats to all surfaces, waiting 20 minutes between coats. Apply only one coat inside the teeth. Allow the two coats to dry for two to three hours, and then sand everything with 180-grit sandpaper. Carefully smooth all of the edges where the gear teeth make contact.



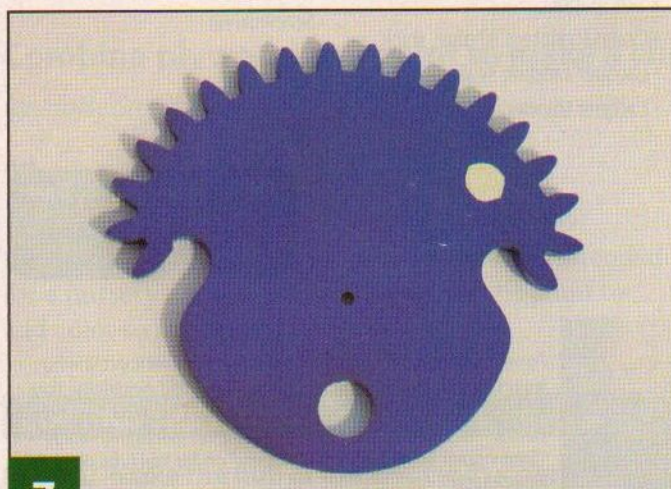
5

Basecoat the fish gears. Thin $\frac{1}{8}$ cup (3ml) of sanding sealer with $\frac{1}{8}$ cup (3ml) of lacquer thinner and add 2 to 3 drops of yellow Transtint dye. Apply one coat to the fish gears. Dump what is left of the yellow back into the mixing cup and add 2 to 3 drops of orange Transtint dye. Thin this overspray coat with more lacquer thinner and apply a light coat of the orange, aiming upward from the tail. Blend the orange with the yellow of the tail, but angle the sprayer so only the edges of the spray hit the head. The gear should be orange at the tail and blend with yellow at the head.



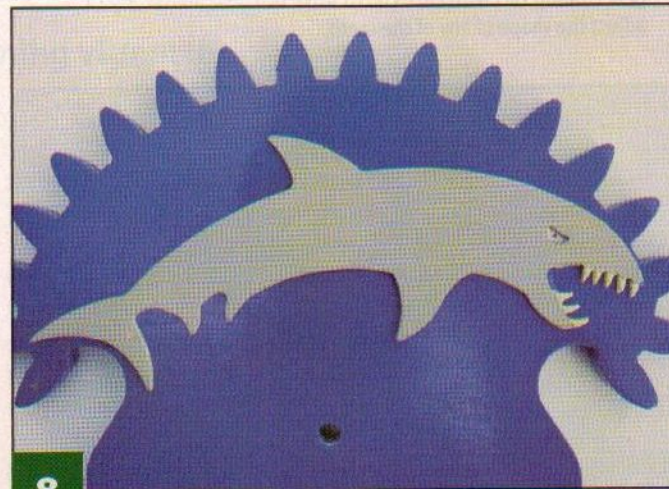
6

Add the fish gear details. Use a loop of masking tape to hold each gear in place. Hold the striped painting template over the fish and apply a coat of white spray lacquer paint, such as Ace Lacquer instant drying paint (Transtint dyes do not come in white). To spray the white, begin spraying straight down a few inches to the side of the painting template, and continue to spray across the template to the other side of the mask, evenly and lightly covering the fish below. Don't begin by spraying directly onto the fish through the template.



7

Paint the base and urchin gear. Apply a base coat of white paint, allow the paint to dry, and then mark the location of the shark's eye. Mask off an area twice the size of the shark's eye. Dilute sanding sealer with an equal portion of lacquer thinner and add a few drops of blue Transtint dye. Spray from all directions. To make a more intense color, apply additional coats.



8

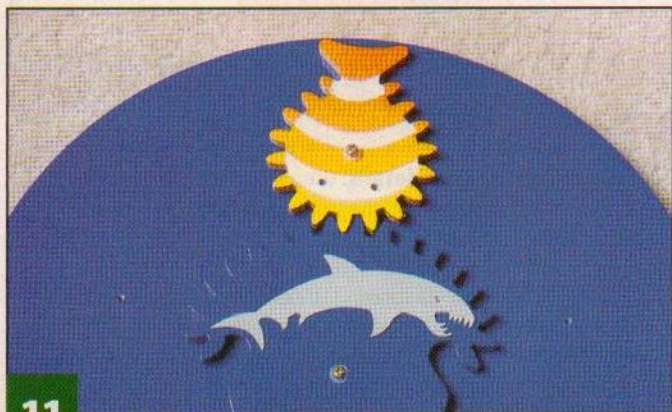
Paint the shark's mouth with white spray paint. Mask off the teeth and apply flat gray or gray primer to the shark. Remove the mask and use thick cyanoacrylate (CA) glue to attach the shark to the urchin gear. Use a pencil or permanent marker to make a dot inside the shark's eye to represent the pupil.

SHARK BAIT: ASSEMBLING THE PROJECT



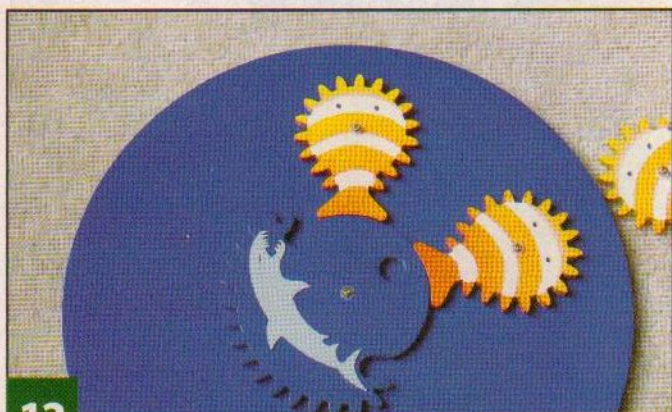
9

Attach the urchin gear to the base. Insert a #6 by $\frac{3}{4}$ " (19mm)-long sheet metal screw through a #8 washer, through the hole in the urchin gear, through another #8 washer, and into the pilot hole in the base. The washers allow the gear to move freely and also ensures that the screw will not protrude from the bottom of the base. Tighten the screw enough to hold the gear in place without interfering with its movement.



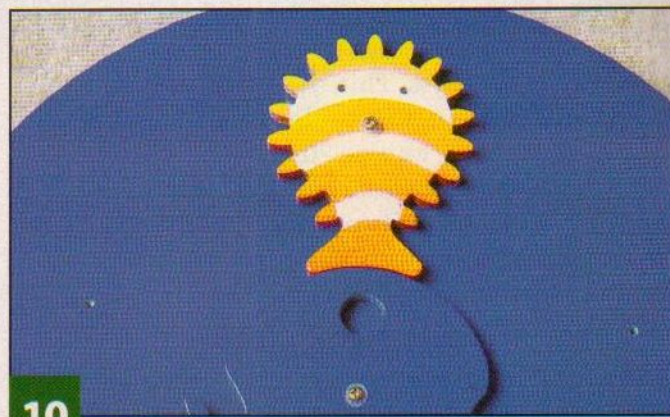
11

Check the action of the gears. Rotate the urchin gear 360° to check for smooth movement between the fish and urchin gears. Doing this with each consecutive fish gear allows you to adjust the shape of any of the teeth.



12

Add the remaining fish gears. Add the screw and washers to the second fish and place it in position with the tail facing the center. Rotate the urchin gear until the non-toothed portion faces the second fish's tail (about 72°). Place the tail against the urchin gear and screw the fish in place. Rotate the urchin gear to check the action of the gears. Repeat the process to add the remaining fish gears.



10

Add the first fish gear. Insert a screw through a washer, through the center of a fish gear, and through another washer. Align the tail of the fish gear with the smooth, rounded, non-toothed part of the urchin gear. This makes it easy to align the gears as you drive the screw into the pilot hole.

Materials & Tools

Materials:

- Good quality plywood, $\frac{1}{2}$ " (13mm) thick: base, 24 x 24" (610mm x 610mm)
- Good quality plywood, $\frac{1}{4}$ " (6mm) thick: gears, 12" x 12" (305mm x 305mm)
- Wood of choice, $\frac{1}{16}$ " (2mm) thick: shark, 2" x 5" (51mm x 127mm)
- Sheet metal screws, size #6: 6 each $\frac{3}{4}$ " (19mm) long
- Flat washers, size #8: 12 each
- Spray adhesive
- Sandpaper
- Cyanoacrylate (CA) glue, thick
- Lacquer sanding sealer
- Lacquer thinner

- Transtint dyes: yellow, orange, blue
- Lacquer spray paint: white
- Primer spray paint: gray
- Masking tape

Tools:

- Blades: #5 reverse-tooth
- Belt sander
- Drill with bits: $\frac{5}{64}$ " (2.25mm); $\frac{3}{64}$ " (3.5mm) brad point; $\frac{3}{4}$ " (19mm) diameters
- Finish sprayer
- Screwdriver

Patterns for **SHARK BAIT** are in the pattern pullout section.



Forrest Burnett is an amazing multimedia kinetic artist who works mainly in metal, wood, glass, light, and electricity. You can see videos of his creative kinetic genius, such as "103 Weird Gears," "Newton's Law and Many Moons," "Metallica Alula," "Steampunk Voyager," and "Drakkar" on his YouTube channel, kineticstuff1.



Clayton Boyer loves to make wood move. He has created more than 50 unique wooden clocks and kinetic sculptures, many of which can be seen on his website, www.lisaboyer.com, where woodworking plans for these wonderful mechanisms are available. Be sure to check out his "These Gears Really Work?" video on YouTube.



Noah's Ark Intarsia

Combine plywood and paint to make a charming vignette

By Janice Smith

Intarsia artists often use different colors of hardwood to create their scenes. But for this illustration of the classic Bible story, which is intended for a nursery or child's room, I used acrylic paint to add color to the project.

CUTTING THE PIECES

Step 1: Make the hull of the ark. Cut four pieces of $\frac{1}{2}$ " (13mm)-thick Baltic birch plywood to $1\frac{3}{4}$ " (44mm) wide by $7\frac{1}{2}$ " (191mm) long. Glue and clamp them face to face. Allow the glue to dry, attach a pattern to the blank with the plywood layers running horizontally, and cut the ark hull, including the stair-step deck shape. Use a belt sander to round the front and back of the hull.

Step 2: Make the cabin and lookout. Cut 10 pieces of $\frac{1}{2}$ " (13mm)-thick Baltic birch plywood to 1" (25mm) wide by $1\frac{3}{4}$ " (44mm) long. Glue and clamp all 10 pieces together face to face. Allow the glue to dry and then attach the pattern to the blank with the plywood layers running vertically. Drill blade-entry holes and cut the windows. Use the same process to make the lookout area from three $\frac{1}{2}$ " (13mm)-thick pieces of Baltic birch plywood cut into 1" (25mm) by $1\frac{1}{8}$ " (29mm) pieces.

Step 3: Make the roof pieces. Attach the patterns for the roof pieces to $\frac{3}{8}$ " (3mm)-thick oak and cut them. Transfer the side-view patterns to the roof supports, and angle the saw table to match the angle on the pattern or use a disc sander to sand the angle onto the pieces. Center the top edge of each roof piece on the support as you glue and clamp it in place.

Step 4: Make the animals. Cut the animals from basswood or your choice of wood. I cut the giraffes from maple and used walnut for the spots. You could also paint the spots. I cut each of the animals into segments, but you could cut them from a solid piece of wood and paint the details onto them. Hand-sand all of the edges of the pieces. Wrap sandpaper around a dowel or a pencil to get into the tight areas, such as the lion's mane. Add texture to the lion's mane using the folded corner of a piece of sandpaper.

Step 5: Finish cutting the pieces. Cut the dove's branch and Noah's staff from wood or fashion them from a piece of wire. Pay attention to the grain direction of the maple you use for the wave. Be careful not to break any parts of the waves as you round the edges. Cut the frame pieces and backing board to size (see Note, Step 7, before cutting backing board).

FINISHING THE PROJECT

Step 6: Paint the pieces. Use the colors listed in the paint chart or create your own paint scheme. Allow the paint to dry thoroughly. Use masking tape to protect the joint areas and the areas where the intarsia attaches to the backing board, and paint the frame and backing board.

Step 7: Assemble the project. Use the pattern as a guide to glue the elements of the ark to the backing board. Then, attach the intarsia elements to the ark. Finally, attach the waves to the hull of the ark and attach the dove and branch to the backing board. Apply glue to the mitered ends of the frames, clamp them in place, and drive brads or small nails into the joints. Glue the backing board to the inside edges of the frame. *Note: For more durability, cut the backing board oversized and screw and glue the frame to the backing board.* Apply a little wood putty to the joint and touch up the paint. Attach the screw eyes and hanging wire to the back.

Painting Chart

Dove: white, yellow

Penguins: black, white, orange

Geese: white, DC straw

Snakes: DA light avocado

Elephants: DA slate grey

Lions: basecoat – DC empire gold; highlights – DA honey brown

Noah: white, flesh, DA Wedgewood blue

Wave: bottom half – DC ocean reef blue; top half – DA baby blue; highlights – white

Frame: DC midnight blue

Backing board: DA baby blue

Legend

DC= Delta Ceramcoat

DA= DecoArt Americana

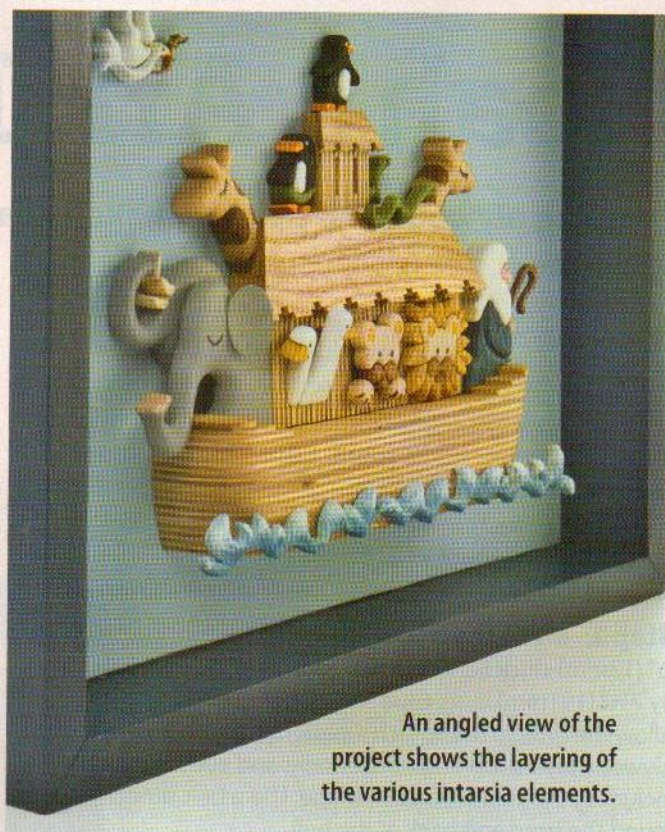
Materials:

- Baltic birch plywood, ½" (13mm) thick: boat, 7½" x 10" (191mm x 254mm)
- Baltic birch plywood, ¼" (6mm) thick: backing board, 10" x 13½" (254mm x 343mm)
- Oak, ⅛" (3mm) thick: roof, 1½" x 7½" (38mm x 191mm)
- Oak, 1" (25mm) thick: large roof support, 1½" x 4¼" (38mm x 108mm)
- Oak, ½" (13mm) thick: small roof support, ½" x 1" (13mm x 25mm)
- Basswood, ¼" (6mm) thick: dove, penguins, snakes, geese, lion, lioness, 4" x 6" (102mm x 152mm)
- Basswood, ½" (13mm) thick: Noah, 1½" x 2¼" (38mm x 57mm)
- Maple, ¼" (6mm) thick: waves, 1" x 9" (25mm x 229mm)
- Maple, ½" (13mm) thick: giraffes, 1½" x 4" (38mm x 102mm)
- Walnut, ½" (13mm) thick: giraffes, 2" x 2" (51mm x 51mm)
- Pine, ¾" (19mm) thick: short frame sides, 2 each 2¼" x 11½" (57mm x 292mm); long frame sides, 2 each 2¼" x 15" (57mm x 381mm)
- Acrylic paints: white, yellow, black, orange, flesh; Delta Ceramcoat: straw, empire gold, ocean reef blue, midnight blue; DecoArt Americana: light avocado, slate grey, honey brown, Wedgewood blue, baby blue
- Wood glue
- Sandpaper

Tools:

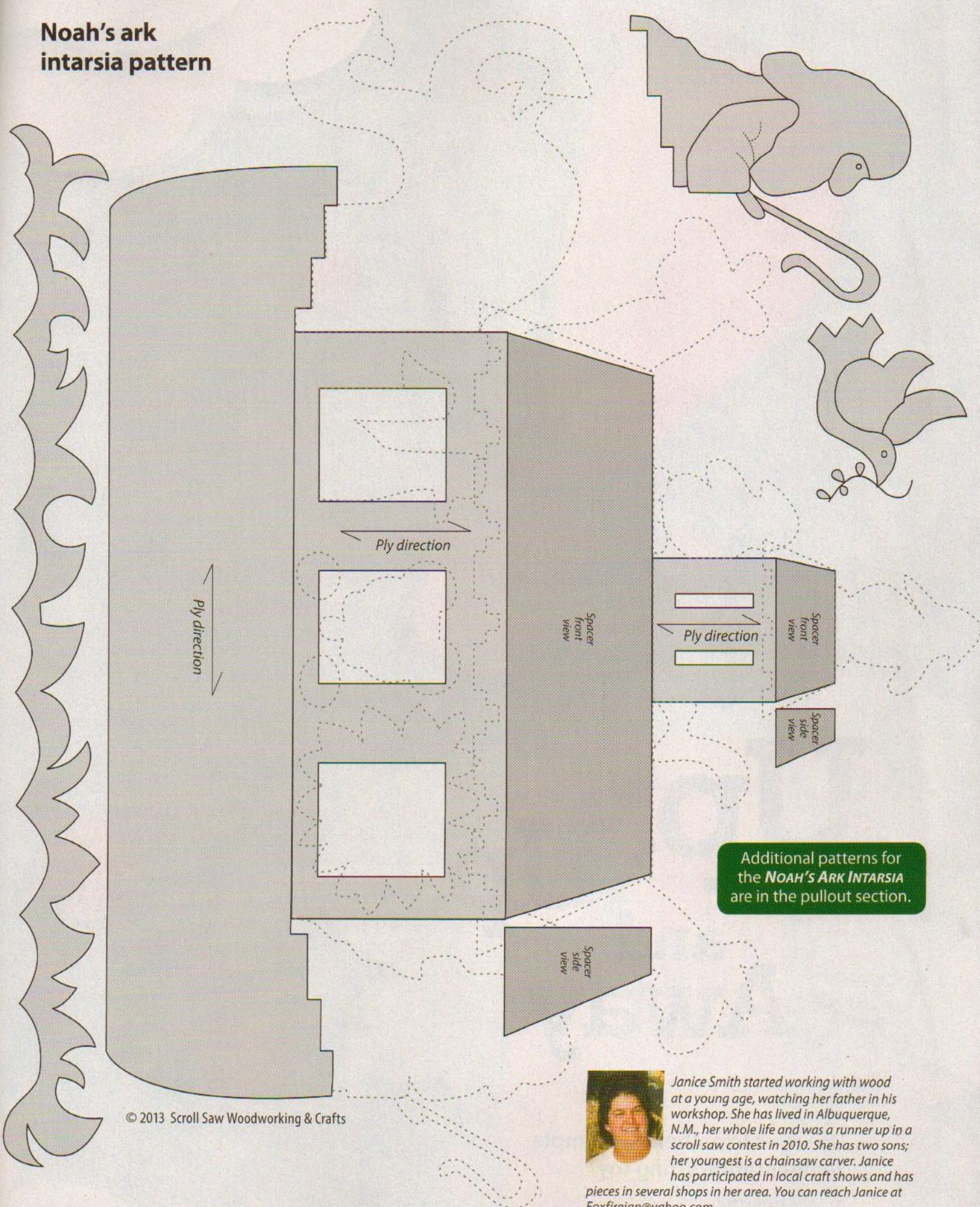
- Table saw or disc sander (optional to make miters)
- Blades: #5 reverse-tooth
- Belt sander
- Paintbrushes
- Clamps
- Drill with bits: ⅛" (2mm)
- Sanding sticks

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.



An angled view of the project shows the layering of the various intarsia elements.

Noah's ark intarsia pattern

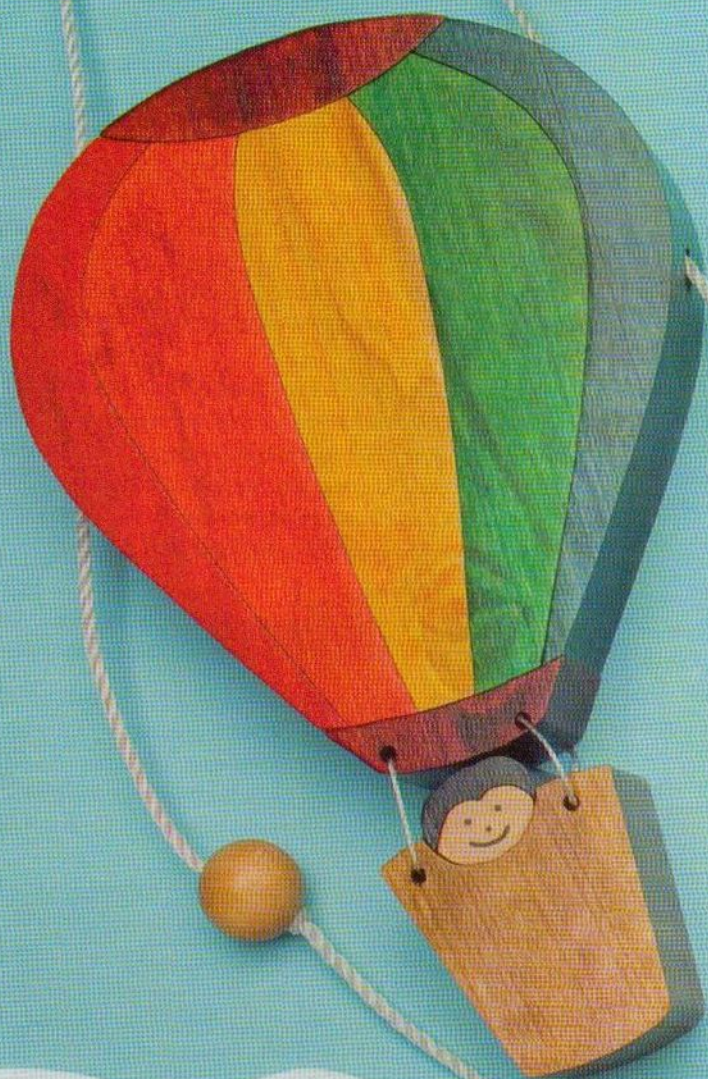


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Additional patterns for
the **NOAH'S ARK INTARSIA**
are in the pullout section.



Janice Smith started working with wood at a young age, watching her father in his workshop. She has lived in Albuquerque, N.M., her whole life and was a runner up in a scroll saw contest in 2010. She has two sons; her youngest is a chainsaw carver. Janice has participated in local craft shows and has pieces in several shops in her area. You can reach Janice at Foxfirejan@yahoo.com.



Up, Up, and Away

Use dyes to embellish a simple
segmentation string toy

By Dale Helgersen

This simple toy is fun to play with and usually amazes kids. Pull down on one string and then the other to make the hot air balloon climb the strings. When you stop pulling the strings, the balloon descends.

Making the Toy

Start by attaching the patterns to the wood (see page 78 for instructions). Use a square to transfer the dashed lines across the top edge of the balloon blank and mark the center on the edge. Use a nail or awl to create a dimple for the drill bit. Because these holes are at an angle, I recommend cutting the wood off the bottom portion of the blank on the dotted lines before drilling. Using a drill press and a $\frac{7}{64}$ " (2.75mm)-diameter bit, drill the angled holes deep enough to get beyond the pattern; you do not need to drill all the way through the blank. Next, drill the two holes in the lower part of the balloon and in the basket as noted on the pattern.

You can use a piece of wood or a dowel for the hanger piece. Drill the $\frac{7}{64}$ " (2.75mm)-diameter holes as indicated on the pattern. Then, drill $\frac{7}{64}$ " (2.75mm)-diameter holes through the centers of the four wooden balls.

Cut the balloon and basket following the lines on the pattern. You can either cut around the perimeter of the pattern and paint your own design, or cut the balloon and basket into pieces and use dyes, stains, or paints to color the toy before gluing the pieces back together using wood glue. I add details to the boy's face using a fine-tip permanent marker. Apply a few coats of a clear finish to all parts, including the four wooden balls and hanger piece.

Assembling the Project

Connect the basket to the balloon using two pieces of nylon mason's twine. Position the basket 1" (25mm) below the balloon. Feed the strings through the holes and tie the ends together.

Cut a piece of the twine about 9' (3,660mm) long. Fold it in half and push the center through the center hole in the hanger. Tie an overhand knot in the looped twine to create a fixed loop; the knot will keep the loop from pulling through the hole. Feed the ends of the twine through the outer holes on the hanger—one on each side—so they hang down opposite the loop. Push the ends of the twine through the long angled holes in the balloon. Slide one $\frac{1}{2}$ " (13mm)-diameter wooden ball onto each end of the twine and tie a knot to hold the ball about 8" (203mm) from the end of the string. Slide one $\frac{3}{4}$ " (19mm)-diameter ball on each string and tie a knot at the end of each string.

Hang the toy by the loop and gently tug back and forth on the two $\frac{3}{4}$ " (19mm)-diameter balls. Watch the balloon soar up, up, and away!

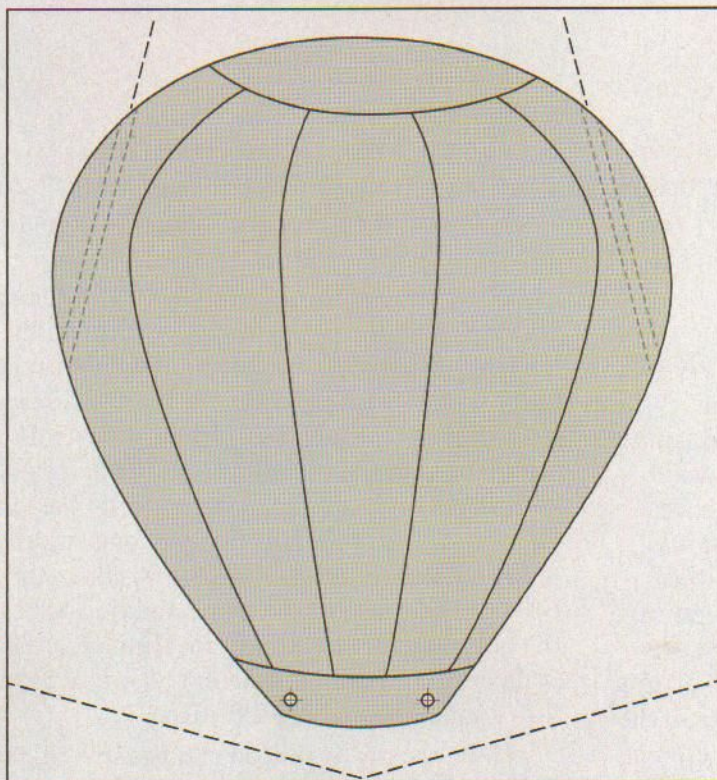


Tug back and forth on the cords to make the balloon rise. Stop pulling and the balloon slides to the bottom.

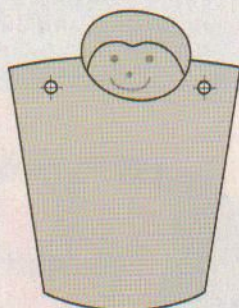
Balloon toy pattern



Hanger



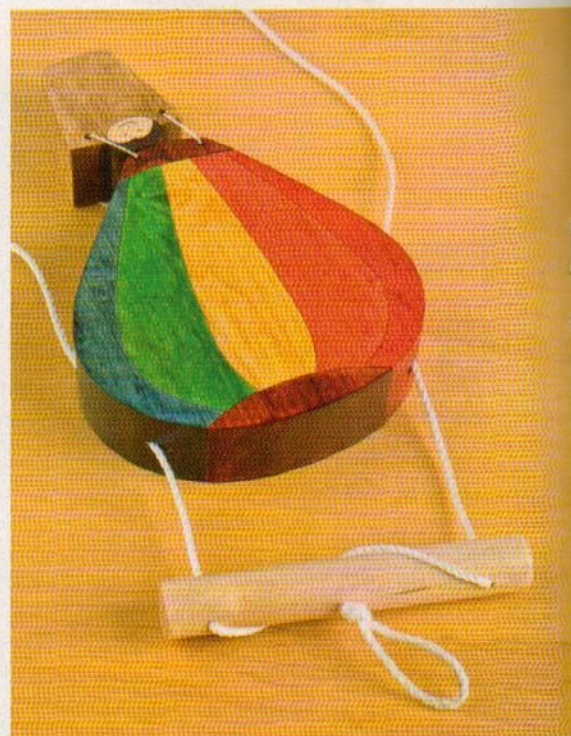
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TIP

FEEDING THE TWINE THROUGH THE HOLES

To make it easier to feed the twine through the holes, feed a small piece of fishing line through the hole and then back through the hole to create a loop. Place the twine inside the loop, grab the ends of the fishing line, and pull the twine through the hole. If your twine frays on the ends, carefully melt the ends with a lighter.



Thread the string through the hanger and then through the angled cuts in the balloon.

Materials & Tools

Materials:

- Light-colored hardwood, such as maple, $\frac{1}{2}$ " to $\frac{3}{4}$ " (13mm to 19mm) thick: balloon, 4" x 4" (102mm x 102mm); basket, $1\frac{1}{2}$ " x 2" (38mm x 51mm); hanger (optional), $\frac{1}{2}$ " (13mm) or $\frac{3}{4}$ " (19mm) x 3" (76mm)
- Hardwood dowel, $\frac{1}{2}$ " to $\frac{3}{4}$ " (13mm to 19mm) diameter: hanger (optional), 3" (76mm) long
- Wooden balls: 2 each $\frac{3}{4}$ " (19mm) diameter; 2 each $\frac{1}{2}$ " (13mm) diameter

- Nylon mason line twine: 10' (3,665mm)
- Sandpaper
- Wood glue, such as Titebond II
- Finish: dyes, paints, or stains; clear finish

Tools:

- Blades, such as FD-TC: #3 two-way cut
- Drill press with bits: $\frac{7}{64}$ " (2.75mm) diameter
- Clamps
- Square

The author used these products for the project.
Substitute your choice of brands, tools, and materials as desired.



Dale Helgerson is a woodworking leader for the 4-H club in his hometown of Kansasville, Wis. Contact him at luckyscroller788@yahoo.com.

Celtic Knot Projects



Combine scrolling and carving to create a woven look in wood

By Dan Bowe

Celtic designs cut and carved from wood intrigue me. After much experimentation, piles of sawdust, and raw fingernails, I am closer to what I had in mind. These trivets are attractive projects on their own, and they are a great way to master the process before making a hanging wall clock.

In this project I used ½"-thick walnut, but you can adjust the designs to fit the stock you have. Butternut, or white walnut, is another good choice for these projects because it is soft and easy to carve and has a beautiful pronounced grain.

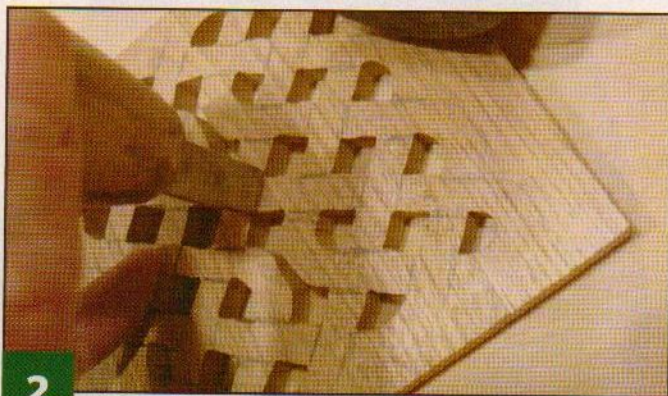


CELTIC KNOTWORK: CUTTING A TRIVET



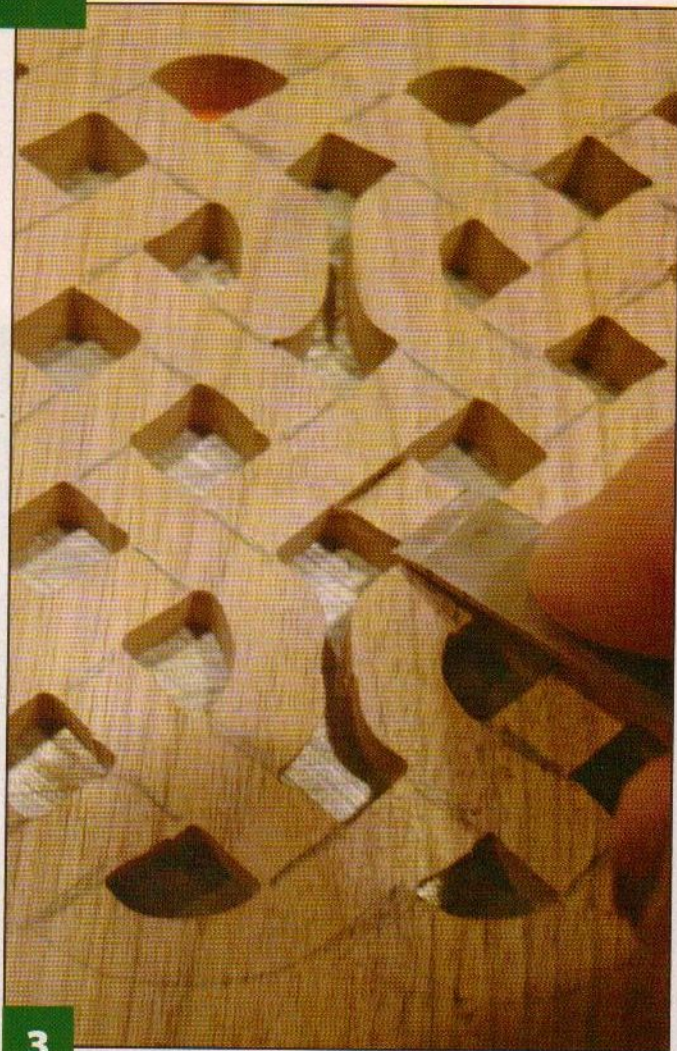
1

Cutting the frets. Cut the blank to rough size. Attach the pattern to the blank; I used double-sided carpet tape. Drill $\frac{1}{16}$ " (2mm)-diameter blade-entry holes. Insert a #3 or #5 blade through the blade-entry holes and cut the frets. Try to make the corners as sharp and distinct as possible. You can cut the perimeter now or wait until you've carved the design.



2

Carving the pieces. Carefully peel back the double-sided tape and pattern, and use a pencil to draw the carving lines onto the blank. Place a flat chisel on one of the pattern lines and tap it a few times with a mallet to form a vertical cut approximately $\frac{1}{4}$ " (6mm) deep, called a stop cut. Make stop cuts on all of the carving lines.



3

Carve up to the stop cuts. Position the same chisel a small distance from a stop cut and carve diagonally down toward the stop cut. The cut should be about $\frac{1}{4}$ " (6mm) deep at the stop cut. This will create a rough pattern of woven wood.



4

Round the sections. Use a sanding stick or a large sanding drum equipped with a 120-grit paper to remove the sharp edge of each section. Switch to a 220-grit sleeve to smooth the wood and create an even curve from one stop cut to the next. Use a smaller sanding drum with a 220-grit sleeve to refine the tight areas. Buff the piece with a mop sander and then coat it with finish, such as clear lacquer.



Making Your Own Tools

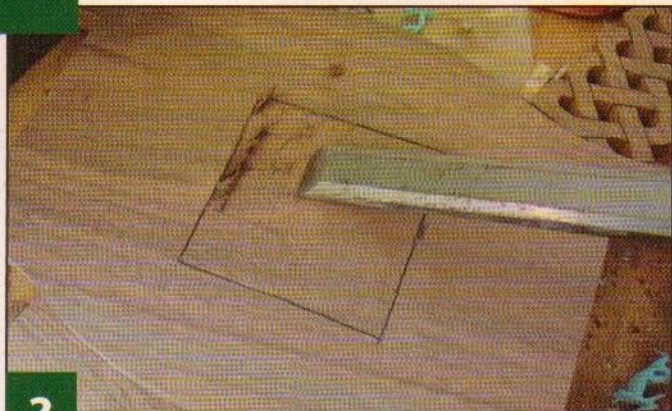
You can use the carving tools of your choice. I created my own chisel-like knife from a reciprocating saw blade. These blades hold an edge well. Make sure that the steel goes all the way through the handle to the top so the mallet does not put pressure on the handle. Then, glue a handle to each side of the blade as shown.

CELTIC KNOTWORK: MAKING A WALL CLOCK



1

Make the watchband. After making a trivet, you should have the skills needed to create the band of the wall clock. Use the process explained in Steps 1 through 4 of the trivet instructions (page 42) to cut and shape the watchband pieces. Shape the edges with a drum sander.



2

Shape the back of the clock. Draw a 2½" by 2½" (64mm by 64mm) square in the center back of the clock face. Use a straight chisel to carve down ¼" (6mm) inside this square to accommodate the clock movement.



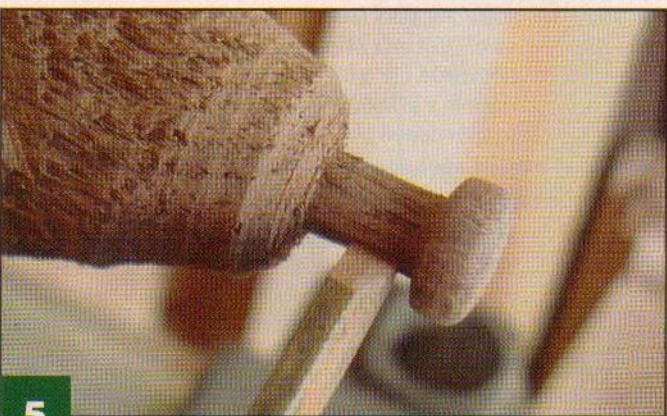
3

Refine the clock face. Sand down the four tails where the watchband attaches. Create a small curve with no sharp edges. Drill a hole in the middle of the clock face for the clock movement. Sand the face smooth, and then drill pilot holes at 3, 6, 9, and 12 o'clock. Drive small brass brads with round heads into the holes.



4

Cut the circle piece. Transfer the lines to the blank and cut the circle. Sand it smooth. Round the top outside edge and the inside edges with a router and a ¼" (6mm)-radius round-over bit. Use a ⅛" (3mm)-radius round-over bit for the inside bottom edges. Sand the edges smooth and glue the circle onto the watch face.



5

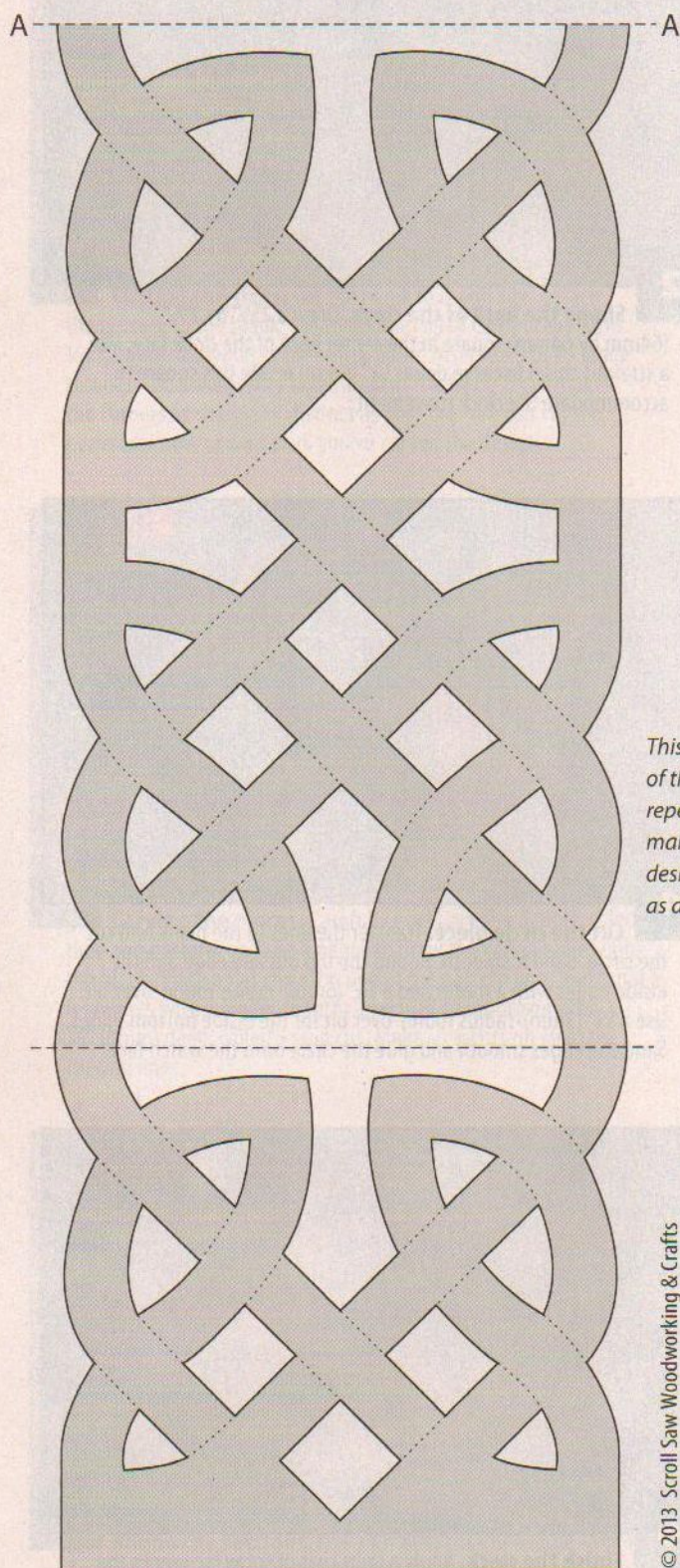
Make the watch stem. I turned the stem on a lathe, but you can carve one or fashion one from two dowels. Drill a hole in one side of the clock body and glue the stem in place.



6

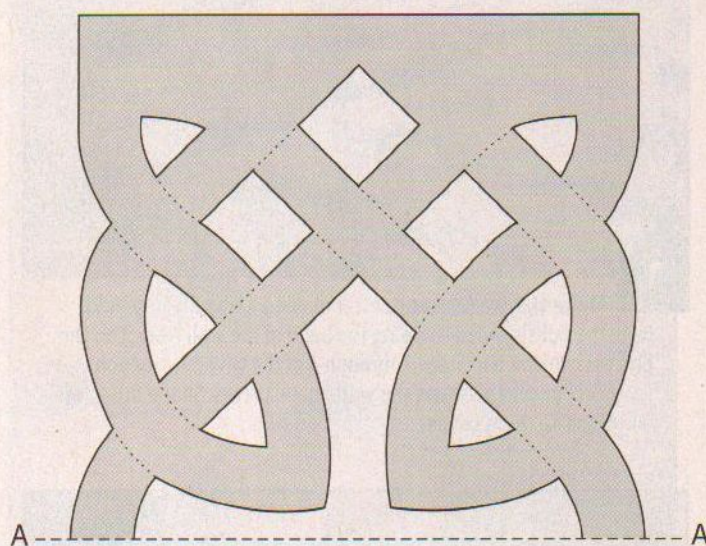
Finish the clock. Apply a light coat of spray lacquer to the watchband and sand it lightly with 0000 steel wool. Apply a heavier coat of lacquer to the body of the clock and buff it with steel wool. Drill a hole through each of the four tails into the watchband and use brads to attach the band to the tails. Install the clock movement.

Celtic watch clock patterns



*This section
of the pattern
repeats to
make the
design as long
as desired.*

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Materials & Tools

Materials:

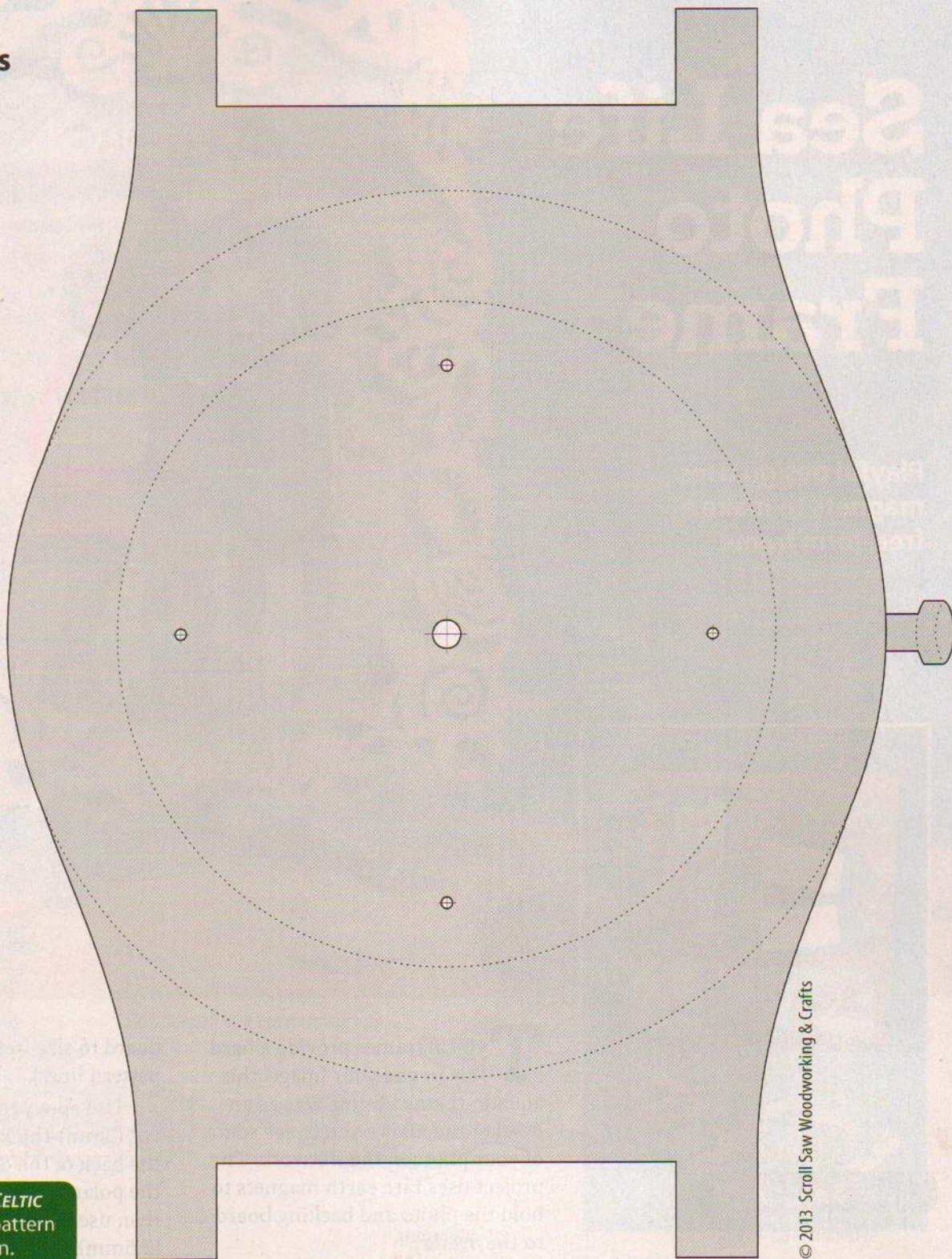
- Walnut: ½" (13mm) thick: trivet, 3¾" x 3¾" (95mm x 95mm); wristbands, 2 each 3½" x 12" (89mm x 305mm); clock face, 6½" x 9½" (165mm x 241mm); clock circle, 6½" x 6½" (165mm x 165mm); stem, scrap or dowels
- Clock mechanism
- Brass round head brads: 4 each cut to ¾" (10mm) long
- Wire brads: 4 each, 1" (25mm) long
- Wood glue
- Sandpaper
- Steel wool: 0000 grit
- Clear finish, such as lacquer

Tools:

- Blades, such as Flying Dutchman Ultra Reverse: #3 or #5 reverse-tooth
- Chisel
- Sanding stick with 120-grit and 220-grit bands
- Rotary carver with large and small sanding drums and 120- and 220-grit belts
- Drill and assorted bits sized to fit clock movement, brads, and watch stem
- Mop sander
- Router with bits: ¼" (6mm)-radius round over; ⅛" (3mm)-radius round-over
- Hammer
- Lathe with chisels and gouges (optional)

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

Celtic watch clock patterns



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Patterns for the **CELTIC TRIVETS** are in the pattern pullout section.

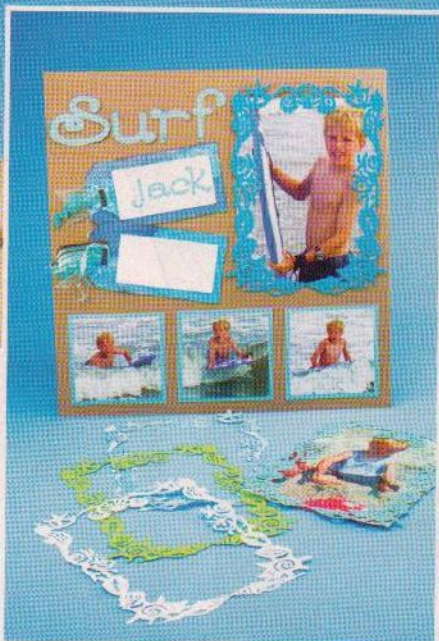


Dan Bowe lives in Rogers, Ark. He inherited his dad's love of working with wood. To see more of Dan's work, search for *twistedcandlesticks* or *Dan Bowe* at www.etsy.com.

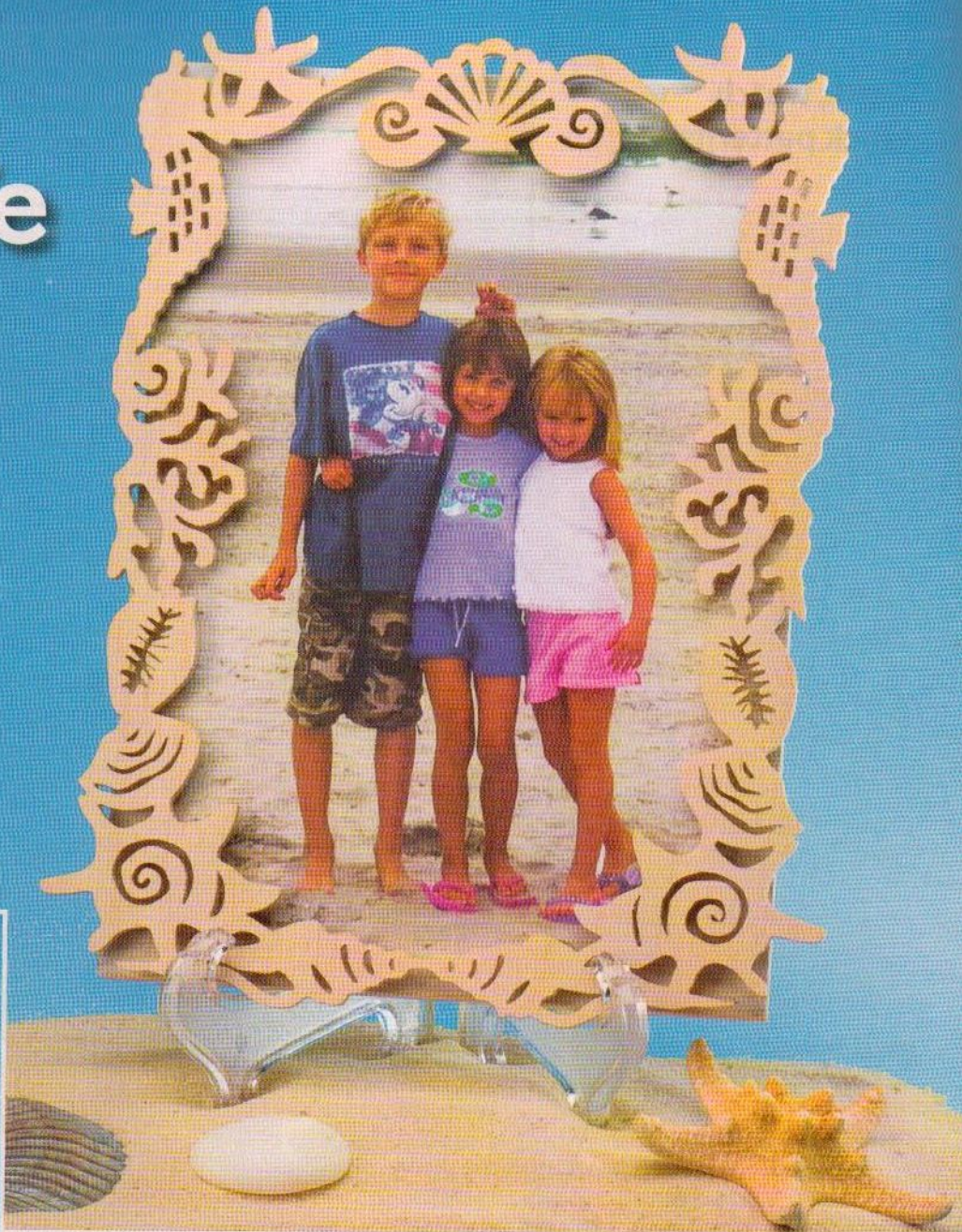
Sea Life Photo Frame

Playful design uses magnets to make a free-form frame

By Alison Tanner
Cut by Leldon Maxcy



For a different look, sandwich a few sheets of paper or cardstock between Baltic birch plywood and cut the stack. Use the cut paper frames as scrapbooking embellishments.



Typical frames provide a hard line to end your image; this aquatic-themed frame acts as an overlay and allows you to see some of your photo in the fretwork. The project uses rare earth magnets to hold the photo and backing board to the overlay.

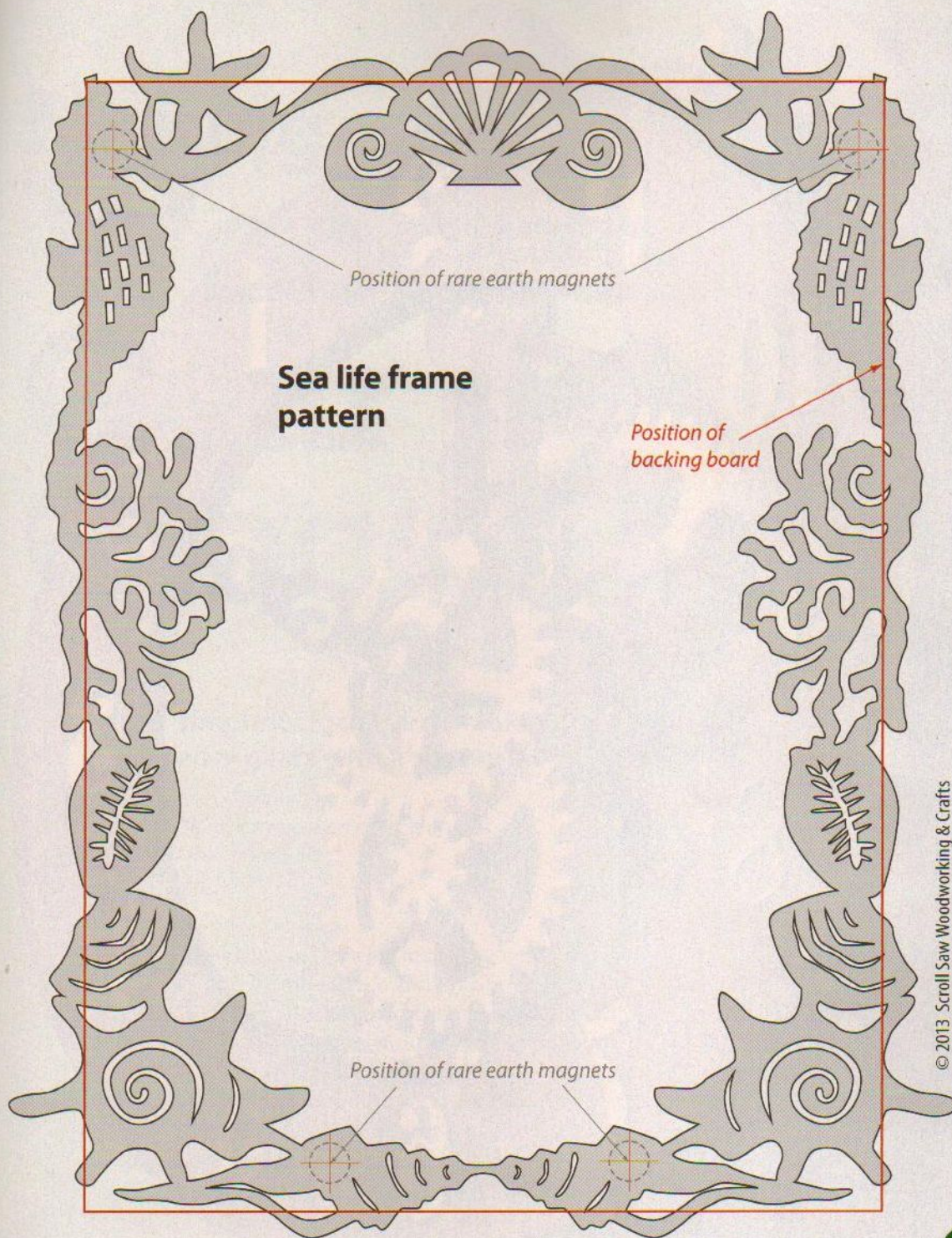
Making the Frame

Drill blade-entry holes as needed and cut the overlay from $\frac{1}{8}$ " (3mm)-thick Baltic birch plywood. Drill $\frac{1}{4}$ " (6mm)-diameter holes for the magnets in the $\frac{1}{4}$ " (6mm)-thick Baltic birch plywood backing board before cutting the backing

board to size (refer to the red pattern lines).

Use epoxy to attach the $\frac{1}{16}$ " (2mm)-thick magnets to the back of the overlay. Check the polarity of the magnets and then use epoxy to attach the $\frac{3}{32}$ " (2.5mm)-thick magnets in the holes in the backing board. Finish the frame as desired.

Use double-sided tape or another adhesive to attach the photo to the backing board. The magnets should be strong enough to attach to each other through the photo. Use a mini easel to display the photo frame.



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Alison Tanner began cutting paper at the age of 8, inspired by a visit to the home of fairy-tale writer Hans Christian Andersen in Denmark. Alison is the owner/creator of Papercuttings by Alison, which carries the largest variety of patterns and supplies for the scissorist. For more of her work, visit www.papercuttingsbyalison.com.

Materials & Tools

Materials:

- Baltic birch plywood, $\frac{1}{8}$ " (3mm) thick: overlay, $6\frac{1}{2}$ " x 8" (165mm x 203mm)
- Baltic birch plywood, $\frac{1}{4}$ " (6mm) thick: backing board, 5" x 7" (127mm x 178mm)
- Sandpaper
- Rare earth magnets, $\frac{1}{4}$ " (6mm) diameter: 4 each $\frac{1}{16}$ " (2mm) thick and 4 each $\frac{3}{32}$ " (2.5mm) thick
- 5-minute epoxy

- Double-sided adhesive
- Mini easel

Tools:

- Blades: #1 reverse-tooth
- Drill with bits: $\frac{1}{16}$ " (2mm)-diameter twist, $\frac{1}{4}$ " (6mm)-diameter Forstner

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.



Making a Wooden Gear Clock

Our simplest clock ever—make quick and easy gears with a shopmade jig

Designed by Brian Law

Instructions, cutting, and cutting photos

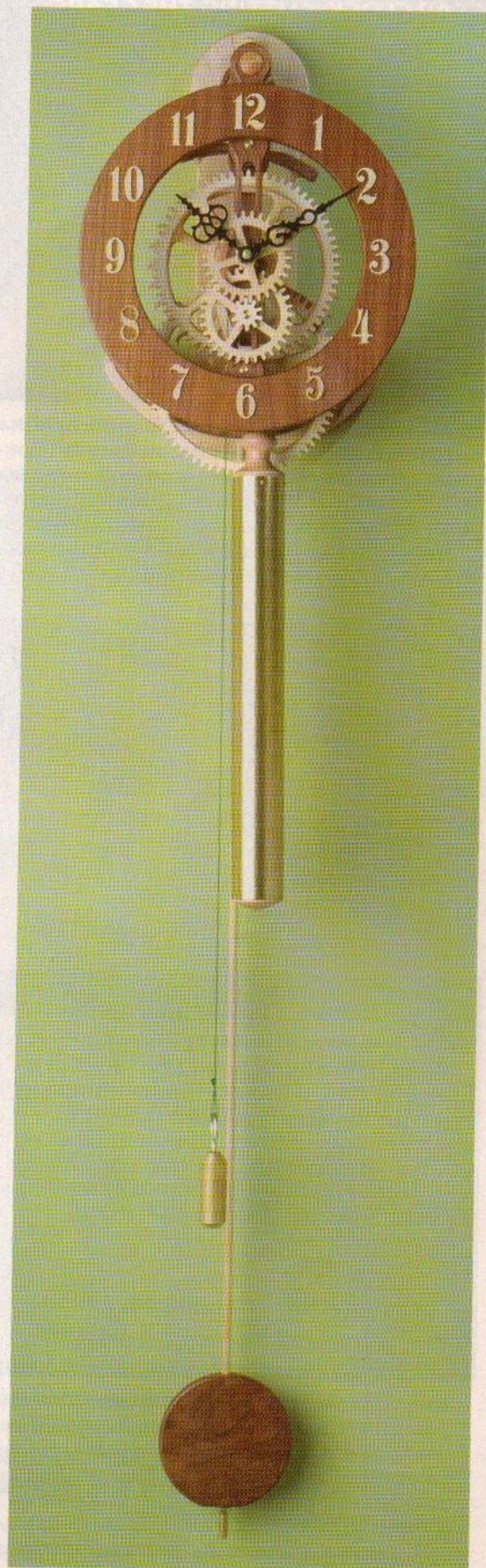
by Rolf Beuttenmuller

Assembly photos by Scott Kriner

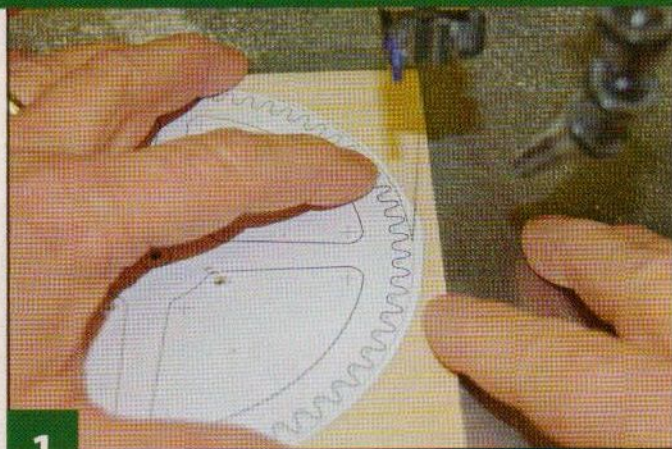
Wooden gear clocks, including some of mine, can be quite large and take up a lot of wall space. I specifically designed this clock to be compact; if you don't count the pendulum and weights, this clock is not much bigger than a dictionary. Making the clock small did require me to sacrifice the second hand, but I think the working action of the gears keeps things interesting even without it.

Many of the pieces are simple shapes that are easy to cut with a scroll saw. I won't go into detail on cutting those pieces. Instead, I'll focus on the more difficult-to-cut pieces and give a few tips to make cutting them easier.

Start by attaching the patterns to the blanks. Drill the holes for the front and back frame shaft and spacer hole. These are critical holes. Drill one axle hole, put a pin in it, clamp the frame together, and then drill the second hole. Put a pin in the second hole, and drill the last hole. The alignment of the frame spacer and support pins is also critical. If the alignment is off, the shafts will bind.

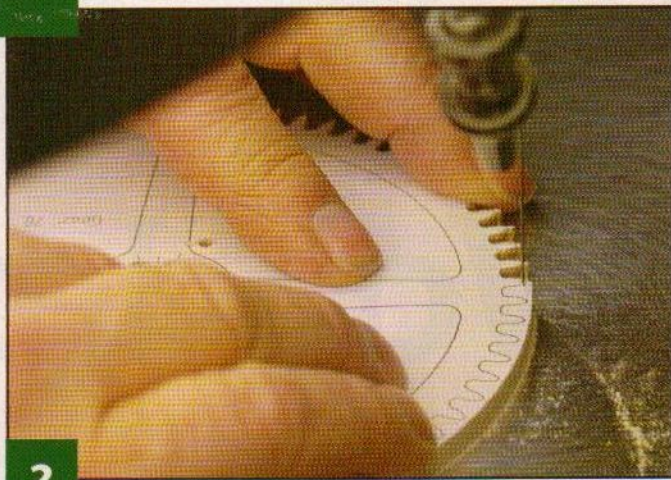


GEAR CLOCK: CUTTING THE GEARS



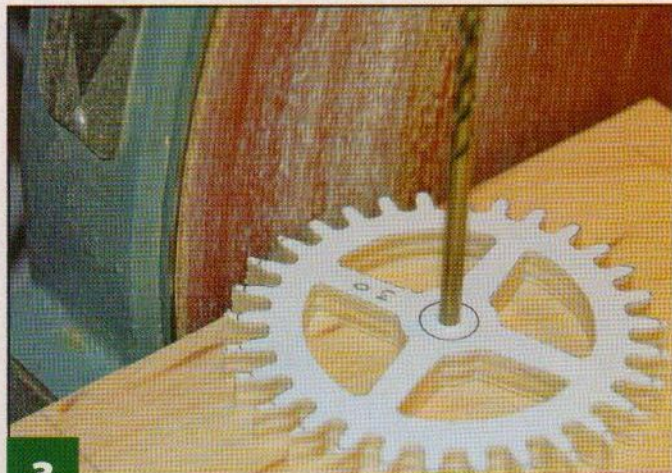
1

Prepare to cut the gears. Use spray adhesive to attach the patterns to removable contact paper; use the contact paper to attach the patterns to the blanks. With a center punch, make a dimple in the center of each hole. Use a compass to draw a line $\frac{1}{8}$ " (3mm) outside the gear teeth for each gear. Use a scroll saw and #2/0 reverse-tooth blades to cut along this line. Drill $\frac{1}{16}$ " (2mm)-diameter blade-entry holes to cut the open spaces inside the gears.



2

Cut the teeth. Cut the valleys between the teeth, but leave the wood at the tips of the teeth out to the original cutting line. We will sand off the extra wood later to produce clean teeth and perfectly round gears. Cut the open spaces inside the gears, and then drill a $\frac{1}{4}$ " (6mm)-diameter hole in the center of each gear. *Note: You will drill the larger center holes marked on the patterns after sanding the gears.*



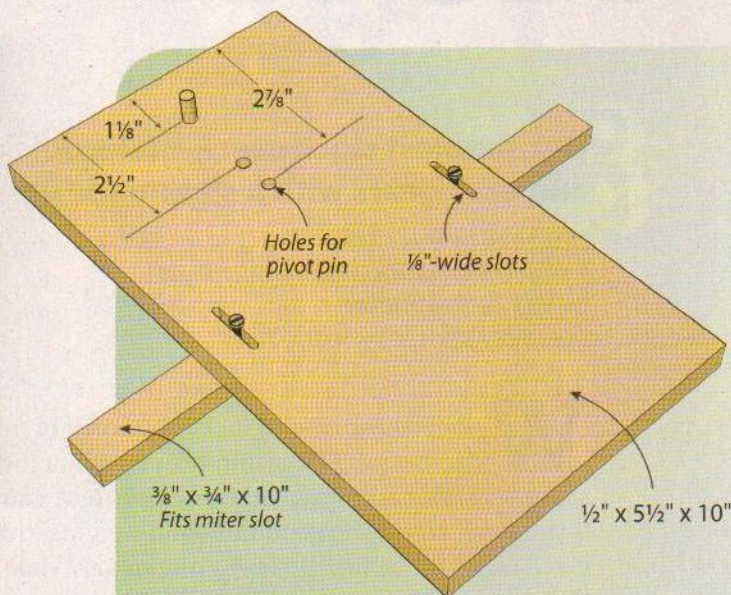
3

Sand the gears round. Use the drawing at right as a guide to make an adjustable jig to fit on a disc sander. I use a $\frac{1}{4}$ " (6mm)-diameter drill bit as the pivot pin the gear rotates on. Set the jig so the gear barely touches the sander, turn on the sander, and use the screws and slots to carefully adjust the jig to sand up to the line at the tips of the teeth. Slowly rotate the gear to sand all of the tips off at the pattern line. Repeat for the remaining gears. Drill the center holes as marked on the patterns.

TIP

USE FRESH BLADES

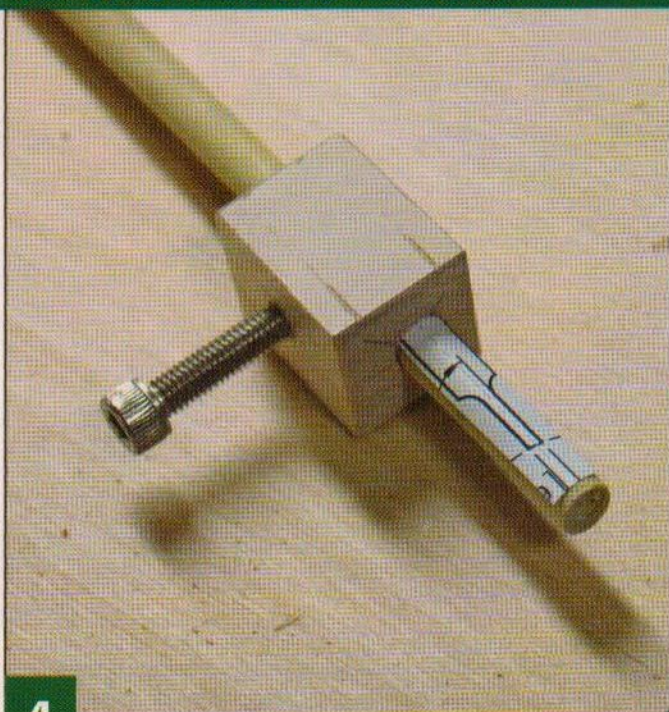
I cut the gears from $\frac{1}{4}$ " (6mm)-thick Baltic birch plywood that is good on both sides. I used Olson #2/0 reverse-tooth blades, and I changed blades every 15 minutes because the plywood is tough on blades. I wanted the maximum precision in my cuts without pushing the blade, which would cause deflection and angled cuts.



Sanding Jig

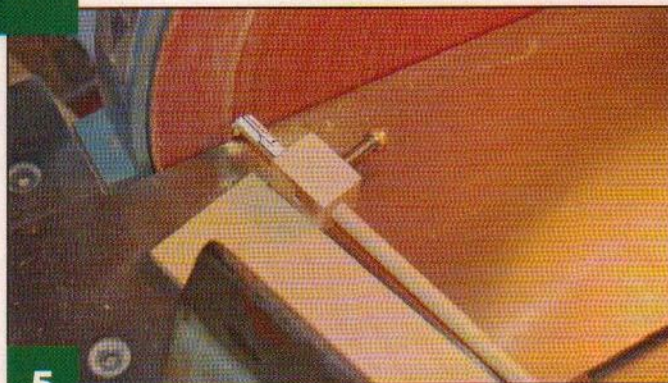
I used basic hardware and scrap plywood to make an adjustable jig to sand the gears perfectly round. Cut a strip of $\frac{3}{8}$ " (10mm)-thick wood to fit the miter slot on a disc sander; sand the strip smooth. Cut the plywood to size (see the drawing), and cut two $\frac{1}{8}$ " (3mm)-wide by $1\frac{1}{2}$ " (38mm)-long slots in the center of the plywood $\frac{1}{2}$ " (13mm) in from each edge. Then, drill three $\frac{1}{4}$ " (6mm)-diameter holes for the pivot pins, using the drawing as a guide. See Step 3 for instructions to use the jig.

GEAR CLOCK: SHAPING THE PALLET PINS



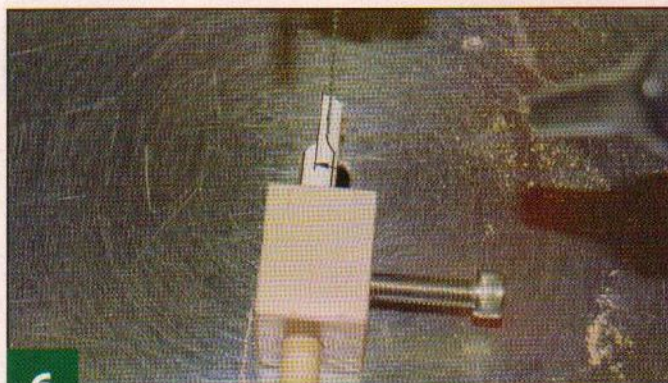
4

Prepare to shape the pallet pins. Chuck a 2" (51mm) long by 1/4" (6mm)-diameter dowel in a drill press and round one end. Sand a flat spot on one side about 1" (25mm) from the non-rounded end. Make a jig by drilling a 1/4" (6mm)-diameter hole through a rectangular piece of scrap. Drill an intersecting perpendicular hole just smaller than the diameter of any machine screw in your shop. Push the dowel into the large hole, and thread the screw into the perpendicular hole. Tighten the screw against the flat part of the dowel to hold the dowel in place. Attach the pattern for the pallet to the end of the dowel. Repeat for the second dowel.



5

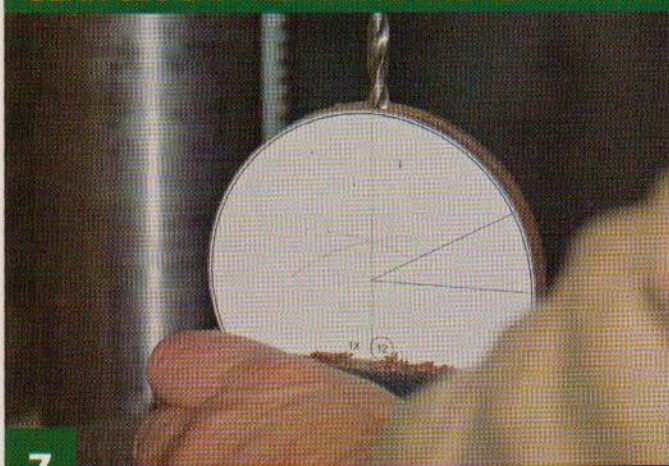
Angle the ends of the pallets. *Note: The left and right pallets have different angles on their ends. Use the pattern as a guide to clamp a scrap of wood to a sanding disc table. Sand the angle onto the end of the pallet pin. Repeat for the second pin.*



6

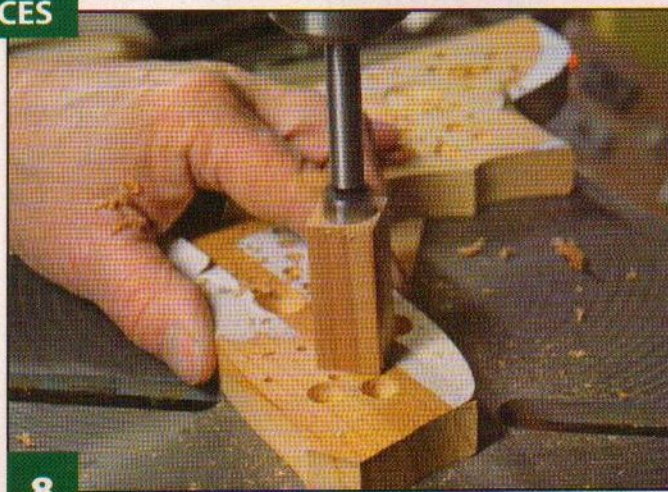
Finish shaping the pallet pins. Cut the sides of each pallet pin using a #3 reverse-tooth blade. The jigs make it easy to hold the dowels flat on the scroll saw table.

GEAR CLOCK: PREPARING THE REMAINING PIECES



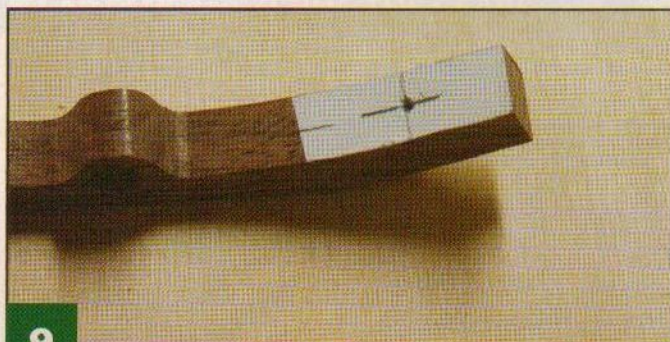
7

Make the pendulum bob. Cut the outline of the pendulum bob with a #3 blade, such as an Olson PGT. Cut outside of the line on the flat bottom and sand up to the line. Transfer the vertical centerline to the top and bottom of the blank and use a punch to mark the center. Clamp the bob in a vise and use a 1/4" (6mm)-diameter brad-point bit in a drill press to drill holes vertically from the top and bottom through the bob.



8

Make the spacers. Cut the pieces for the spacers to size, and then use a 1/2" (13mm)-diameter Forstner bit to drill a 1/2" (13mm)-deep hole in one end. Glue a 1" (25mm) length of 1/2" (13mm)-diameter dowel into the hole. Drill a 1/2" (13mm)-diameter hole in a scrap of wood and insert the dowel pin, and then drill a 5/8" (16mm)-diameter by 1/2" (13mm)-deep hole in the other end of the spacer to accommodate the back supports and the pendulum support.



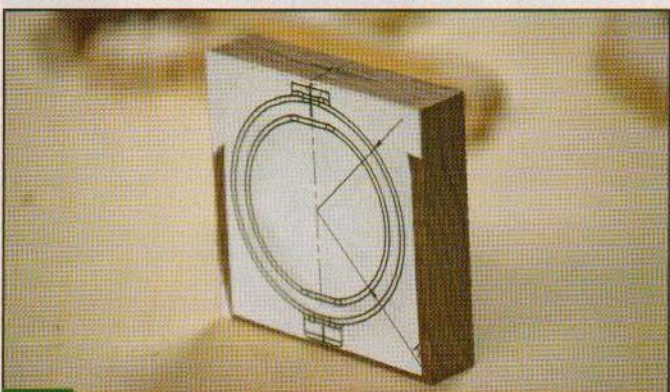
9

Make the escapement. Transfer the pattern to the blank and cut it. Attach the drilling patterns to the bottom edge and use a center punch to mark the center of each hole. Test several bits in a piece of scrap wood to determine which size hole will hold the pallets snugly. A snug hole eliminates the need for screws to hold the pallets in place. Then, drill the pallet holes in the escapement.



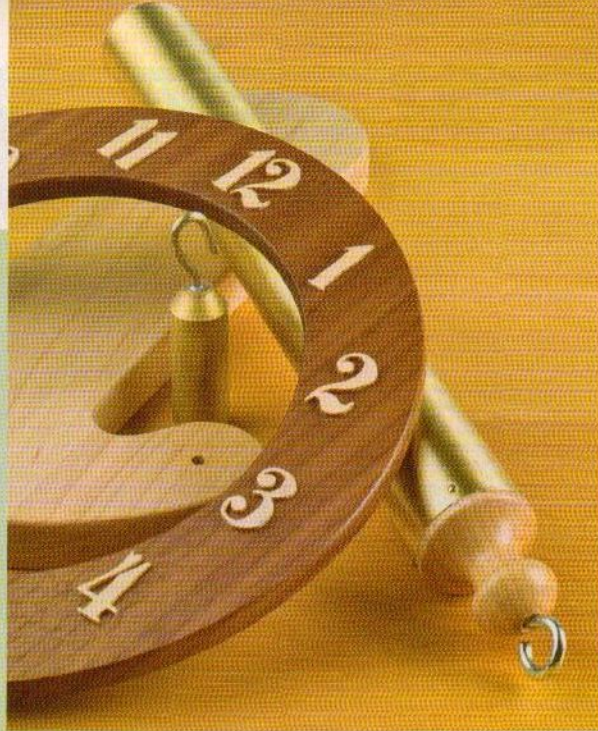
10

Make the bottom of the pendulum. While it's possible to thread a $\frac{1}{4}$ " (6mm)-diameter nut onto the bottom of the pendulum to hold the bob in place, I added a brass screw. Cut the dowel to length, and then cut the head off of a brass machine screw. Clamp the screw in a vise and drill a $\frac{3}{16}$ " (5mm)-diameter by $\frac{3}{4}$ " (19mm)-deep hole down the center of the screw. Sand the end of the pendulum dowel to fit in the hole and use cyanoacrylate (CA) glue to lock it in place.



11

Cut the pendulum head. Cut a square of wood and draw a vertical centerline down one face. Attach the pattern to the blank, aligning the centerline on the pattern with the line on the blank. Extend the centerline across the top and bottom. Clamp the block in a vise and drill $\frac{1}{4}$ " (6mm)-diameter holes in the top and bottom. Drill a blade-entry hole and cut the inside and outside of the head. Round the edges. Then, make the pendulum pivot. You can use the pattern to angle a simple $\frac{1}{4}$ " (6mm)-diameter dowel or turn a more elaborate pivot from a $\frac{3}{8}$ " (10mm)-diameter dowel on a lathe.



GEAR CLOCK: FINISH CUTTING THE CLOCK

12

Cut the clock face. Attach the pattern for the clock face to the blank and use a center punch to mark the two holes. Drill the holes half-way through the back of the clock face. Be precise when drilling the holes to make sure the face fits on the front frame. Then, cut the numbers from a contrasting piece of wood. *Note: If you use light-colored wood for the clock face, you could woodburn the numbers onto the face.* Glue the numbers in place using the pattern as a guide.

13

Make the weights. For the pull-cord weight, cut a section of $\frac{3}{4}$ " (19mm)-diameter brass rod that, combined with the screw hook, weighs 3.5oz (100g). *Note: The rod will be approximately 2½" (64mm) long.* Drill a hole in the top of the rod, taper the ends, polish the brass, and solder a screw eye into the hole. For the clock weight, cut a length of brass pipe and fashion wooden plugs for both ends. Put the plugs, pipe, a screw eye, and two small brass eustachian pins on a scale and add lead shot until it reaches almost 9 lbs (4kg). Place a plug in one end of the pipe. Drill a hole through the pipe and into the plug, and use an eustachian pin to lock the plug in place. Fill the pipe with the lead shot and use a hole and pin to lock the other plug in place. Add the screw eye to the top plug.

14

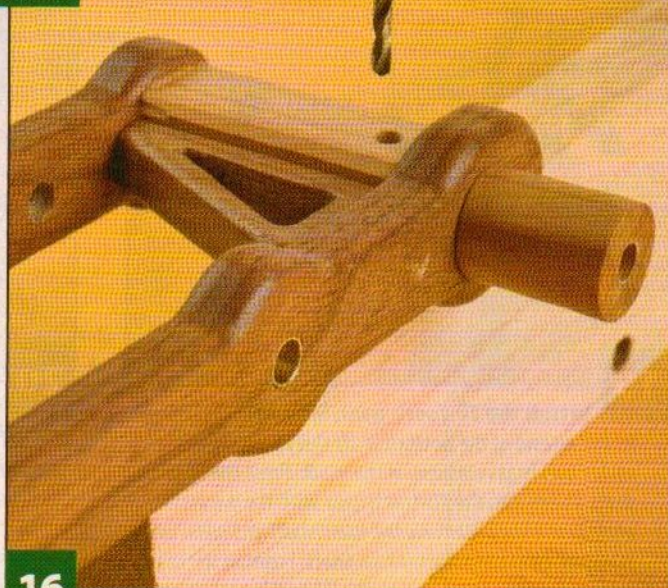
Finish the wooden pieces. Cut any remaining wooden pieces. Sand all of the pieces. Use a router with a $\frac{1}{8}$ " (3mm)-radius round-over bit to soften the edges of the frames, clock face, spacers, escapement, back support, backing board, and inner openings of the large gears. Use sandpaper to round the edges of the opening in the smaller gears. Cut a T-shaped slot in the back of the backing board so the clock will hang flush to the wall. Follow the manufacturer's instructions to apply spray lacquer to the gears and gel varnish to the other elements.

GEAR CLOCK: ASSEMBLING THE CLOCK



15

Dry-assemble the frame. Use the frame spacers to dry-assemble the front and back frame, and then add the pendulum support and the two back supports. Glue the frame spacers to the front frame. *Optional: On the front side, glue a decorative cap over the end of the top frame spacer.* Clamp the assembly together at the three corners. Glue and clamp the back frame bracket to the back frame with the top of the bracket against the bottom of the top frame spacer. *Optional: To reduce friction, press 1/2" (13mm)-long pieces of brass tube into the frame holes that support the main shaft, escapement shaft, and hour pivot.*



16

Drill the holes for the frame pins. Refer to the frame spacer pattern and mark the location of the frame-pin hole on each spacer. Position a piece of scrap wood under the spacer you plan to drill through, and use a 3/16" (5mm)-diameter bit to drill a hole through each spacer and the back support nestled inside. Cut the gear pins and glue them into the appropriate holes in the escapement wheel and the 70-tooth gear.



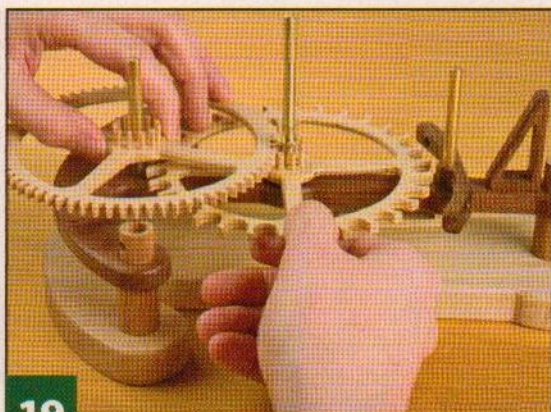
17

Assemble the back section. Remove the front frame. Attach the back supports to the backing board with wood screws. Insert the top shaft through the top hole in the back frame and through the yoke. Slide the escapement onto the top shaft and slide it down almost to the back frame. Insert the bottom shaft into the bottom hole. Make sure the escapement and top shaft move freely.



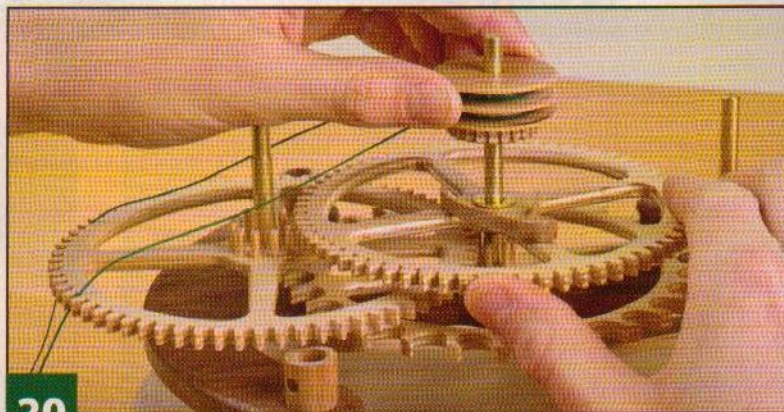
18

Assemble the escapement. Solder or epoxy two brass washers to one end of the escapement sleeve. Press the sleeve into the hole in the escapement wheel until the washers are flush with the back side. Put the escapement wheel in place, and insert the main shaft through the hole in the wheel and back frame. Hold the shaft flush with the back of the back frame and mark the placement of the escapement sleeve on the main shaft. Carefully remove the main shaft, align the main shaft sleeve with the mark, and solder or epoxy the main shaft sleeve in place. Center two brass washers in the middle of the main shaft sleeve and epoxy or solder them in place.



19

Install the 70-tooth gear. Measure $\frac{7}{16}$ " (11mm) from one end of the bottom shaft sleeve and epoxy or solder two brass washers at the mark. Press the bottom shaft sleeve into the 70-tooth gear with the washers against the back. Remove the main shaft and slide the 70-tooth gear onto the bottom shaft. Position the gear on the sleeve so the gears on the 70-tooth gear engage with the gear pins on the escapement wheel. Then, replace the main shaft.



20

Install the ratchet mechanism. Position the 66-tooth gear on the main shaft sleeve and make sure the gears engage with the gear pins in the 70-tooth gear. Glue together the five pieces of the drum, and then glue the ratchet to the drum. Attach the weight cord to the outermost position on the drum, wrapped so it will feed off the right side of the drum. Install the pull cord in the innermost position on the drum, wrapped so it will feed off the left side of the drum. Glue the pawl pivot into the hole in the 66-tooth gear, and then install the pawl on the pawl pivot. Place a brass washer onto the main shaft sleeve, and then install the drum and ratchet assembly onto the main shaft sleeve with the ratchet down.



21

Finish installing the gears. Replace the front frame and insert the frame pins into the holes. Add the 8-tooth gear to the main shaft. Press the hour pivot through the 10-tooth gear and hour gear, and insert it into the hole in the frame. Make sure the teeth engage with the 8-tooth gear. Press the hour sleeve into the 30-tooth gear and press the hour hand onto the sleeve. Insert the 30-tooth gear onto the main shaft and lock it in place with the minute hand. Glue the clock face pins to the back of the clock face and place the face in position on the front frame.



22

Assemble the pendulum. Glue the pendulum pivot to the pendulum head. Glue the pendulum rod to the pendulum head. Insert the pendulum screw through the hole in the curved side of the bob, and thread the pendulum nut onto the pendulum screw to hold the bob in place.



GEAR CLOCK: COMPLETING THE CLOCK

23

Install the pendulum. Carefully remove the top screw and one side screw from the backing board. Rotate the backing board enough to slip the pendulum head over the pendulum support. Reinsert the screws.

24

Install the weights. Hang the backing board on a screw in the wall. Level the clock and use adhesive putty or dabs of silicone to hold the clock in place. Hang the weight and pull cord weight from loops tied in the appropriate cords. Pull the pull cord weight down as you lift the weight.

25

Add the pallet pins and check the action of the clock. Insert the pallet pins into the holes in the escapement so both pins extend the same distance into the escapement wheel teeth. Gently set the pendulum swinging. Adjust the pallet pins so they are deep enough to stop the escapement wheel from spinning more than one tooth at a time, but not so deep that they rub on the teeth and slow the action of the pendulum. Observe the clock in motion and apply a little paraffin wax as necessary to reduce the friction. Note: As the seasons change, you may need to adjust the action of the clock to offset the expansion or contraction of the wood caused by changes in humidity.

Materials & Tools

Materials for sanding jig:

- Scrap wood, $\frac{3}{8}$ " (10mm) thick: $\frac{3}{4}$ " x 12" (19 x 305mm)
- Scrap wood, $\frac{1}{2}$ " (13mm) thick: $5\frac{1}{2}$ " x 10" (140 x 254mm)

Materials for pallet jig (see Step 4):

- Scrap wood, 1" (25mm) thick: 2 each 1" x 2" (25 x 51mm)

Materials for clock:

- Maple, $\frac{3}{4}$ " (19mm) thick: 9" x 12 $\frac{1}{4}$ " (229 x 311mm)
- Walnut, $\frac{1}{2}$ " (13mm) thick: 10" x 49" (254 x 1,244mm)
- Cherry, $\frac{3}{4}$ " (19mm) thick: 2 $\frac{3}{8}$ " x 2 $\frac{1}{2}$ " (60 x 64mm)
- Cherry, $\frac{1}{4}$ " (6mm) thick: 2" x 2 $\frac{1}{2}$ " (51 x 64mm)
- Cherry, $\frac{1}{8}$ " (3mm) thick: 1 $\frac{1}{2}$ " x 3" (38 x 76mm)
- Cherry dowel, $\frac{7}{8}$ " (16mm) dia.: 6" (152mm) long
- Poplar dowel, $\frac{1}{4}$ " (6mm) dia.: 50" (1,270mm) long
- Poplar dowel, $\frac{3}{8}$ " (10mm) dia.: 1 $\frac{1}{4}$ " (32mm) long

- Poplar dowel, $\frac{1}{8}$ " (3mm) dia.: 11 $\frac{1}{4}$ " (285mm) long
- Baltic birch plywood, $\frac{1}{4}$ " (6mm) thick: 12" x 12" (305 x 305mm)
- Baltic birch plywood, $\frac{1}{16}$ " (2mm) thick: 6" x 6" (152 x 152mm)
- Black acrylic, $\frac{1}{8}$ " (3mm) thick: 2" x 4" (51 x 102mm)
- Brass rod, $\frac{1}{4}$ " (6mm) thick: 10 $\frac{1}{2}$ " (267mm)
- Brass tubing, $\frac{9}{32}$ " (7mm) dia.: 3 $\frac{1}{2}$ " (89mm)
- Brass washers, $\frac{1}{4}$ " (6mm) dia.: 7 each
- Brass machine screw, #1/4-28: 3" (76mm) long
- Brass nut: #1/4-28
- Brass tubing, 1 $\frac{1}{2}$ " (38mm) dia.: 11 $\frac{3}{4}$ " (298mm) long
- Maple, 1 $\frac{1}{2}$ " (38mm) thick: 1 $\frac{1}{2}$ " x 4" (38 x 102mm)
- Brass eustachian pins, $\frac{1}{8}$ " (3mm) dia.: 8 each, $\frac{1}{4}$ " (6mm) long
- Brass rod, $\frac{3}{4}$ " (22mm) dia.: 2 $\frac{1}{8}$ " (54mm) long
- Screw hooks, $\frac{1}{8}$ " (3mm) dia.: 2 each 1 $\frac{1}{2}$ " (38mm) long
- Braided fishing line, 30-pound test: 10' (3,050mm)

- Wood glue
- Adhesive putty or silicone
- Paraffin wax (optional)
- Soldering iron and solder, or epoxy
- Cyanoacrylate (CA) glue
- Wood screws, #10: backing board, 3 each 1 $\frac{1}{4}$ " (32mm) long
- Decorative wood plug, $\frac{1}{2}$ " (13mm) dia. (optional to cover hole in top of front frame)

Tools:

- Blades: #2/0, #3, and #5 premium blades, such as Olson Precision Ground Tooth blades
- Drill press with Forstner bits: $\frac{1}{4}$ " (6mm), $\frac{1}{2}$ " (13mm), $\frac{5}{8}$ " (16mm); twist bits: $\frac{1}{8}$ " (3mm), $\frac{9}{32}$ " (7mm) or #K wire
- Center punch
- Disc sander
- Router with bits: $\frac{1}{8}$ " (3mm)-radius round-over; T-slot bit
- Wood lathe (optional for pin decorations)
- Clamps

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

SPECIAL SOURCES:

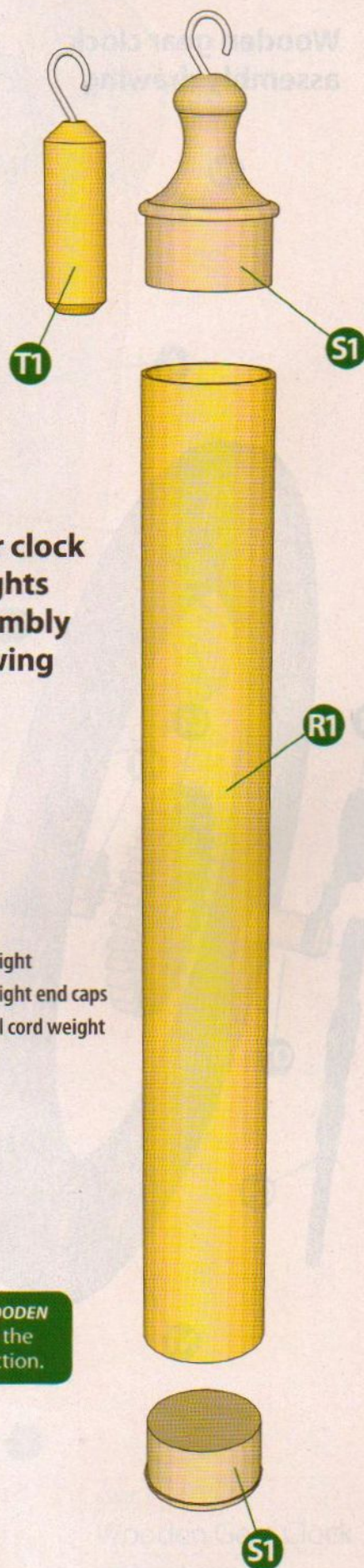
Brass rods (#8313K173), tubes (#8859K172), and washers (#92916A380) are available from McMaster-Carr, www.mcmaster.com, for around \$30+s&h (you will have material leftover).

Hardware kits with brass rods and tubing cut to length and brass washers soldered into the correct location are available from test cutter Rolf Beuttenmuller for \$22+postage. Kit does not contain materials for the weight and pull cord weight. Contact Rolf on the *Scroll Saw Woodworking & Crafts* Message Board (www.scrollsawer.com/forum); his screen name is "Rolf."

Patterns for the **WOODEN GEAR CLOCK** are in the pattern pullout section.

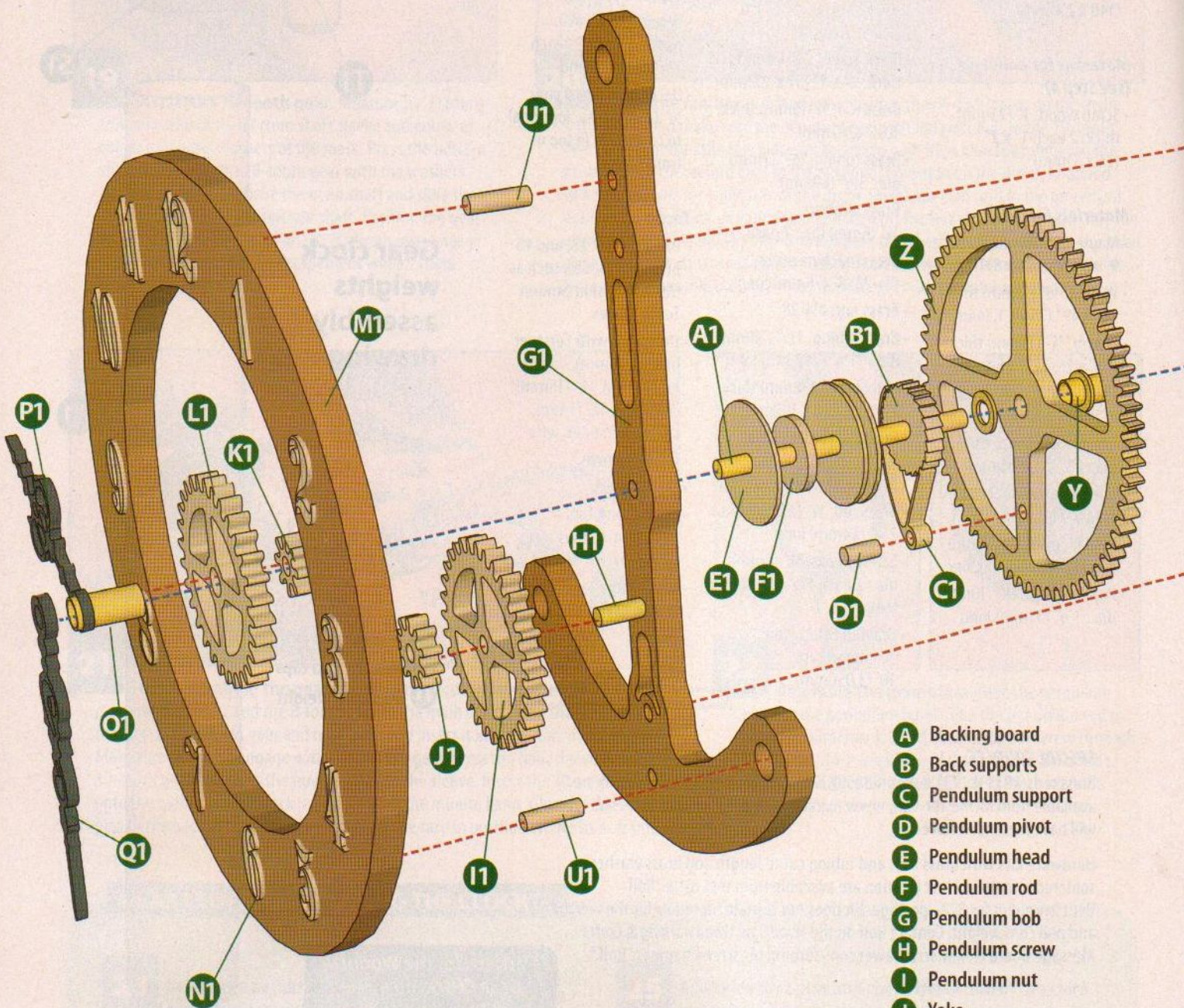
Gear clock weights assembly drawing

- R1** Weight
- S1** Weight end caps
- T1** Pull cord weight

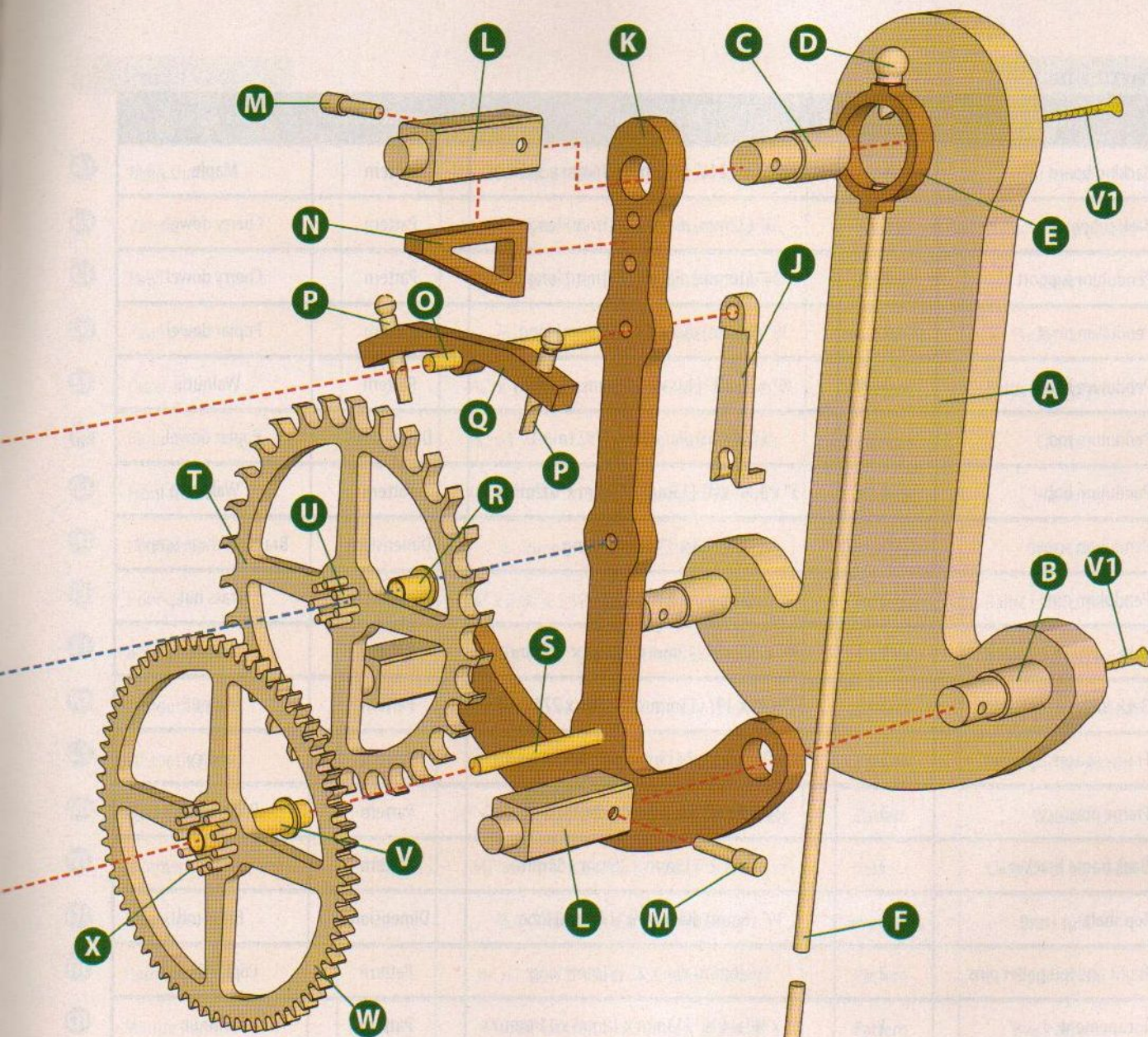


ON THE WEB See a video of the wooden gear clock in motion.
www.scrollsawer.com

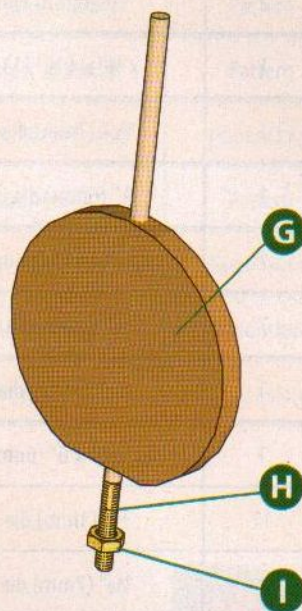
Wooden gear clock assembly drawing



- A** Backing board
- B** Back supports
- C** Pendulum support
- D** Pendulum pivot
- E** Pendulum head
- F** Pendulum rod
- G** Pendulum bob
- H** Pendulum screw
- I** Pendulum nut
- J** Yoke
- K** Back frame
- L** Frame spacer
- M** Frame pins
- N** Back frame bracket
- O** Top shaft
- P** Right and left pallet pins



- | | |
|-------------------------------|---------------------------|
| Q Escapement | F1 Inner drum |
| R Escapement sleeve | G1 Front frame |
| S Bottom shaft | H1 Hour pivot |
| T Escapement wheel | I1 Hour gear |
| U Escapement gear pins | J1 8-tooth gear |
| V Bottom shaft sleeve | K1 10-tooth gear |
| W 70-tooth gear | L1 30-tooth gear |
| X 70-tooth gear pins | M1 Clock face |
| Y Main shaft sleeve | N1 Numbers |
| Z 66-tooth gear | O1 Hour sleeve |
| A1 Main shaft | P1 Hour hand |
| B1 Ratchet | Q1 Minute hand |
| C1 Pawl | U1 Clock face pins |
| D1 Pawl pivot | V1 Wood screws |
| E1 Outer drum | |



SSWC 51

Wooden Gear Clock

DESIGNED BY BRIAN LAW
3-D Illustration by Jon Deck

Parts List

	Item	Quantity	Dimensions	Presentation	Material
A	Backing board	1	$\frac{3}{4}$ " x 8 $\frac{1}{2}$ " x 12 $\frac{1}{4}$ " (19mm x 216mm x 311mm)	Pattern	Maple
B	Back supports	2	$\frac{7}{8}$ " (22mm) dia. x 2" (51mm) long	Pattern	Cherry dowel
C	Pendulum support	1	$\frac{5}{8}$ " (16mm) dia. x 2" (51mm) long	Pattern	Cherry dowel
D	Pendulum pivot	1	$\frac{3}{8}$ " (10mm) dia. x 1 $\frac{1}{4}$ " (32mm) long	Pattern	Poplar dowel
E	Pendulum head	1	$\frac{1}{2}$ " x 2" x 2" (13mm x 51mm x 51mm)	Pattern	Walnut
F	Pendulum rod	1	$\frac{1}{4}$ " (6mm) dia. x 38 $\frac{1}{2}$ " (971mm)	Dimensions	Poplar dowel
G	Pendulum bob	1	$\frac{1}{2}$ " x 3 $\frac{3}{4}$ " x 4" (13mm x 95mm x 102mm)	Pattern	Walnut
H	Pendulum screw	1	# $\frac{1}{4}$ -28 x 3" (76mm) long	Dimensions	Brass machine screw
I	Pendulum nut	1	# $\frac{1}{4}$ -28	Dimensions	Brass nut
J	Yoke	1	$\frac{3}{4}$ " x $\frac{3}{4}$ " x 5" (19mm x 19mm x 127mm)	Pattern	Maple
K	Back frame	1	$\frac{1}{2}$ " x 8" x 11" (13mm x 203mm x 279mm)	Pattern	Walnut
L	Frame spacer	3	$\frac{3}{4}$ " x $\frac{3}{4}$ " x 1 $\frac{3}{32}$ " (19mm x 19mm x 50mm)	Pattern	Cherry
M	Frame pins	3	$\frac{1}{4}$ " (6mm) dia. x 1 $\frac{1}{4}$ " (32mm) long	Pattern	Poplar dowel
N	Back frame bracket	1	$\frac{1}{2}$ " x 1" x 2" (13mm x 25mm x 51mm)	Pattern	Walnut
O	Top shaft	1	$\frac{1}{4}$ " (6mm) dia. x 3 $\frac{1}{16}$ " (78mm) long	Dimensions	Brass rod
P	Right and left pallet pins	2	$\frac{1}{4}$ " (6mm) dia. x 2" (51mm) long	Pattern	Poplar dowel
Q	Escapement	1	$\frac{1}{2}$ " x $\frac{3}{4}$ " x 4 $\frac{1}{2}$ " (13mm x 19mm x 114mm)	Pattern	Walnut
R	Escapement sleeve	1	$\frac{9}{32}$ " (7mm) dia. x $\frac{1}{2}$ " (13mm) long	Dimensions	Brass tube
S	Bottom shaft	1	$\frac{1}{4}$ " (6mm) dia. x 2 $\frac{3}{4}$ " (70mm) long	Dimensions	Brass rod
T	Escapement wheel	1	$\frac{1}{4}$ " x 6" x 6" (6mm x 152mm x 152mm)	Pattern	Baltic birch plywood
U	Escapement gear pins	7	$\frac{1}{8}$ " (3mm) dia. x $\frac{5}{8}$ " (16mm) long	Dimensions	Poplar dowel
V	Bottom shaft sleeve	1	$\frac{9}{32}$ " (7mm) dia. x 2" (51mm) long	Dimensions	Brass tube
W	70-tooth gear	1	$\frac{1}{4}$ " x 6" x 6" (6mm x 152mm x 152mm)	Pattern	Baltic birch plywood
X	70-tooth gear pins	11	$\frac{1}{8}$ " (3mm) dia. x $\frac{5}{8}$ " (16mm) long	Dimensions	Poplar dowel
Y	Main shaft sleeve	1	$\frac{9}{32}$ " (7mm) dia. x $\frac{1}{2}$ " (13mm) long	Dimensions	Brass tube
Z	66-tooth gear	1	$\frac{1}{4}$ " x 5 $\frac{1}{2}$ " x 5 $\frac{1}{2}$ " (6mm x 140mm x 140mm)	Pattern	Baltic birch plywood

Parts List

	Item	Quantity	Dimensions	Presentation	Material
A1	Main shaft	1	$\frac{1}{4}$ " (6mm) dia. x $3\frac{3}{4}$ " (95mm) long	Dimensions	Brass rod
B1	Ratchet	1	$\frac{1}{4}$ " x $1\frac{3}{8}$ " x $1\frac{3}{8}$ " (6mm x 35mm x 35mm)	Pattern	Baltic birch plywood
C1	Pawl	1	$\frac{3}{16}$ " x $1\frac{1}{4}$ " x $2\frac{1}{2}$ " (5mm x 32mm x 64mm)	Pattern	Cherry
D1	Pawl pivot	1	$\frac{3}{16}$ " (5mm) dia. x $\frac{3}{8}$ " (10mm) long	Dimensions	Poplar dowel
E1	Outer drum	3	$\frac{1}{16}$ " x $1\frac{3}{4}$ " x $1\frac{3}{4}$ " (2mm x 44mm x 44mm)	Pattern	Baltic birch plywood
F1	Inner drum	2	$\frac{1}{8}$ " x $1\frac{1}{4}$ " x $1\frac{1}{4}$ " (3mm x 32mm x 32mm)	Pattern	Cherry
G1	Front frame	1	$\frac{1}{2}$ " x 8" x 11" (13mm x 203mm x 279mm)	Pattern	Walnut
H1	Hour pivot	1	$\frac{1}{4}$ " (6mm)-dia. x $\frac{7}{8}$ " (22mm)-long	Dimensions	Brass rod
I1	Hour gear	1	$\frac{1}{4}$ " x $2\frac{3}{4}$ " x $2\frac{3}{4}$ " (6mm x 70mm x 70mm)	Pattern	Baltic birch plywood
J1	8-tooth gear	1	$\frac{1}{4}$ " x 1" x 1" (6mm x 25mm x 25mm)	Pattern	Baltic birch plywood
K1	10-tooth gear	1	$\frac{1}{4}$ " x $\frac{3}{4}$ " x $\frac{3}{4}$ " (6mm x 19mm x 19mm)	Pattern	Baltic birch plywood
L1	30-tooth gear	1	$\frac{1}{4}$ " x $2\frac{5}{8}$ " x $2\frac{5}{8}$ " (6mm x 67mm x 67mm)	Pattern	Baltic birch plywood
M1	Clock face	1	$\frac{1}{2}$ " x $9\frac{3}{4}$ " x $9\frac{3}{4}$ " (13mm x 248mm x 248mm)	Pattern	Walnut
N1	Numbers	1	$\frac{1}{16}$ " x 4" x 4" (2mm x 102mm x 102mm)	Pattern	Baltic birch plywood
O1	Hour sleeve	1	$\frac{9}{32}$ " (7mm) dia. x 2" (51mm) long	Dimensions	Brass tube
P1	Hour hand	1	$\frac{1}{8}$ " x $1\frac{1}{4}$ " x 3" (3mm x 32mm x 76mm)	Pattern	Black acrylic
Q1	Minute hand	1	$\frac{1}{8}$ " x $\frac{3}{4}$ " x 4" (3mm x 19mm x 102mm)	Pattern	Black acrylic
R1	Weight	1	$1\frac{1}{2}$ " (38mm) dia. x $11\frac{3}{4}$ " (298mm) long	Dimensions	Brass tube
S1	Weight end caps	2	$1\frac{1}{2}$ " (38mm) x $1\frac{1}{2}$ " (38mm) x 4"	Pattern	Maple
T1	Pull cord weight	1	$\frac{3}{4}$ " (19mm) dia. x $2\frac{1}{8}$ " (54mm) long	Dimensions	Brass rod
U1	Clock face pins	2	$\frac{1}{4}$ " (6mm) dia. x $\frac{1}{2}$ " (13mm) long	Dimensions	Poplar dowel
V1	Wood screws	3	#10 x $1\frac{1}{4}$ " (32mm) long	Dimensions	Screws



Brian Law has designed 14 wooden gear clocks and a host of other projects that use gears of some sort. For more of his work, visit his website at www.woodenclocks.co.uk.



Rolf Beuttenmuller was born in Germany to a toolmaker and a seamstress. As a result scrolling came naturally to him. Rolf started scrolling in 2005 and test cutting in early 2010. His motto "I don't know that I can't, therefore I can" was tested by this clock.

Freestanding Insect Puzzles

Easy-cut puzzles will remind you of summer all year long

By Judy and Dave Peterson



From the chirps of crickets to the buzz of bees and whine of mosquitoes, insects are as much a part of summer as sunburns and s'mores. Liven up your living room with a display of some of summer's more pleasant crawly critters.

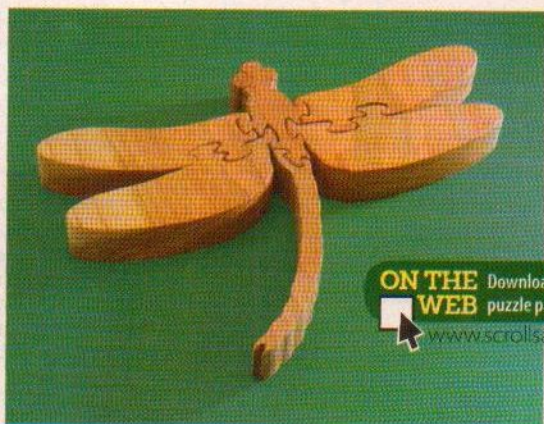
These easy-to-cut puzzles rely heavily on good wood selection. Not only are there delicate parts to consider, but the color and grain pattern of the blank you select can accent the overall look of the project.

Cutting the Puzzles

After you attach the patterns to the blanks, cover them with clear packaging tape to lubricate the blade and reduce the chance of scorching the wood. Before cutting the grasshopper, drill a $\frac{1}{16}$ " (2mm)-diameter hole where indicated for the eye. Insert a $\frac{1}{4}$ " (6mm)-diameter teardrop-shaped carving bit in the drill and use it to increase the size of the hole and make the

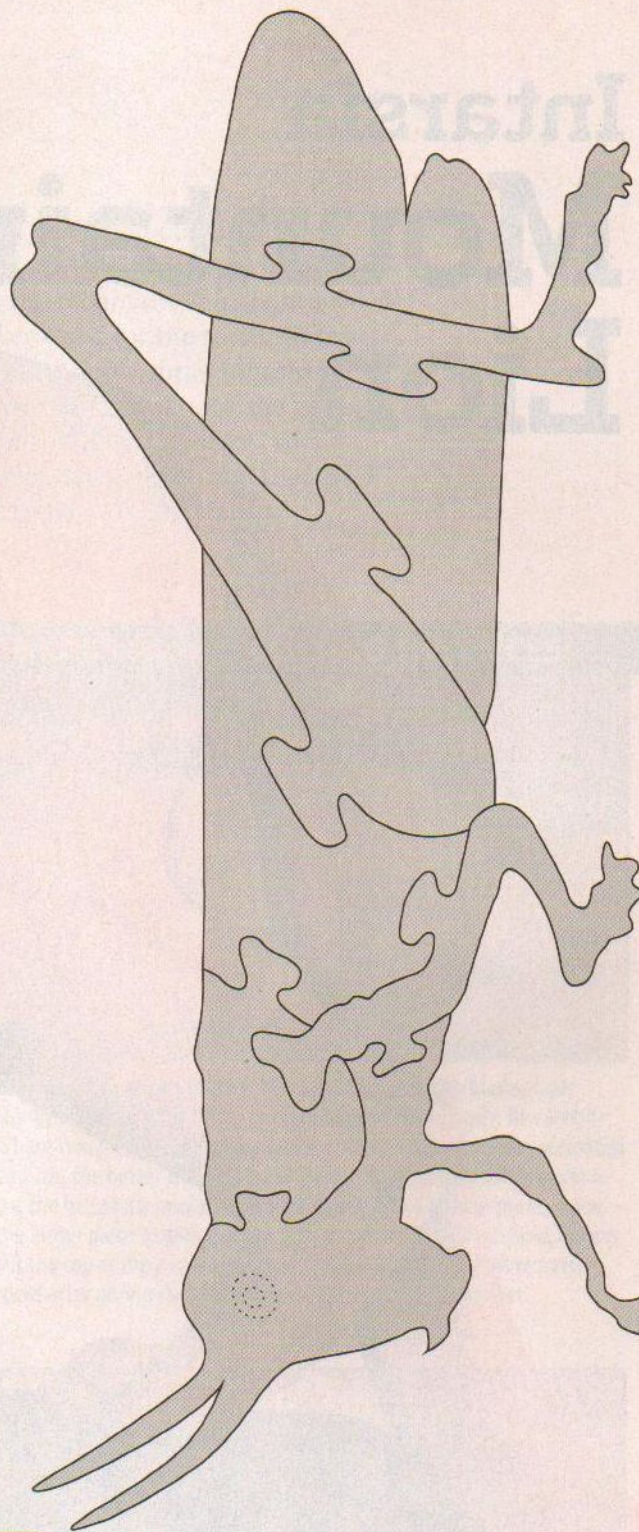
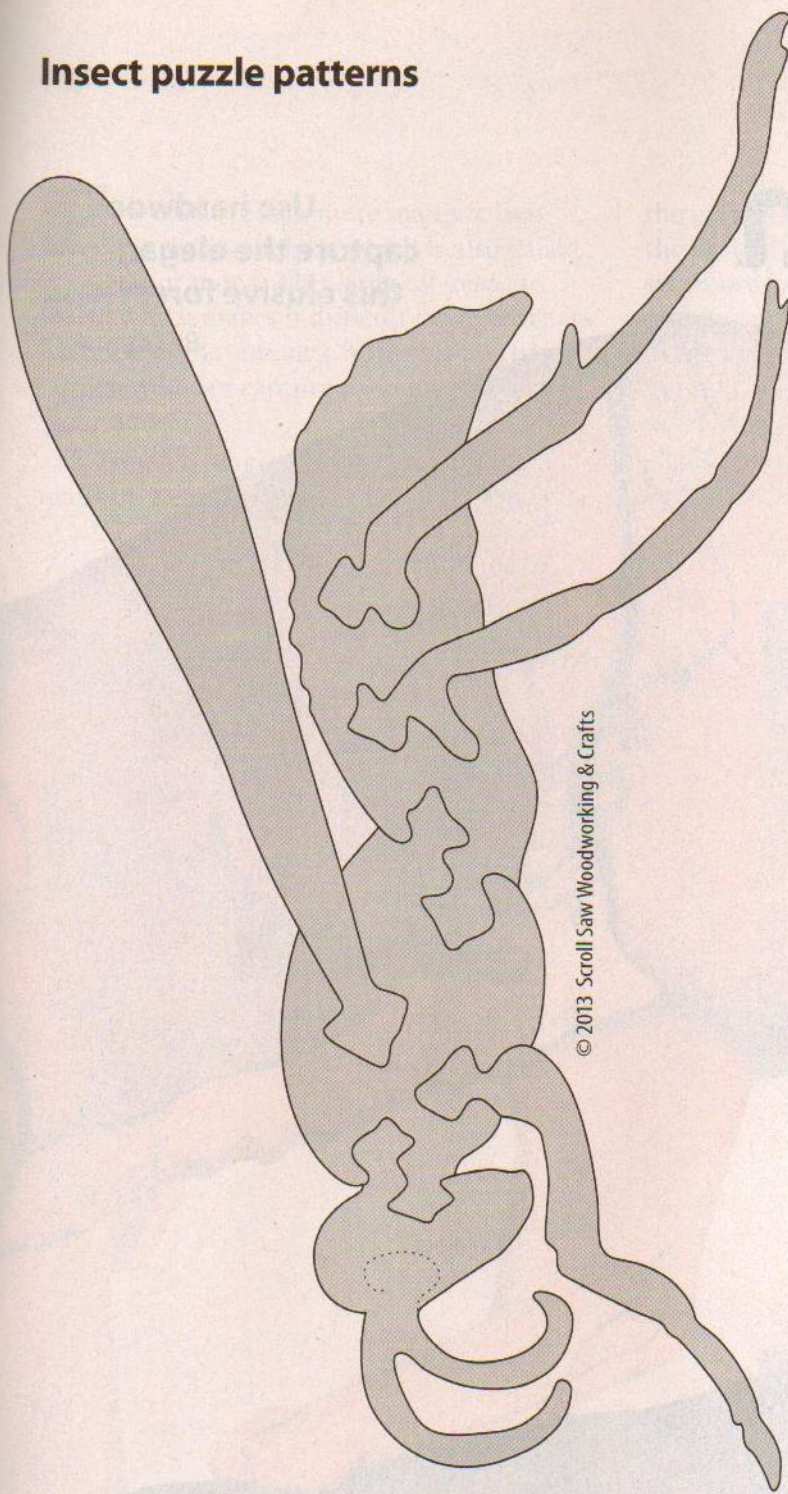
eye a bit more prominent. Cut the puzzles, sand the pieces smooth, and then use a flap sander to round the edges of the pieces slightly. Finish the pieces with clear Danish oil.

We have included patterns for the wasp and grasshopper. A bonus dragonfly pattern is available online at www.scrollsawer.com.



ON THE WEB Downloadable dragonfly puzzle pattern online.
www.scrollsawer.com

Insect puzzle patterns



© 2013 Scroll Saw Woodworking & Crafts

Materials & Tools

Materials:

- Sweet gum (liquidambar styraciflua), $\frac{3}{4}$ " (19mm) to 1" (25mm) thick: wasp, 5" x 8" (127mm x 203mm)
- Hard maple, $\frac{3}{4}$ " (19mm) to 1" (25mm) thick: grasshopper, $3\frac{1}{2}$ " x 8" (89mm x 203mm)

- Spray adhesive, repositionable
- Packaging tape: clear
- Sandpaper: 220-grit
- Danish oil: clear

Tools:

- Blades: #7 skip-tooth or reverse-tooth

- Drill press with bits: $\frac{1}{16}$ " (2mm)-diameter; $\frac{1}{4}$ " (6mm) teardrop-shaped carving
- Sandpaper or sanding disc
- Flap sander

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

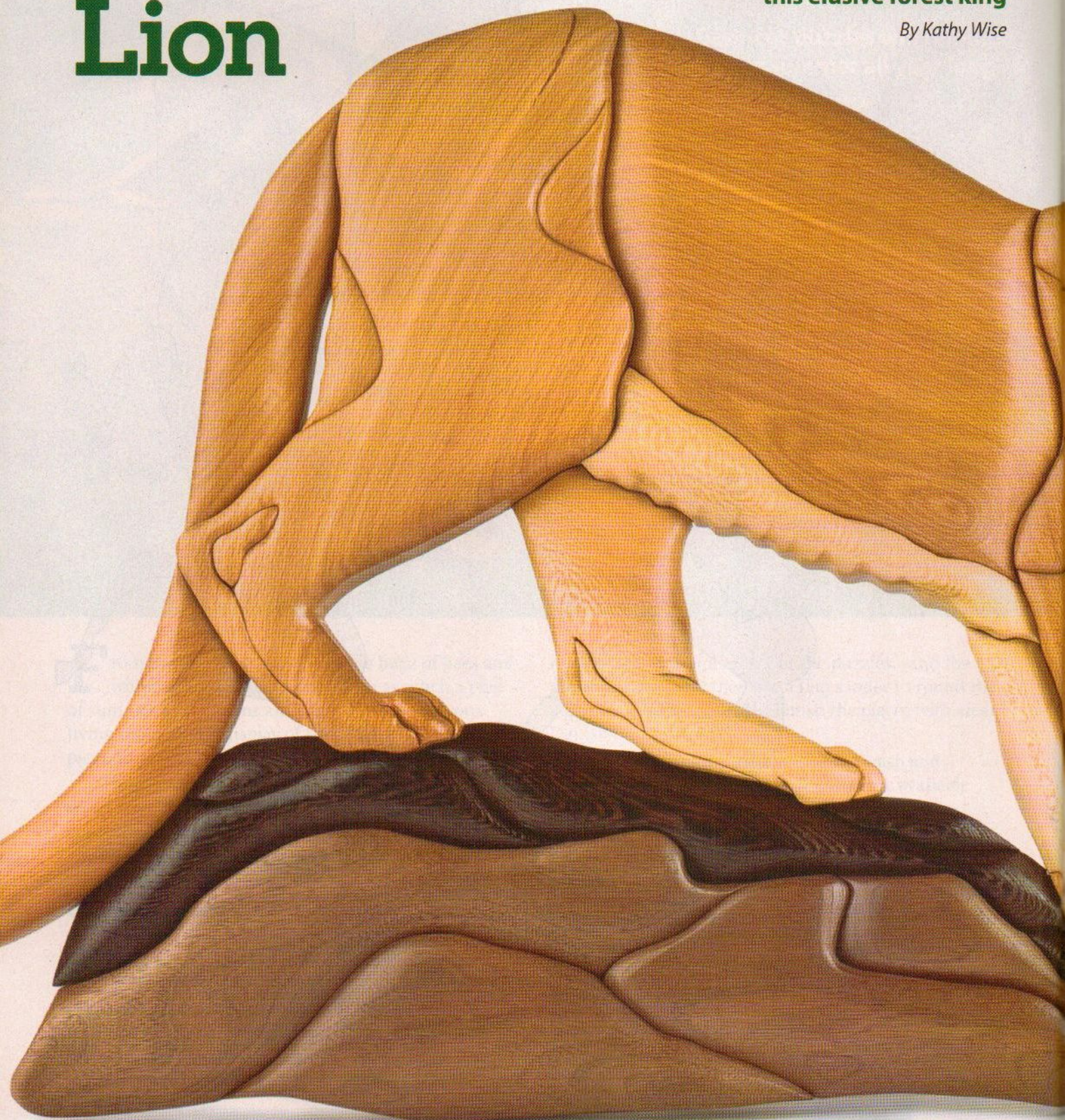


A former teacher and librarian, Judy Peterson found her niche in life as a woodworker. A winner of many design awards, she sells her puzzles at art shows around the country. Her husband, Dave, runs the record-keeping side of the business. Together they have written several books, which are available at www.foxchapelublishing.com.

Intarsia Mountain Lion

Use hardwood to
capture the elegance of
this elusive forest king

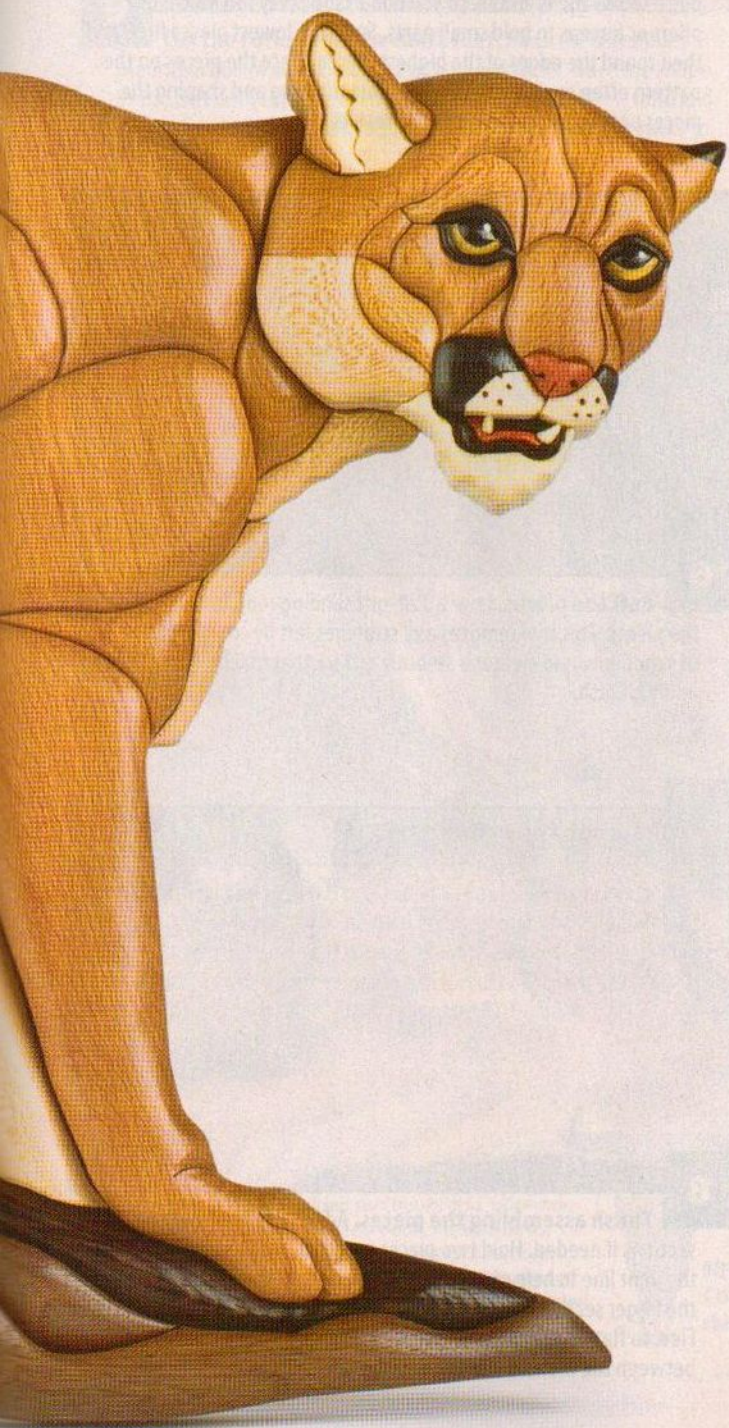
By Kathy Wise



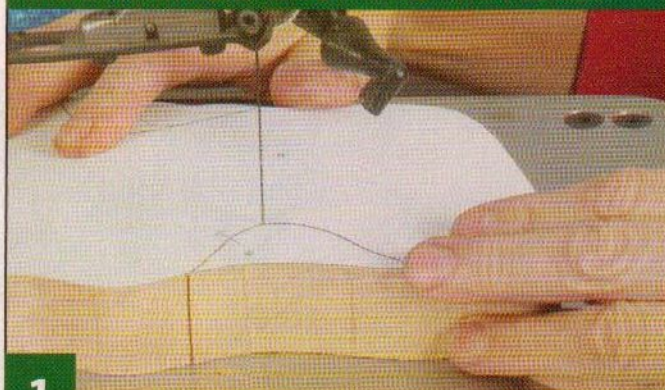
Few creatures are more majestic than the mountain lion, which is also called a cougar or puma. This large cat keeps to itself, which makes it difficult for researchers to track its movements. With this intarsia design, you can capture a mountain lion for your house.

To start, make several copies of the pattern. Keep one as a master copy. Select

the varieties of wood and plane them to the desired thicknesses. I use beech and sycamore for the mountain lion's light-brown coat and darker wood for the rocks. Cut the pattern pieces and apply spray adhesive to the backs of the patterns. Attach the patterns to the shiny side of clear Con-Tact® shelf paper. Cut the patterns apart, and then peel and stick the patterns to the blanks.

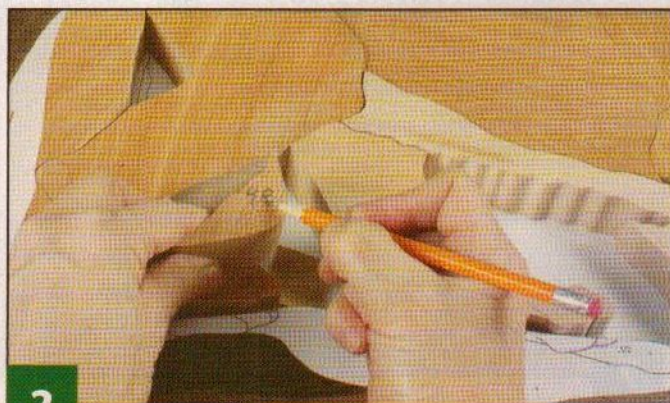


MOUNTAIN LION: CUTTING THE PIECES



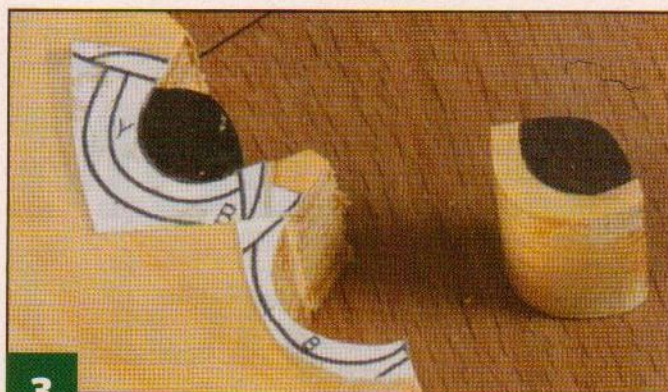
1

Cut the major pieces. Use a #5 reverse-tooth blade to cut slowly on the lines of the larger pieces, such as the body. Be careful where two pieces of different colored wood meet; the more accurately you cut, the better the pieces will fit together. Use a smaller blade to cut the head into smaller pieces. Always cut the smaller pieces from the larger piece to give you as large a piece as possible to hold. Do not cut the top of the rocky outcrop yet; we will trace the feet onto the rocks after gluing the lion together. Do not cut the eyes yet.



2

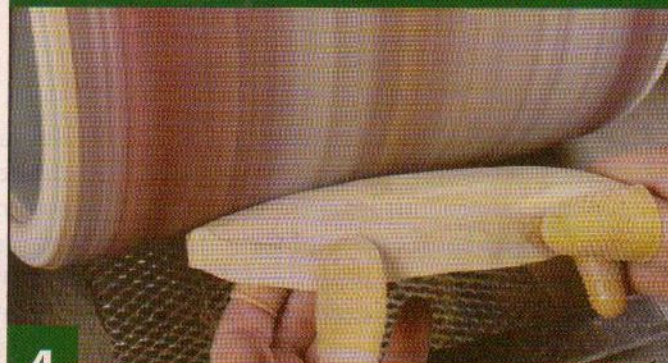
Check the fit of the pieces. As you cut the pieces, mark the piece number on the bottom with a pencil to make sure you don't sand the wrong side. Place the pieces on a pattern taped to the backing board to check the fit. Mark the areas to sand using the shaping guide as a reference.



3

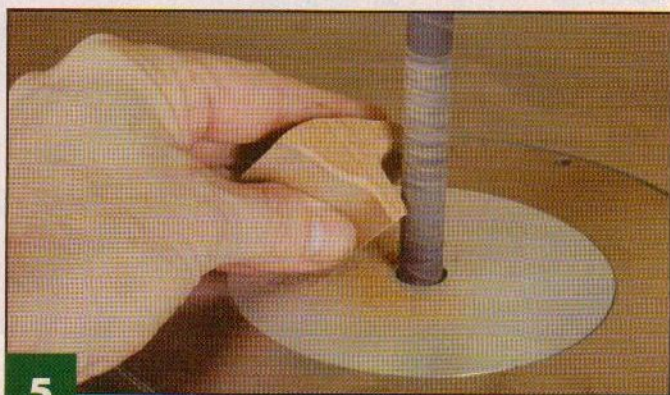
Cut the eyes. Start by cutting the pupils. Then, cut the insides of the irises and fit the black pupils inside. Glue the pupils in place. Cut the perimeters of the irises. You can make a simple eye by omitting the iris and making the entire eye black. Conserve expensive hardwood (like the ebony for the eyes) by cutting risers from inexpensive wood and gluing the hardwood to the risers.

MOUNTAIN LION: SHAPING THE PIECES



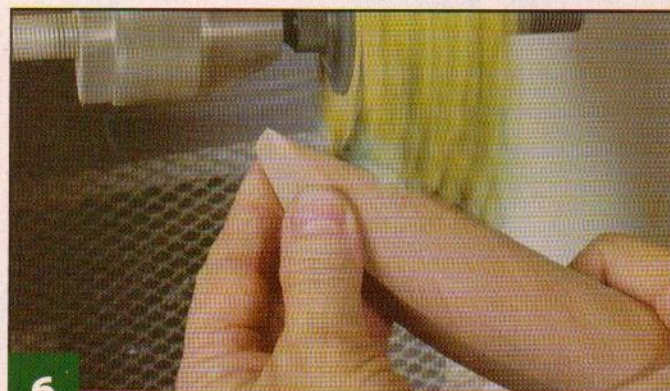
4

Sand and shape the pieces. Mark the level you want to shape to and use a drum sander to sand down to that line. Hold the piece so the line is visible, so you don't sand away too much. Use pliers or forceps to hold small parts. Sand the lowest pieces first, and then round the edges of the highest pieces. Place the pieces on the pattern often to check the fit. Continue marking and shaping the pieces until you're happy with the results.



5

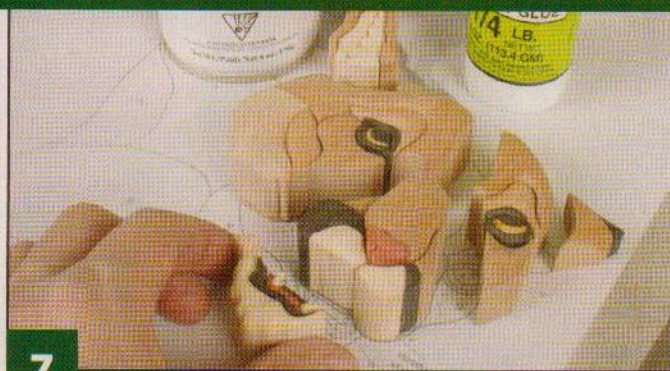
Refine the pieces. Use a rotary tool or an oscillating spindle sander to round the inside edges of tight curves. Use cyanoacrylate (CA) glue to stick together sections, such as the muzzle, that should be shaped together. Place the pieces on the pattern to check the fit and overall appearance, and make any necessary adjustments.



6

Buff the pieces. I use a 220-grit sanding mop to buff all of the pieces. This tool removes any scratches left by coarser grits of sandpaper and creates a smooth surface that makes it easy to apply a finish.

MOUNTAIN LION: ASSEMBLING THE PROJECT



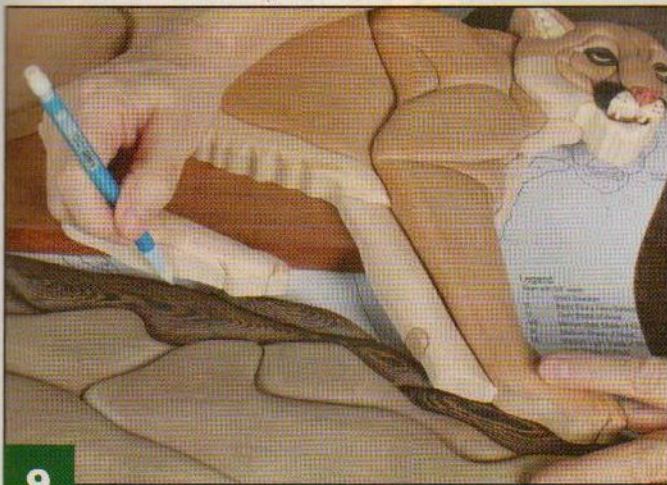
7

Begin assembling the project. Place the pattern on a flat surface and cover it with waxed paper. Starting with the head, place dots of cyanoacrylate (CA) glue between three or four pieces and hold the pieces together until the glue sets. Move on to the adjoining pieces. You can use CA glue accelerator, but you have to get the parts into position quickly. Assemble the pieces into a few large sections.



8

Finish assembling the pieces. Adjust the fit of the larger sections if needed. Hold two pieces together in place and cut along the joint line to help pieces fit together better. Then, glue together the larger sections and use a portable drum sander, such as a Sand Flee, to flatten the bottom of the intarsia to ensure a tight joint between the intarsia and the backing board.



9

Cut the rocks to fit the lion's feet. Place the assembled mountain lion in position on the assembled rocks. Trace the shape of the feet onto the tops of the rocks. Cut along the lines, sand and shape the pieces to fit, and then use CA glue to attach the rocks to the mountain lion.



11

Apply the finish. I use a clear satin spray finish. Apply the finish according to the manufacturer's instructions. Allow the finish to dry overnight. Put a dot of white paint on the eyes. Allow the paint to dry, and then apply a few coats of clear gloss to give the eyes a lifelike shine. Attach a hanger to the back.

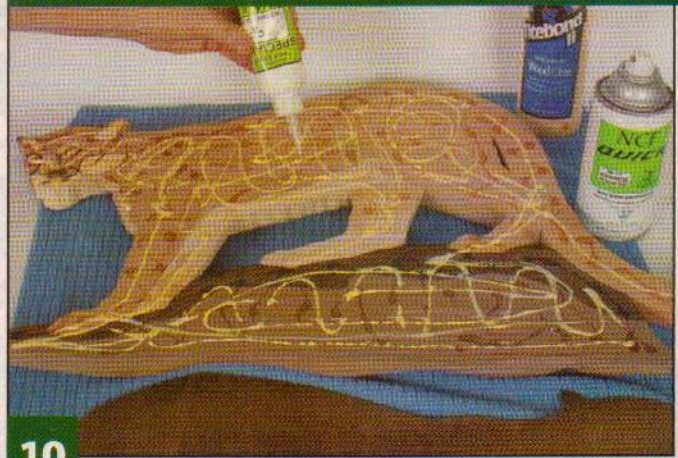


A nationally acclaimed intarsia artist, Kathy Wise has written two books and more than 30 articles. Her new book, *Intarsia Birds: Woodworking the Wise Way*, has more than 30 beautiful bird patterns. Private and semi-private intarsia classes are available. For a free catalog of 500 patterns, contact Kathy Wise Designs Inc., P.O. Box 60, Yale, Mich. 48097, fax 810-387-9044, www.kathywise.com, kathywise@bignet.net.



#810
Cow
skull

MOUNTAIN LION: FINISHING THE PROJECT



10

Attach the lion to the backing board. Trace the project onto the tempered hardboard backing board. Cut just inside the line, and paint or stain the edges if desired. With the intarsia face down on a soft cloth, apply dots of CA glue and wood glue to the back. Spray CA glue accelerator onto the backing board. Place the backing board in position and hold for 30 seconds until the glue sets. Flip the piece right side up and apply uniform pressure to lock everything in place.

Materials & Tools

Materials:

- Reddish-pink wood, such as pink ivory, 1" (25mm) thick: nose, 1" x 1" (25mm x 25mm)
- Dark wood, such as black walnut, 1" (25mm) thick: rocks, 6" x 22" (152mm x 559mm)
- Black wood, such as wenge, 3/4" (19mm) thick: rocks, 6" x 20" (152mm x 508mm)
- Black wood, such as ebony, 1" (25mm) thick: muzzle, 1" x 2" (25mm x 51mm)
- Black wood, such as ebony, 1/2" (13mm) thick: eyes, 2" x 3" (51mm x 76mm)
- Yellow wood, such as yellowheart, 1/2" (13mm) thick: eyes, 1" x 2" (25mm x 51mm)
- White wood, such as holly, 1" (25mm) thick: ears, muzzle, teeth, 2" x 3" (51mm x 76mm)
- Light wood, such as sycamore, 1" (25mm) thick: body, 6" x 18" (152mm x 457mm)

- Medium wood, such as beech, 1" (25mm) thick: body, 8" x 36" (203mm x 914mm)
- Tempered hardboard, 1/8" (3mm) to 1/4" (6mm) thick: backing board, 18" x 27" (457mm x 686mm)
- Glues: cyanoacrylate (CA) glue, wood glue
- CA glue accelerator
- Con-Tact® clear shelf paper
- Spray adhesive
- Hanger

Tools:

- Blades: #5 reverse-tooth, #3 reverse-tooth
- Sanders: pneumatic drum; portable drum, such as a Sand-Flee; sanding mop
- Rotary carver or die grinder
- Pencil

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

Pattern for the **INTARSIA MOUNTAIN LION** is in the pattern pullout section.

Wooden Dragonfly Decorations



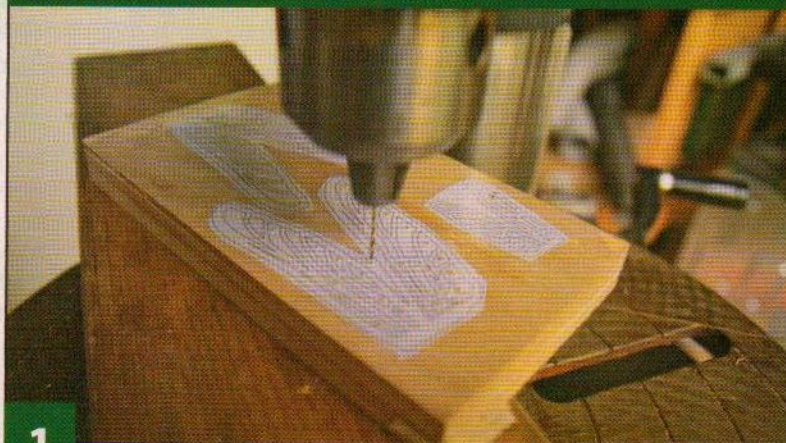
Make a variety of projects by enlarging or reducing the patterns

By David Griffin

I designed these dragonflies in response to customer requests. They were inspired by my butterfly magnets with fretwork wings, which have been popular for several years. I tried to come up with as many different ideas as I could using the same basic pattern.

I made the pattern in a few different sizes, adjusting the fretwork as I made the design smaller. If you find a heavily figured piece of wood, you can make a very small dragonfly with no fretwork in the wings.

DRAGONFLY: MAKING A MAGNET

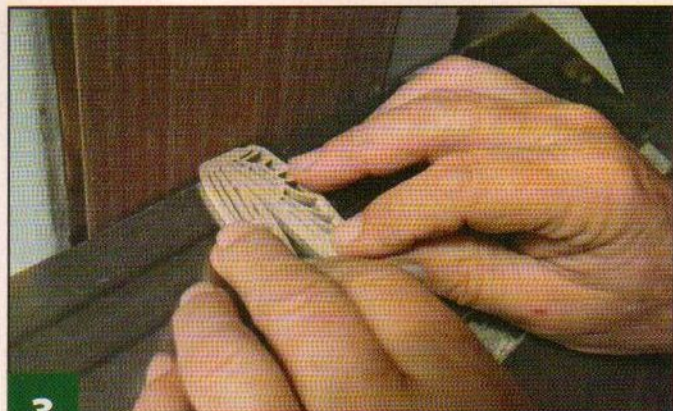


1

Prepare the stacks. Stack an even number of $\frac{1}{8}$ " (3mm)-thick blanks for the wings, and two or three layers of $\frac{3}{16}$ " to $\frac{1}{4}$ " (5mm to 6mm)-thick blanks for the bodies. Attach the wing patterns to the stacks; I suggest using an oversized blank and cutting several at once so you have a larger, more stable stack to work with. Use a #60 drill bit to drill blade-entry holes. If the grain of the wood deflects the bit into a nearby fret, combine the two frets. Since no two dragonflies are the same, omit any holes that are too small for you.



2 **Cut the wings and bodies.** Feed the blade through the blade-entry holes and cut the frets. Pay extra attention to the body area where the wings join the body. This joint gets sanded on the wings, but it's difficult to sand the body, so try to cut the line as straight as possible.

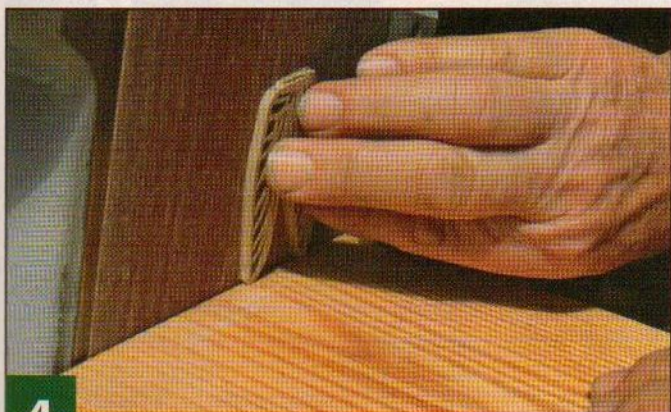


3 **Sand the angle onto the wings.** Set a belt sander to a 20° angle and use a 100-grit belt for hard woods and a 120- to 150-grit belt for softer woods. Sand the edges of both wings at the same angle (see Tip below). Remember to flip over one set of wings to create left and right sides. The front wing is the larger of the two.

TIP

CHANGING THE WING ANGLES

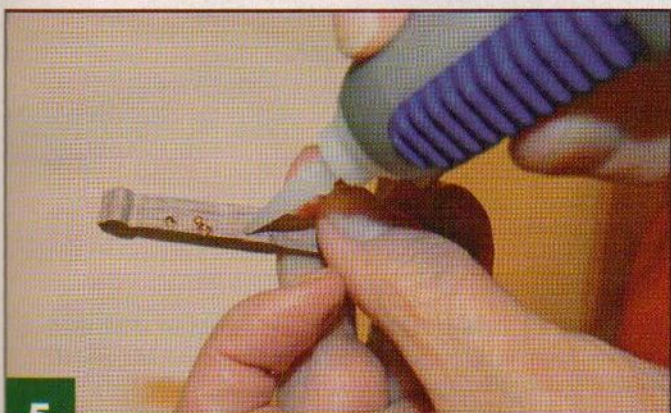
Increase the angle if you want the wings to be more closed and reduce the angle to make the wings flatter. I chose the 20° angle because it provides the most glue area.



4 **Sand the face of the wings.** Use a 220-grit belt on the belt sander. I clamp an auxiliary table onto the belt sander to keep the wings from being dragged through the gap between the belt and the table. You could also use a fine-grit sanding block to hand-sand the wings. Be careful not to press too hard or you may break the fragile wings.



6 **Finish the dragonfly.** Mix 1 part boiled linseed oil with 2 parts mineral spirits and dip the completed dragonflies in the mixture. Wipe off the excess. For light woods, such as maple, use spray lacquer. Place a rare earth magnet on a flat surface and apply E6000 epoxy to the top of the magnet. Center the dragonfly body on top of the magnet and allow the epoxy to set for two to three hours. Alternatively, use a magnet equipped with pressure-sensitive adhesive. *Note: Rare earth magnets can cling tightly enough to break the fretwork when you try to free the magnet from a piece of metal. To reduce the strength of a magnet, cut a small disc of 1/2" (1mm)-thick Baltic birch plywood and attach it to the magnet with epoxy.*



5 **Attach the wings to the body.** I use a combination of gel-type cyanoacrylate (CA) glue and PCA glue, such as Aleene's Tacky Glue. Place a thin coat of the PCA glue on the edge of the wings and three dots of CA glue on the body. Press together for 15 seconds until the glue sets. Wait five minutes and repeat the process for the second wing. After you attach both wings, allow the glue to dry for an hour.

Gallery of Project Ideas



Christmas Ornament

This clip-on Christmas ornament is inspired by the German blown-glass bird ornaments that clip to the ends of the tree branches. Cut and assemble the dragonfly using the instructions for the dragonfly magnet. However, instead of gluing a magnet to the body, glue a lanyard clip to the bottom of the body. If you prefer the dragonfly to stand a little off from the tree, glue a $\frac{3}{8}$ " by $\frac{3}{8}$ " by $\frac{1}{2}$ " (10mm by 10mm by 13mm) block of wood to the dragonfly body and glue the clip to the block. Position the clip so the lever is centered over the block. That way you're pushing the clip down directly over the wood instead of putting stress on the glue joint. I use E6000 epoxy to attach the clip and the dragonfly body to the block.



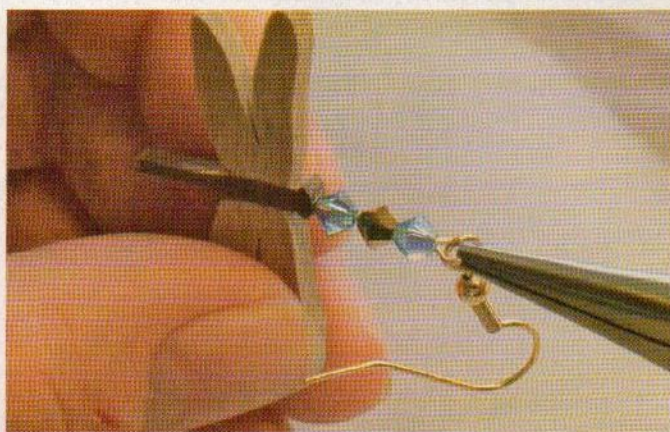
Barrette

The medium-sized pattern works well for a dragonfly barrette. Use the same methods to cut the elements, but sand the edges of the wings at a 90° angle (the wings on the barrettes are flat for additional strength). Place the wings upside-down on a flat surface, such as a tile or piece of glass. Refer to Steps 5 and 6 to attach the wings and finish the dragonfly. Cut a piece of $\frac{1}{4}$ " (6mm) to $\frac{3}{8}$ " (10mm)-thick wood to roughly fit the curve of a barrette clip. Glue the wooden adapter to the clip using E6000 epoxy. Sand the top of the adapter flat and use CA and PCA glue to attach the adapter to the dragonfly body.



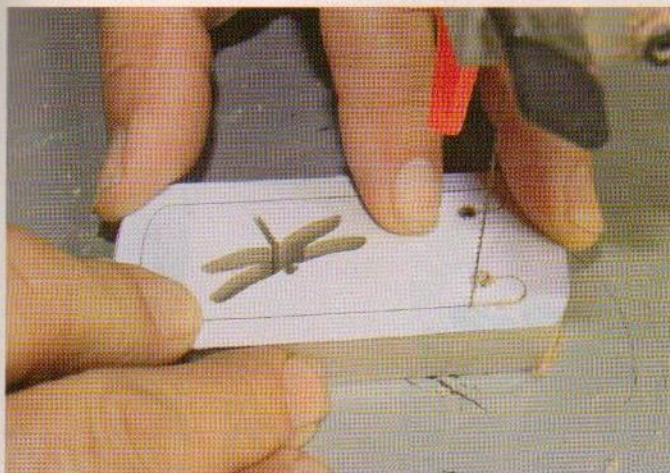
Plant Ornament

Make a plant ornament by adding a piece of florist's wire to an assembled large dragonfly. Drill a #53 hole most of the way through the body before you attach the wings to the body. Glue the wings on, and then cut a length of #16 florist's wire (the kind with a green coating), add a drop of CA glue to the hole, and push the wire into the hole.



Earrings

To make earrings, reduce the pattern. Since the wings are small, use a wood with a distinct grain, such as bocote or zebrawood, and omit the fretwork. Use an evenly dark wood, such as walnut, for the body. I use $\frac{1}{8}$ " (3mm)-thick stock for the body and wings. Orient the pattern so the grain runs the length of the body. Drill a $\frac{1}{4}$ " (6mm) to $\frac{3}{8}$ " (10mm)-deep hole in the end of the head with a #68 bit. Cut the pieces and glue the wings to the body, allow the glue to dry, and sand both sides flat. Slide beads over an eye pin and cut the eye pin so it is just shorter than the depth of the hole with the beads in place. Glue the eye pin into the hole with gel-type CA glue. Gently pry open the eye using pliers, slip an ear wire into the eye, and close the eye.



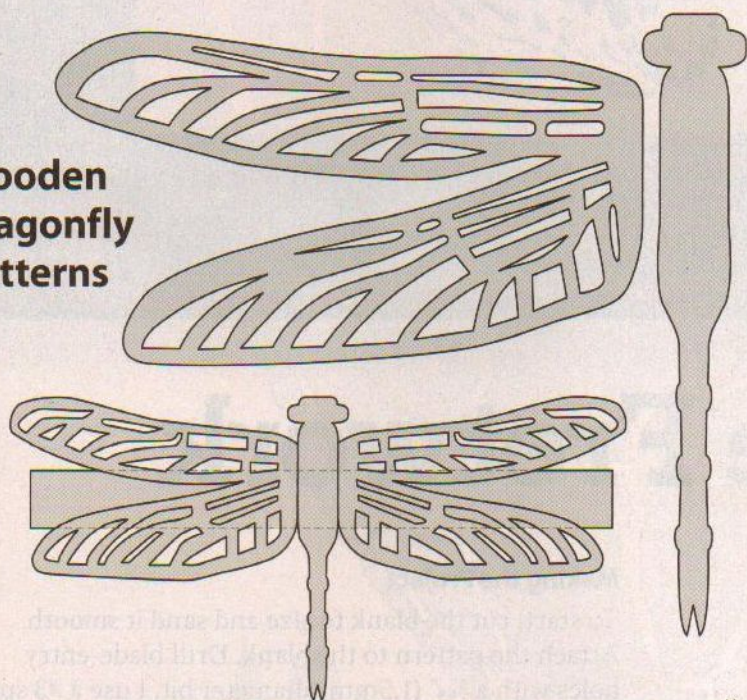
Bookmarks

Cut several pieces of $\frac{1}{32}$ " (1mm)-thick Baltic birch or Finnish birch plywood to $1\frac{3}{4}$ " by $3\frac{5}{8}$ " (44mm by 92mm). Tape the ends together to create a stack of bookmarks. Attach a pattern to the top and use a disc sander to sand the sides to the pattern lines. Wrap tape around the sides, and then sand the top and bottom to shape. Drill $\frac{1}{8}$ " (3mm)-diameter holes where indicated for the tongue and a small blade-entry hole for the dragonfly silhouette. Cut the dragonfly, and then cut along the lines for the tongue. Separate the stack and finish the bookmarks.

Stickers

Use veneer and double-sided adhesive to make stickers. Cover the back of a piece (or pieces) of veneer with double-sided adhesive. Use a roller to roll out any bubbles and to firmly attach the adhesive to the veneer. Cut the veneer into pieces just larger than the pattern and stack the pieces. Mix and match the colors of the veneer to make bodies and wings in contrasting woods. Cut the dragonflies. Then, carefully remove the backing for the adhesive of two wings and the body, and place them wherever you like.

Wooden dragonfly patterns



Materials to make one magnet:

- Hardwood, such as cherry or sassafras, $\frac{1}{8}$ " (3mm) thick: wings, 2 each 2" x 4" (51mm x 102mm)
- Hardwood in a contrasting color, such as walnut, $\frac{1}{4}$ " (6mm) thick: body, 1" x 4" (25mm x 102mm)
- Rare earth magnet: $\frac{1}{16}$ " (2mm) thick x $\frac{1}{2}$ " (13mm) diameter
- Glue: gel-type cyanoacrylate (CA); PCA, such as Aleene's Tacky Glue; and epoxy, such as E6000

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

Materials & Tools

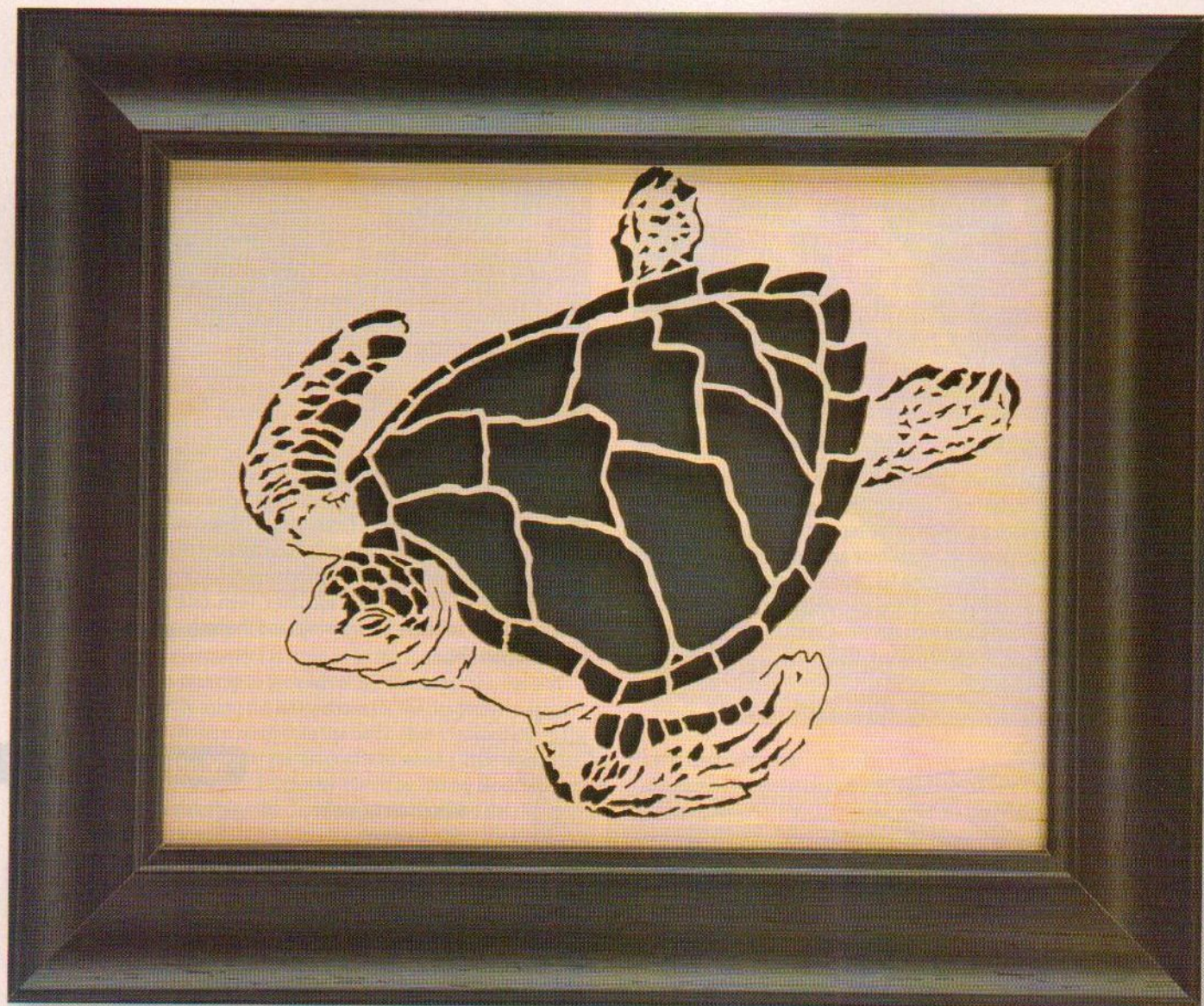
- Finish, such as boiled linseed oil thinned with mineral spirits and/or spray lacquer
- Sanding block: fine-grit

Tools:

- Blades, such as Pegas Modified Geometry: #3 reverse-tooth
- Belt sander
- Drill with bits: #68, #60, #53, $\frac{1}{16}$ " (2mm), $\frac{1}{8}$ " (3mm)-diameter brad-point
- Small square or machinists' 1-2-3 block
- Small needle nose pliers
- Scissors or paper cutter
- Small clamps
- Roller



David Griffin is a computer engineer for the army by day and runs his scroll saw business, Tuliptree Crafts, by night. He lives in Huntsville, Ala.



Sea Turtle Fretwork

Simple silhouette captures the essence of a splendid creature

By Theresa Ekdorn

During a visit to the Shedd Aquarium in Chicago, Ill., I loved watching Nickel, their rehabilitated turtle from Florida, swim gracefully through the water despite an injury caused by a boat propeller. Nickel received her name when the aquarium's veterinarians discovered and removed a five-cent coin lodged in her esophagus. Nickel inspired me to create this project.

Making the Project

To start, cut the blank to size and sand it smooth. Attach the pattern to the blank. Drill blade-entry holes with a $\frac{3}{64}$ " (1.5mm)-diameter bit. I use a #3 spiral blade to cut the veins and a #5 skip-tooth blade to cut the rest of the project. Start with the legs and head, and cut the large openings on the back last. Replace the waste wood cut from the back and secure it with tape to protect the fragile fretwork. Carefully sand the wood smooth after cutting, and apply several coats of spray polyurethane according to the manufacturer's instructions. Place the finished project in a document-sized frame with a piece of black paper behind it.

Materials:

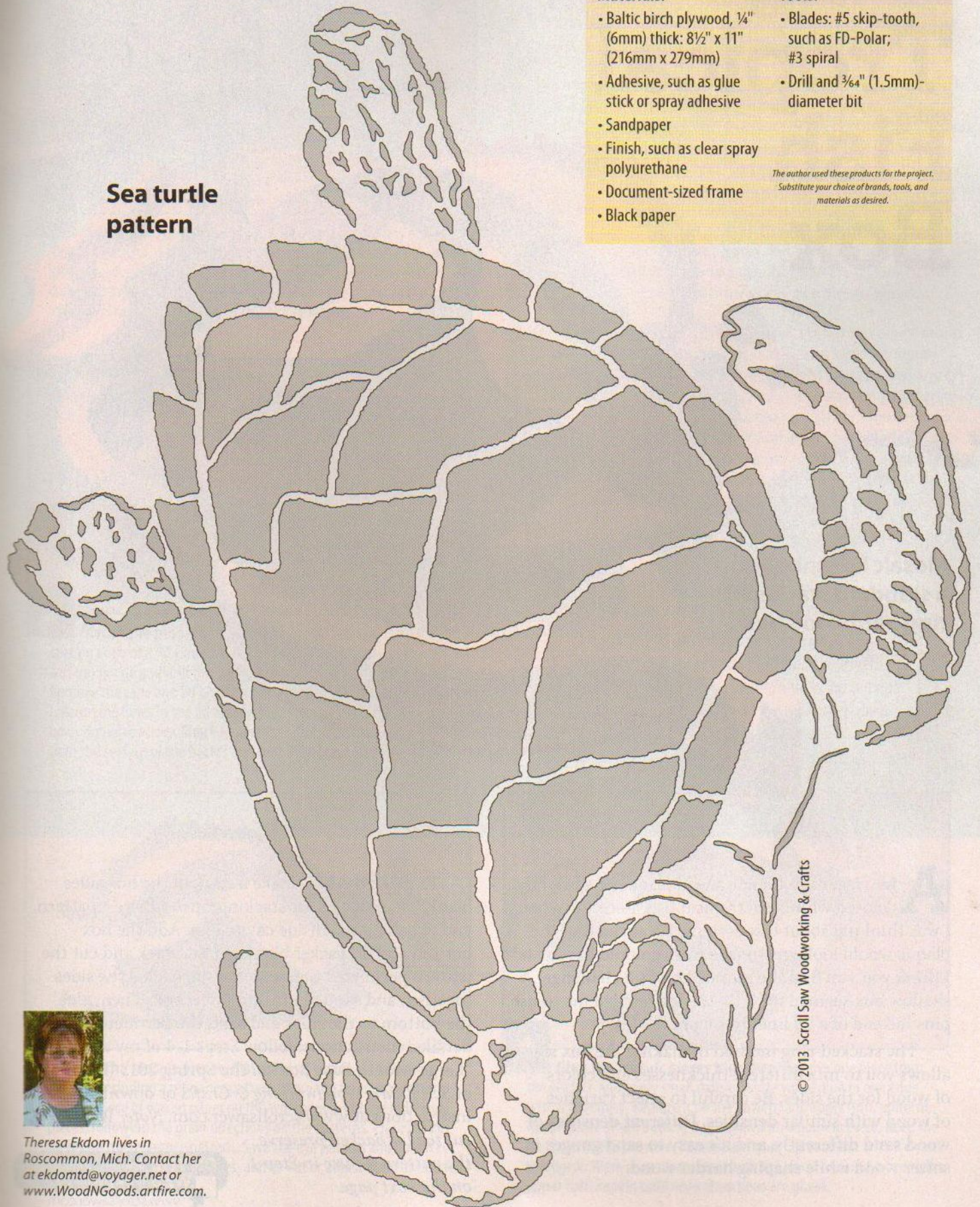
- Baltic birch plywood, 1/4" (6mm) thick: 8 1/2" x 11" (216mm x 279mm)
- Adhesive, such as glue stick or spray adhesive
- Sandpaper
- Finish, such as clear spray polyurethane
- Document-sized frame
- Black paper

Tools:

- Blades: #5 skip-tooth, such as FD-Polar; #3 spiral
- Drill and 3/4" (1.5mm)-diameter bit

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

Sea turtle pattern

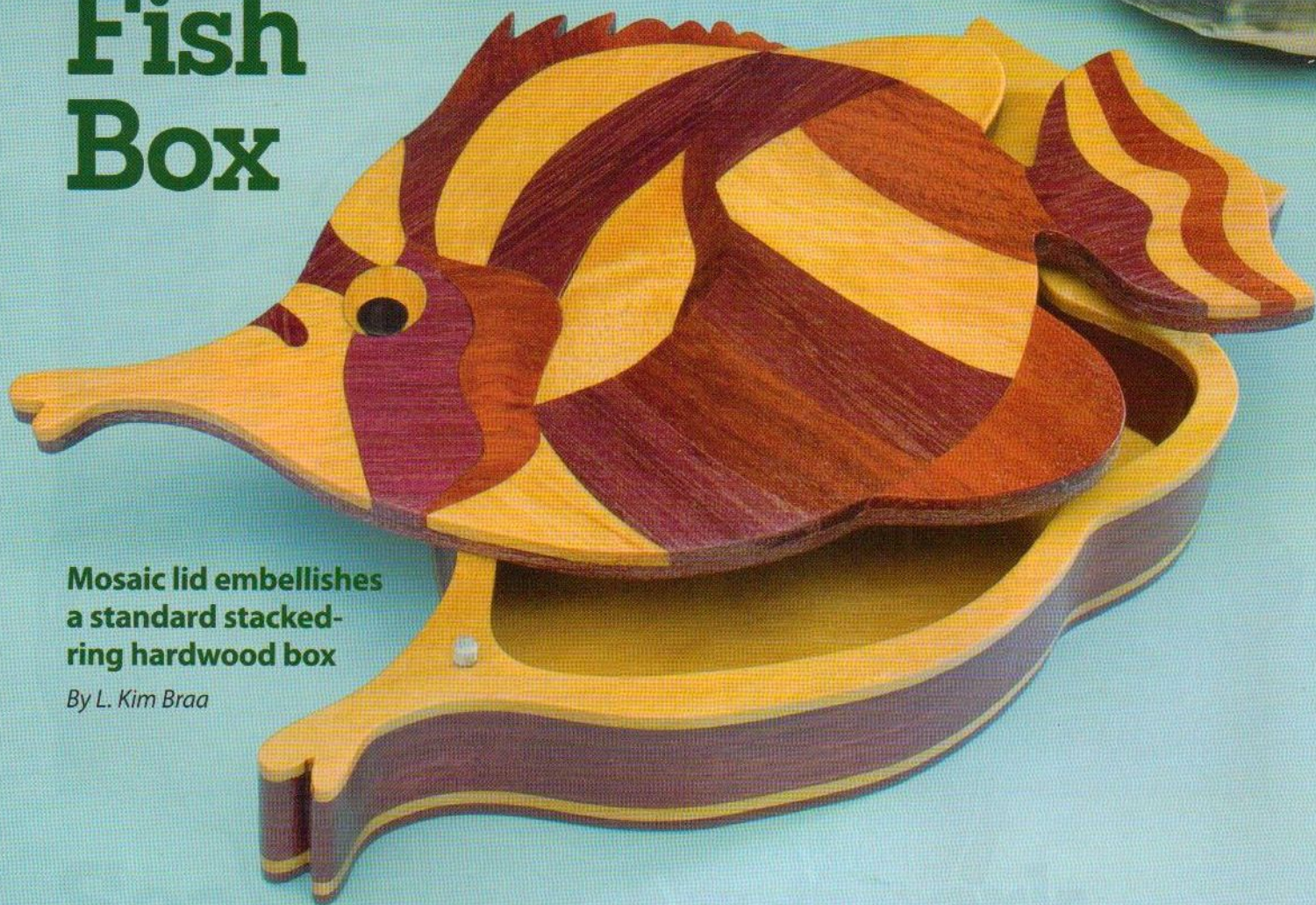


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Theresa Ekdorf lives in Roscommon, Mich. Contact her at ekdomtd@voyager.net or www.WoodNGoods.artfire.com.

Making a Tropical Fish Box



Mosaic lid embellishes a standard stacked-ring hardwood box

By L. Kim Braa

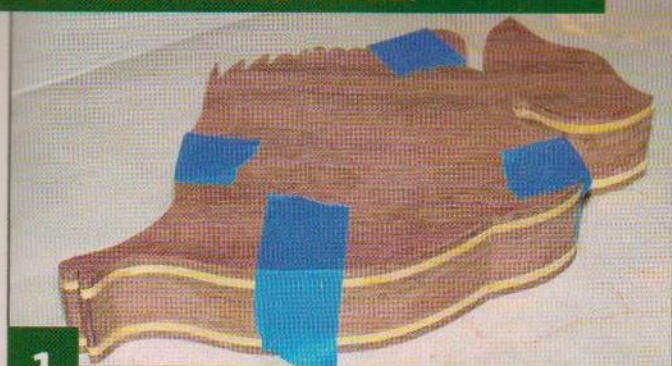
A few years ago I made a wall plaque of a brightly colored whimsical tropical fish. Recently when I was thinking about box designs, I realized that the plaque would look great made from colored hardwoods. I think you will find the mosaic lid a fun challenge. A shallow box seemed to fit the design and led me to use pins instead of a lid liner to secure the lid.

The stacked-ring method of making the box sides allows you to mix different thicknesses and colors of wood for the sides. Be careful to select varieties of wood with similar densities. Different densities of wood sand differently, and it's easy to sand gouges in softer wood while shaping harder wood.

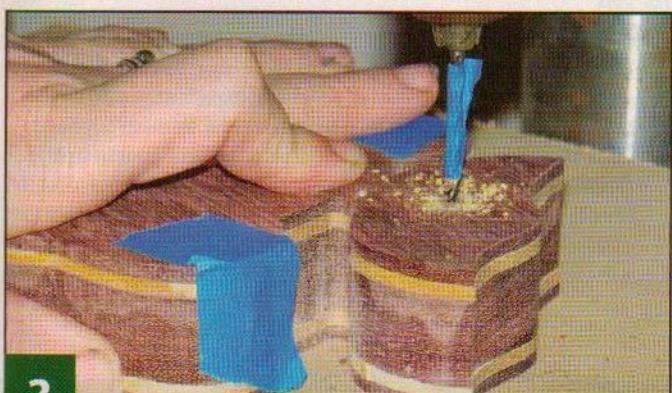
To make the box, make a stack of the box sides blanks (see page 78 for stacking tips), adhere a pattern, and cut along the inside cavity line. Add the box bottom and lid backer blanks to the stack and cut the pattern perimeter. Separate the stack, glue the sides together, and sand the inside of the box. Then, glue the bottom to the sides and sand the perimeter. For detailed instructions, follow Steps 1-4 of my article "Large-Mouth Bass Box" in the Spring 2013 (Issue 50) of *Scroll Saw Woodworking & Crafts* or download the instructions at www.scrollsawer.com. *Note: When you cut the lid backer, preserve the pattern for use in Step 1 on the next page.*

ON THE WEB Download instructions for making the fish box.
www.scrollsawer.com

FISH BOX: MAKING THE LID



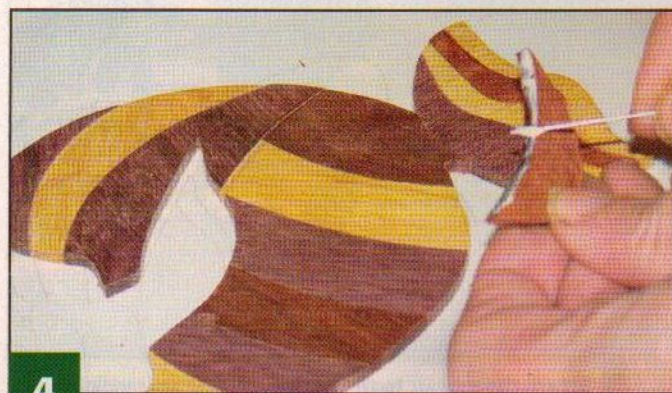
1 Prepare to install the pins. Cut two pieces of brass rod or dowel to length, remove any burrs, and sand the ends smooth. Align the lid backer on the box and secure it with painter's tape. Attach a copy of the pattern and use an awl to pierce the center of the crosshairs to mark the wood; remove the pattern.



2 Install the pins. Wrap painter's tape $\frac{3}{8}$ " (10mm) from the cutting edge of a $\frac{1}{8}$ " (3mm)-diameter brad-point bit to create a depth gauge and drill through the lid backer and into the box. Remove the tape and lid bottom. Use a $\frac{3}{4}$ " (3.6mm)-diameter bit to enlarge the holes in the lid backer. Glue the pins into the holes in the box sides with epoxy. Check to make sure the pins sit slightly lower than the surface of the backer and that the backer lifts off easily.



3 Cut the mosaic pieces. Make several copies of the mosaic pattern, including a reference pattern. Place the reference pattern under a piece of waxed paper on the workbench. Cut the individual pieces, following the grain directions on the patterns. Place the cut pieces on the reference pattern. Save the eye pattern and do not cut the pupil yet. Test-fit the pieces, and re-cut or adjust them as needed.



4 Glue the mosaic pieces together. Remove one piece from the pattern and apply small dabs of white wood glue to one edge with a toothpick. Replace it on the pattern and apply firm, uniform, flat pressure while butting it up against an adjoining piece. Keep the pieces as flat as possible. Remove any glue squeeze-out with a clean toothpick. Work in sections. Start with the lower half and move to the upper half. Repeat until several sections are glued.

Working with Exotic Wood

The varieties of wood I chose for this project rank high on the Janka wood hardness scale, which creates some challenges. Here are some tips for completing the project successfully.

- These hardwoods can splinter and scorch easily, and dull blades quickly. To keep from breaking the brittle wood, take your time, use firm pressure while cutting, and always follow the grain direction arrows on the pattern when applying it to the wood. To keep from scorching the wood, cover the pattern with clear packaging tape, use a sharp blade, and keep the saw speed slow.
- The wood can cause eye and skin irritation. Use a dust collector, respirator, and perhaps even long sleeves and gloves, especially if you have any allergies to wood.
- These varieties are usually porous, which can cause wood dust from one wood to bleed into the pores of nearby wood. When sanding, remove the dust frequently, and try to sand from the lightest wood to the darkest to keep from transferring dark sander dust to the lighter wood. Remove all of the dust using compressed air, a vacuum, or a clean soft-bristle paintbrush before you apply any liquid—even mineral spirits or adhesive remover—to the wood. The liquid will trap fine sander dust in the wood pores.

TIP

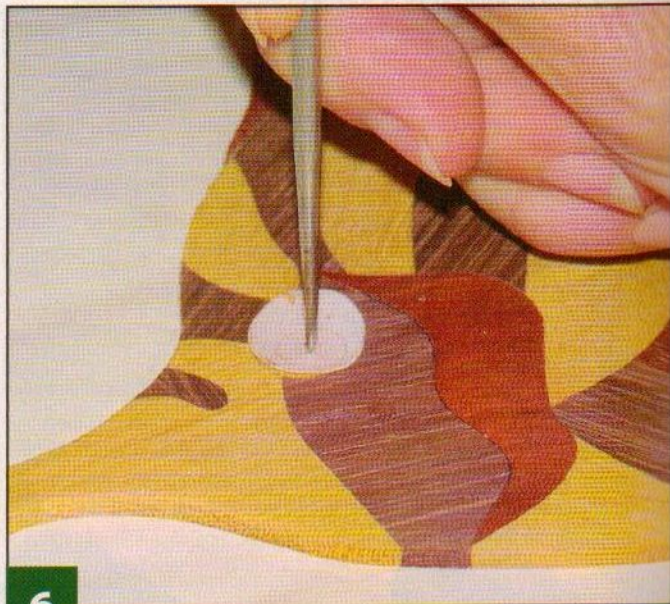
MAKE A ZERO-CLEARANCE INSERT

Some of the lid pieces are small, so I place a piece of clear packaging tape over the blade hole on the saw table to prevent the pieces from falling through. Punch through the tape with the blade to create a hole just large enough for the blade.



5

Finish gluing together the lid. Test-fit the glued-up sections on the lid backer. Apply glue to the edge of one section and butt it up to an adjoining section. Remove any glue squeeze-out using a clean toothpick. Repeat until all of the sections are glued together. Then, glue the eye and pectoral fin in place. Let the glue dry. Sand the top of the lid using progressively finer grits of sandpaper until the top of the lid is flat and smooth.



6

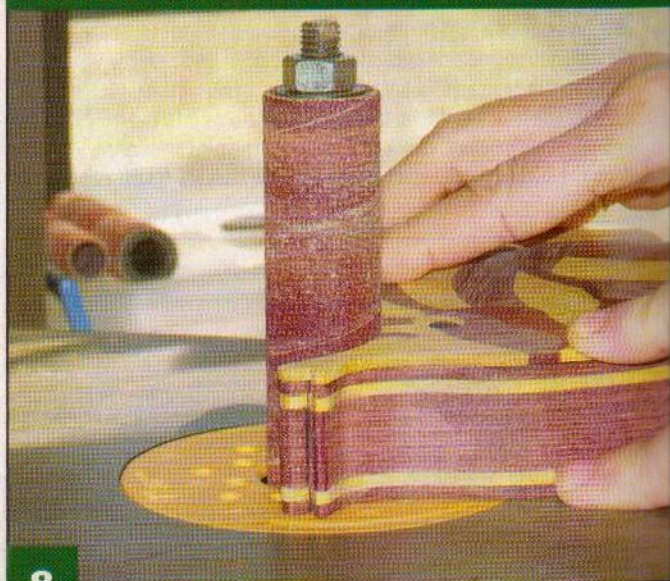
Add the pupil. Place a copy of the eye pattern in position on the lid and use an awl to pierce the center of the crosshairs to mark the wood. Remove the pattern and, while keeping a firm grip on the lid, drill a $\frac{5}{16}$ " (8mm)-diameter hole through the lid. Remove any burrs. Cut a hardwood dowel to $\frac{1}{8}$ " (3mm) long and glue it into the hole flush with the top of the lid. Remove any glue squeeze-out and let it dry. Flip the lid over and use 120-grit sandpaper to flatten the bottom of the dowel and any other raised areas on the back of the mosaic.



7

Attach the mosaic to the backer. Remove any sanding dust and apply a uniform coat of wood glue to the top of the lid bottom, staying well away from the pin holes. Place the lid on the bottom and rub the two together until the glue gets tacky. Then, align the edges. Sandwich the two pieces between two pieces of scrap wood covered in waxed paper. Clamp the pieces together for five minutes, remove the clamps, and clean any squeeze-out, especially in the pin holes. Reclamp the pieces and allow the glue to dry.

FISH BOX: FINISHING THE PROJECT



8

Sand the box. Secure the lid to the box sides with pieces of double-sided tape. Sand the outside of the lid and box to remove any blade marks, scorch marks, or glue residue. Use progressively finer grits of sandpaper up to 220 grit. Use varying drum diameters in an oscillating spindle sander and wrap sandpaper around a pencil or dowel to sand the tightest areas. Finish-sand the box with 400-grit sandpaper in a detail sander and by hand. Round the lid edges and the bottom of the box slightly.



9

Finish the box. Pry the lid off with a putty knife and remove all of the sanding dust with compressed air, a vacuum, or a clean soft-bristle paintbrush. Wipe the box lightly with mineral spirits to remove any glue residue or remaining dust, working from light to dark areas to prevent the bleeding effect. Apply several thin coats of shellac. Use the shellac sparingly on the lid to prevent bleeding. Rub the box with a brown paper bag or 0000 steel wool between coats. When the shellac is dry, apply several thin coats of semi-gloss lacquer. Using a permanent marker, sign and date the bottom of the box.

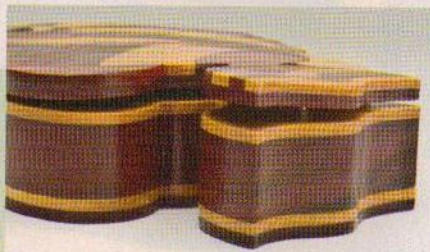
Preventing Wood Movement

By Mindy Kinsey

Thin wood is prone to warping due to changes in relative humidity. This basic fact of woodworking was illustrated to us when Kim sent the fish box from her home on the Gulf Coast to our office in Pennsylvania. As the box sat awaiting photography, the lid warped out of shape. The effect was interesting and very fish-like, but made the lid unusable as a box top.

To remedy the situation, we applied steam and pressure to the lid until it slowly flattened again. We kept it weighted until the photo shoot to prevent a recurrence of the warping. The steam caused the finish to cloud slightly, so we buffed it gently with steel wool and applied another coat of semi-gloss lacquer.

To avoid warping, we suggest using thicker wood, such as 1/2" (25mm)-thick purpleheart, for the lid backer. Or, use good-quality plywood, which will not warp, for the lid backer and disguise the plywood with stain or dye.



Materials & Tools

Materials:

- Purpleheart, 1/8" (3mm) thick: lid backer, box bottom, lid mosaic, 3 each 5 1/2" x 8 1/2" (140mm x 216mm)
- Purpleheart, 3/4" (19mm) thick: box sides, 5 1/2" x 8 1/2" (140mm x 216mm)
- Yellowheart, 1/8" (3mm) thick: box sides, lid mosaic, 3 each 5 1/2" x 8 1/2" (140mm x 216mm)
- Bloodwood, 1/8" (3mm) thick: lid mosaic, 5 1/2" x 8 1/2" (140mm x 216mm)
- Hardwood dowel, 5/16" (8mm)-diameter: pupil. *Note: To make the dark pupil, use a walnut dowel, an ebonized hardwood dowel, a hardwood dowel colored with a permanent marker, or a hardwood dowel with the tip scorched with a belt sander.*
- Brass or aluminum rod, OR hardwood dowel, 1/8" (3mm) diameter: lid pins, 2 each 3/8" (9mm) long
- Repositionable spray adhesive
- Tape: lightweight clear packaging, double-sided plastic carpet tape, painter's tape
- Glue: white wood, epoxy
- Disposable glue brush (optional)
- Corsage pin or toothpicks
- Sandpaper: grits from 120 to 400
- Sanding pads for detail sander: grits from 120 to 400
- Sanding sleeves for oscillating spindle sander: sizes from 1/2" (13mm) to 3/4" (19mm) in grits from 80 to 220
- Paper towel or lint-free cloth
- Waxed paper
- Brown paper bag or 0000 steel wool
- Shellac
- Paintbrush
- Finish: semi-gloss spray lacquer

Tools:

- Drill with brad-point drill bits: 1/16" (2mm), 1/8" (3mm), 3/64" (3.5mm), 5/16" (8mm)
- Blades: #3, #5 and #7 reverse-tooth, such as FD-UR
- Oscillating spindle sander and drums
- Detail sander
- Hacksaw
- Clamps or bowl press
- Pencil
- Black permanent marker
- Putty knife
- Awl
- Ruler

The author used these products for the project. Substitute your choice of brands, tools, and materials as desired.

Patterns for the **TROPICAL FISH BOX** are in the pattern pullout section.



L. Kim Braa grew up in the Midwest and moved to the Gulf Coast region more than 13 years ago. To see more of Kim's work, visit her website at www.gonecoastalart.com. You can contact her at lkimbreaa@att.net.

Carousel Horse Clock



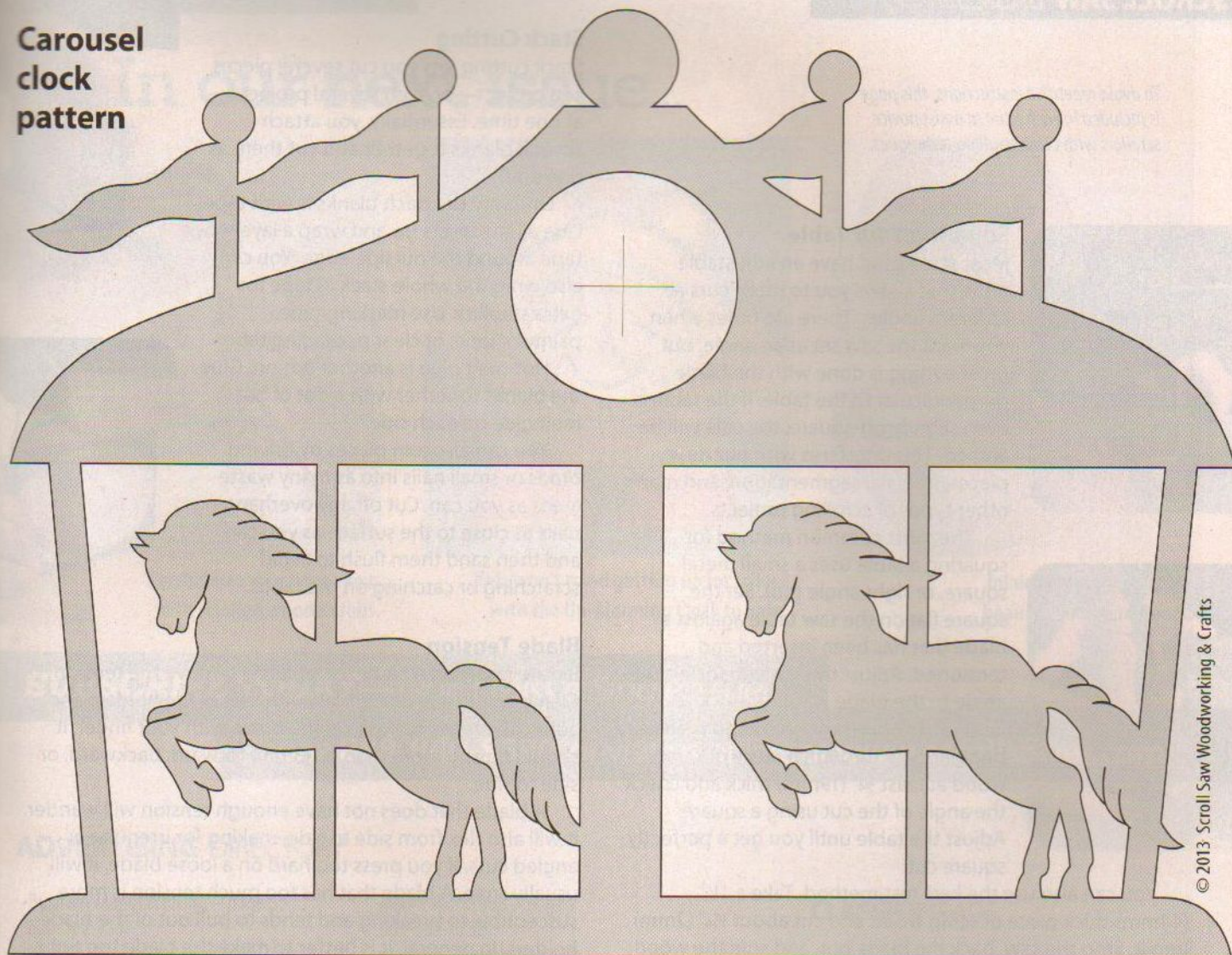
Painted or plain, this project brings home the fun of a country fair

*By The Berry Basket
Cut by Leldon Maxcy*

Most people have fond memories of riding on a carousel. Bring that joy home with a quick and easy clock project. You can either cut the piece from hardwood and finish it, or use pine or plywood and paint the clock in cheerful colors.



Carousel clock pattern



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Making the Clock

Transfer the pattern to the blank (see page 78 for a few methods) and drill blade-entry holes. Cut the fretwork using a #3 reverse-tooth blade. Then, measure the size of the back of your clock insert and drill or cut a hole that size where indicated for the insert. Cut the perimeter of the project using a #5 reverse-tooth blade. Sand the pieces to remove any rough edges or fuzzies. Apply clear spray lacquer to the entire project and attach a hanger to the back if desired. Insert the clock and hang the project or set it on a table.

The Berry Basket scroll saw pattern collection is a time-tested set of projects of varying levels of difficulty. Fellow scrollers regularly send compliments regarding the high quality of the patterns and of their enjoyment in scrolling the projects. Browse the more than 1,200 patterns at their website, www.BerryBasket.com.

Materials & Tools

Materials:

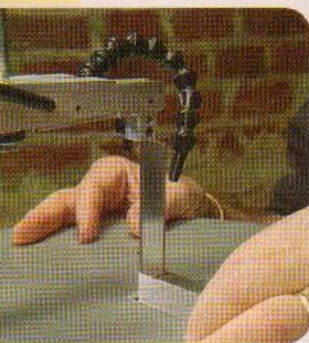
- Mahogany or Baltic birch plywood, $\frac{3}{4}$ " (19mm) thick: 6" x 7 $\frac{1}{2}$ " (152mm x 191mm)
- Clock insert: 1 $\frac{3}{8}$ " (35mm) diameter
- Sandpaper
- Clear spray lacquer
- Paint (optional)
- Picture hanger

Tools:

- Blades: #3 & #5 reverse-tooth
- Drill with assorted small bits

*The author used these products for the project.
Substitute your choice of brands, tools, and materials as desired.*

To avoid repetitive instructions, this page is included in each issue to assist novice scrollers with basic scrolling techniques.



Squaring Your Table

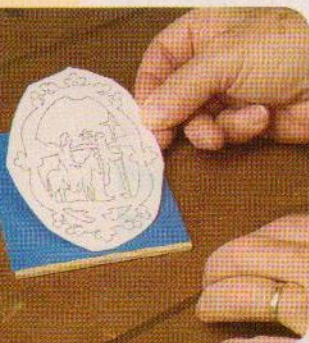
Most scroll saws have an adjustable table that allows you to make cuts at different angles. There are times when you want the saw set at an angle, but most cutting is done with the blade perpendicular to the table. If the table is even slightly off-square, the cuts will be angled. This interferes with puzzle pieces, intarsia, segmentation, and many other types of scrolling projects.

The most common method for squaring a table uses a small metal square, or right angle tool. Set the square flat on the saw table against a blade that has been inserted and tensioned. Adjust the table to form a 90° angle to the blade.



The cutting-through method is also popular. Saw through a piece of scrap wood at least 3/4" (19mm) thick and check the angle of the cut using a square. Adjust the table until you get a perfectly square cut.

You can also use the kerf-test method. Take a 1 3/4" (44mm)-thick piece of scrap wood and cut about 1/8" (2mm) into it. Stop the saw, back the blade out, and spin the wood around to the back of the blade. If the blade slips easily into the kerf, the table is square. If it doesn't slide into the kerf, adjust the table and perform the test again until the blade slips in easily.



Attaching Patterns

Temporary-bond spray adhesive is the most common method used to attach patterns to stock. Photocopy the pattern. Spray the adhesive on the back of the copy of the pattern, wait a few seconds, and then press the pattern down onto the blank. Rubber cement or glue sticks work similarly.

You can also use graphite or carbon transfer paper. Place the pattern on the blank and slip a sheet of transfer paper in between the pattern and the blank. Use a few pieces of painter's tape to hold the pattern and transfer paper in place. Trace around the pattern with a red pen (so you know where you have traced). Choose a light-colored transfer paper for darker woods. Carbon paper costs less than graphite paper, but must be sanded off before finishing.

Stack Cutting

Stack cutting lets you cut several pieces of a project—or even several projects—at one time. Essentially, you attach several blanks together and cut them as one unit.

One way to attach blanks is with tape. Line all the layers up and wrap a layer of tape around the outside edge. You can also wrap the whole stack in tape for extra stability. Use masking tape, painter's tape, or clear packaging tape.

Hot-melt glue is another option. Glue the blanks together with a dot of hot-melt glue on each side.

You can also join pieces by driving brads or small nails into as many waste areas as you can. Cut off any overhanging nails as close to the surface as you can, and then sand them flush to avoid scratching or catching on the table.



Blade Tension

Before inserting a blade, completely remove the tension. Clamp both ends of the blade into the blade holders and adjust the tension. Push on the blade with your finger. It should flex no more than 1/8" (3mm) forward, backward, or side to side.

A blade that does not have enough tension will wander. It will also flex from side to side, making for irregular or angled cuts. If you press too hard on a loose blade, it will usually snap. A blade that has too much tension is more susceptible to breaking and tends to pull out of the blade holders. In general, it is better to make the blade too tight rather than too loose.

Blade-entry Holes

Some patterns have blade-entry holes marked. If the pattern doesn't, place the holes near a line to be cut to prolong the blade life, but don't place the hole on a curving line or inside corner (if possible). Drill the hole perpendicular to the blank. Use a drill press if you have one; otherwise, use a hand drill and make the holes as vertical as possible. Drill through the blank into scrap wood to prevent tear out on the back side of the blank. If you have the space, use a larger bit—it will make it easier to thread the blades through. For thin veining cuts, use the smallest bit the blade will fit through.



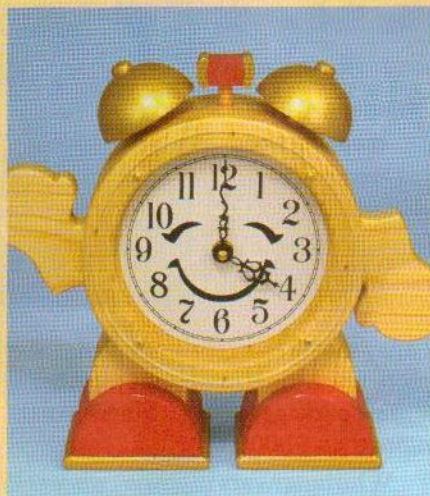
Removing Patterns

Dampen a glued paper pattern with mineral spirits to aid in removal. Commercial adhesive removers work as well. A quick wipe of mineral spirits will remove most adhesives left behind on the wood.

In our next issue...



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Summer Whirligig Wars

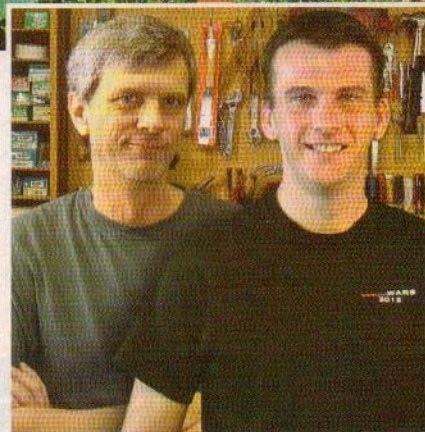
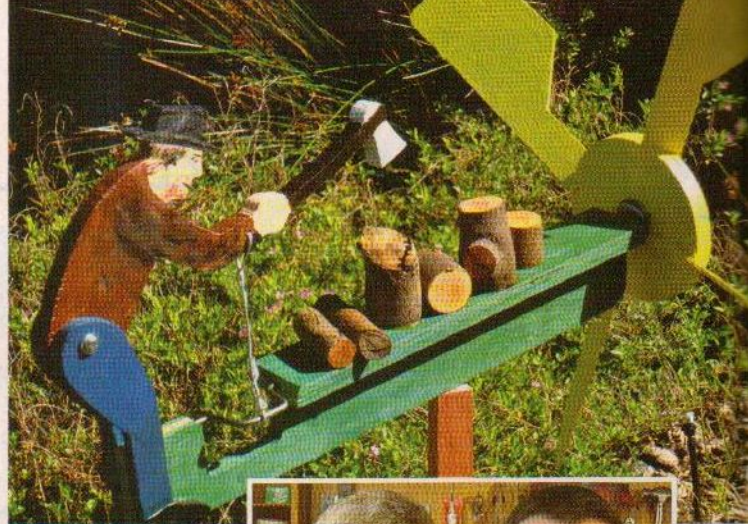
The Second Annual Whirligig Wars are underway, so imagination and creativity are transforming wood into whirligigs around the world. A whirligig is any object made to spin or whirl in the wind. Designs range from a pinwheel, to a bird flapping its wings, to an airplane with spinning propellers. Although whirligigs can be made from many materials, this particular battle is waged in wood.

Inspiration struck woodworker Laney Shaughnessy after his friend Steve Ramsey (www.woodworkingformeremortals.com) posted a YouTube video of his first whirligig. The response was encouraging, and one viewer said it would make a great contest. Laney jumped on the idea and put it into motion. "Whirligigs are fun to build, and you are only limited by your imagination, which means the possibilities are endless! That's what makes this contest so interesting,"

Steve's first whirligig of a man chopping wood inspired Laney to create and organize the annual Whirligig Wars.

Laney said. To make the challenge even more rewarding, Laney put together a prize package for the winners worth more than \$1,000.

Whirligig Wars is now a two-week online event in July. Woodworkers battle for a chance to win prizes by building creative whirligigs and entering them via photographs and videos. Laney hopes these Whirligig Wars will encourage woodworkers and hobbyists alike to have a little fun. For contest and prize information, visit www.asimpledesignofocala.com



Steve Ramsey (left) and Laney Shaughnessy



Diana Thompson has designed compound patterns for 14 years.

Garden Delights

Alabama scroll saw artist Diana Thompson doesn't need a green thumb to grow gorgeous flowers; instead, she uses a piece of wood and a scroll saw.

Diana discovered her husband's scroll saw 14 years ago. "One day after Bob went to work, I just decided to try it out," she said. Diana learned to scroll by following other people's patterns and instructions, and then began experimenting on her own.

Before long she stumbled on a compound-cutting pattern. Intrigued with the process, she wanted more. When she discovered how few compound-cutting patterns were available, she began designing her own. "Just out of curiosity, I tried cutting a petunia blossom out of wood. To my

great surprise, the method worked!" Diana said. "I went on to design over 20 varieties of flowers with vases or flower pots for each one."

Over the span of her career, Diana has created everything from carousel music boxes with horses, to small birdhouse ornaments, and even chess sets. However, flowers remain among her favorite creations. Although she has retired from the bulk of her scroll saw business, don't be surprised if a few more flower designs pop up. "Old habits die hard," she said with a laugh. "I can't imagine not creating more of them!"

Diana has written several articles and five books about scroll saw art and compound cutting. For more of her patterns, visit her website, www.scrollsawinspirations.com. Her books are available through Fox Chapel Publishing, 1-800-457-9112 or www.foxchapelpublishing.com.



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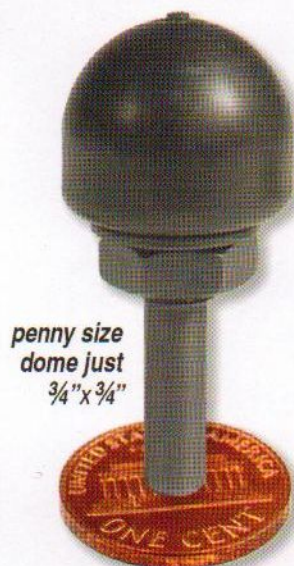
P.O. Box 19053

Lenexa, KS USA 66285

www.carvingtechnologies.com

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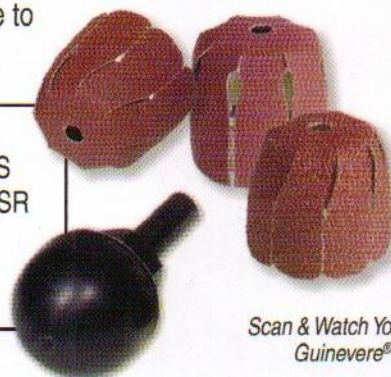
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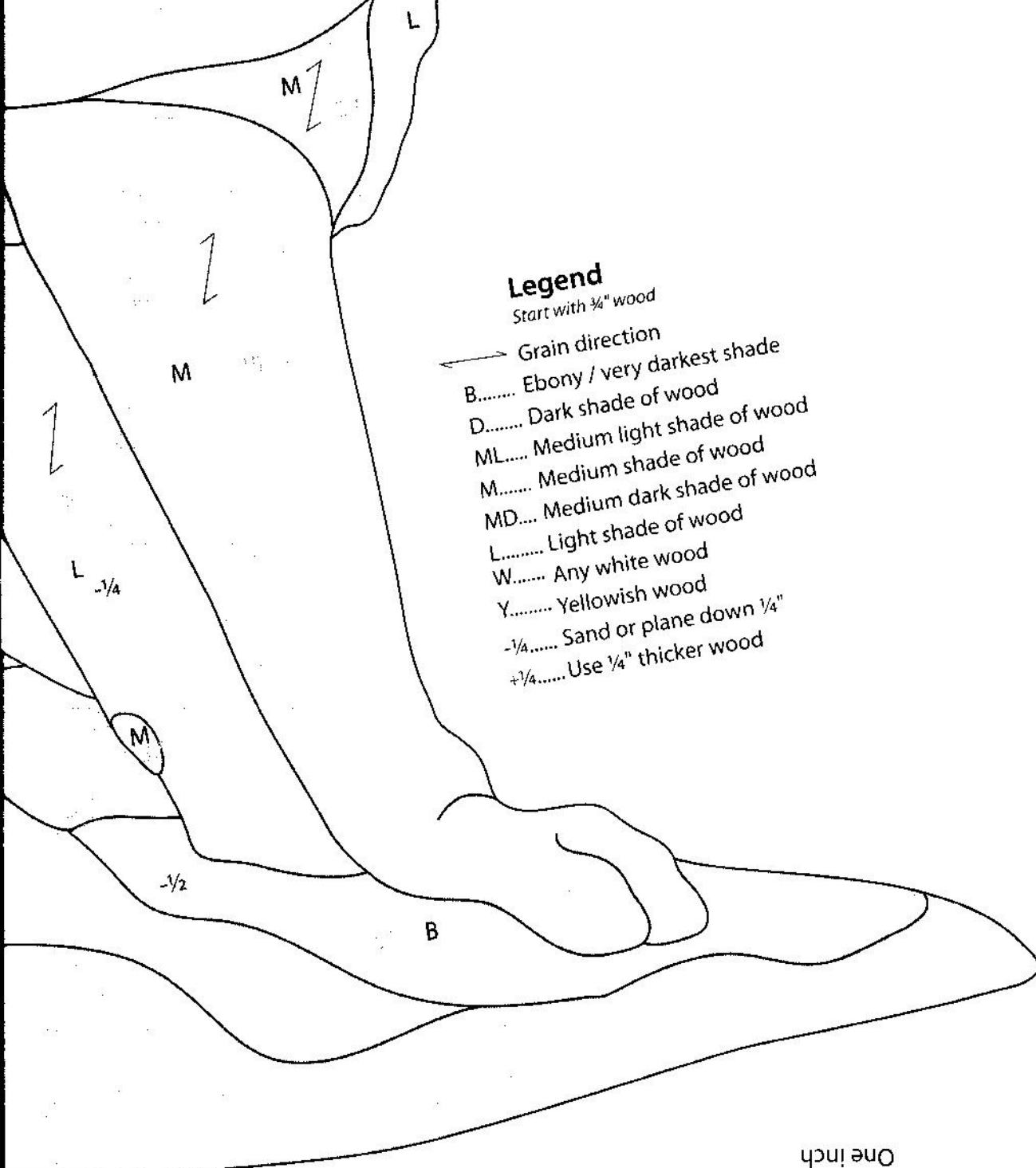
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katools.com



Legend

Start with 3/4" wood

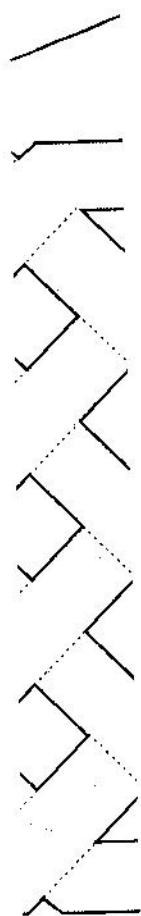
← Grain direction

- B..... Ebony / very darkest shade
- D..... Dark shade of wood
- ML..... Medium light shade of wood
- M..... Medium shade of wood
- MD.... Medium dark shade of wood
- L..... Light shade of wood
- W..... Any white wood
- Y..... Yellowish wood
- 1/4..... Sand or plane down 1/4"
- +1/4..... Use 1/4" thicker wood

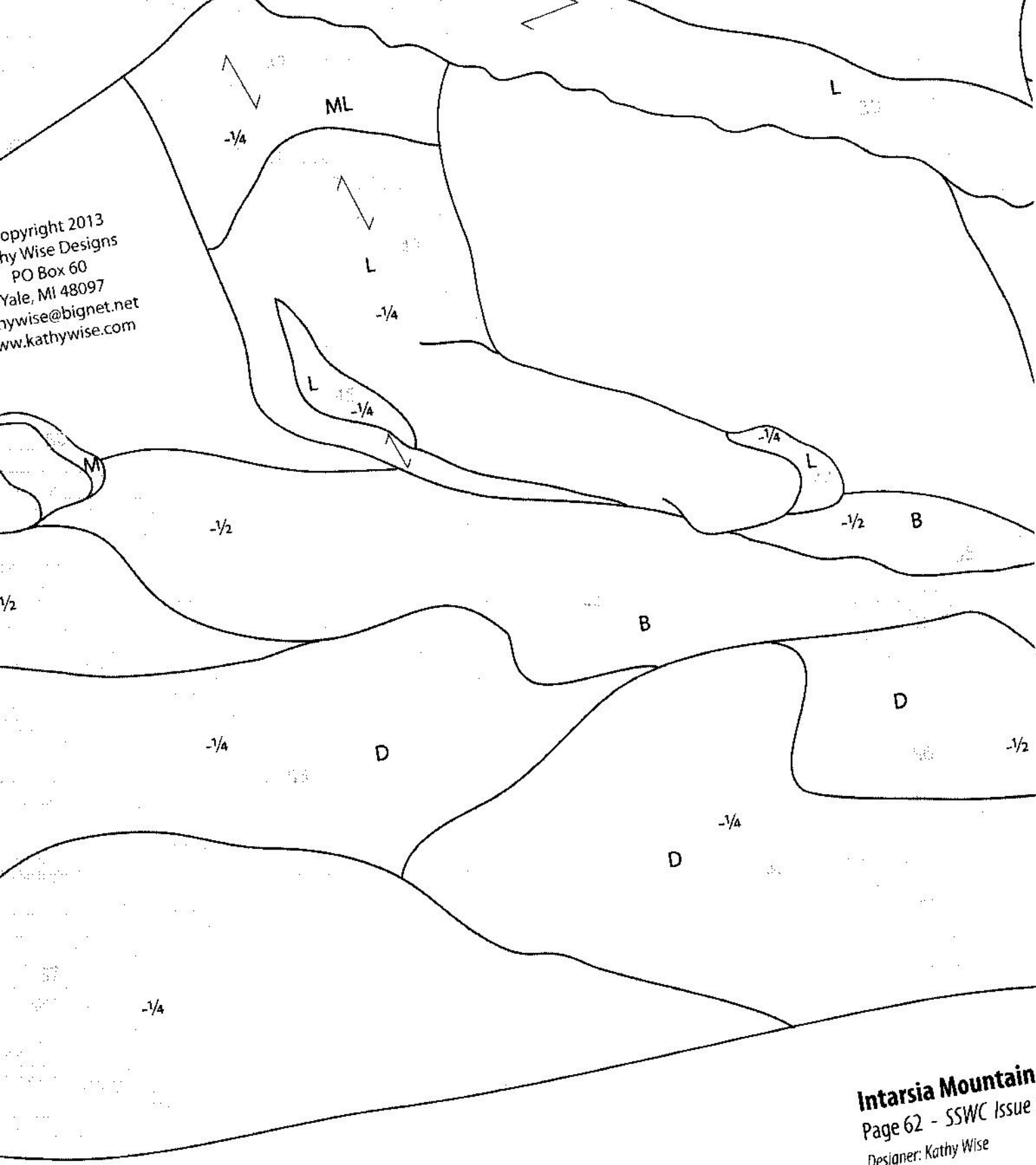
One inch



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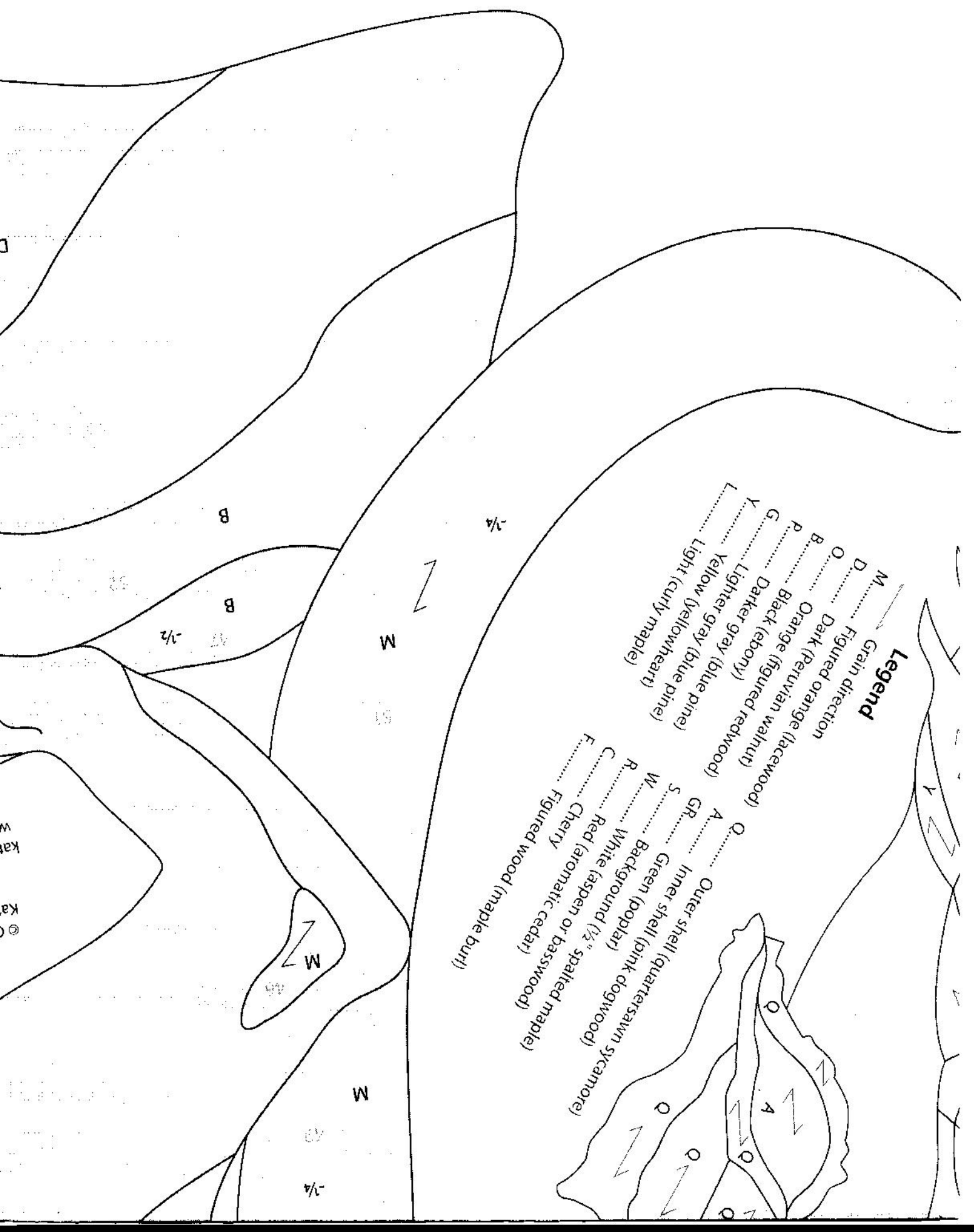


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Kathy Wise Designs
PO Box 60
Yale, MI 48097
kathywise@bignet.net
www.kathywise.com



Legend

- M Grain direction
- D Figured orange
- O Dark (Peruvian walnut)
- B Orange (figured redwood)
- P Black (ebony)
- G Darker gray (blue pine)
- Y Lighter gray (blue pine)
- L Yellow (yellowheart)
- A Outer shell (quartersawn sycamore)
- GR Inner shell (pink dogwood)
- S Green (poplar)
- W Background (1/2" spalted maple)
- R White (aspens or basswood)
- C Cherry
- F Figured wood (maple burr)

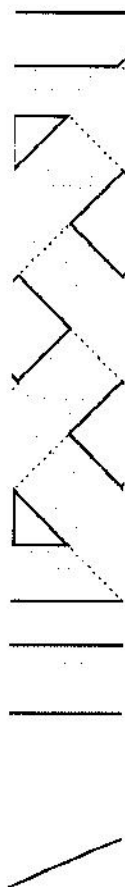
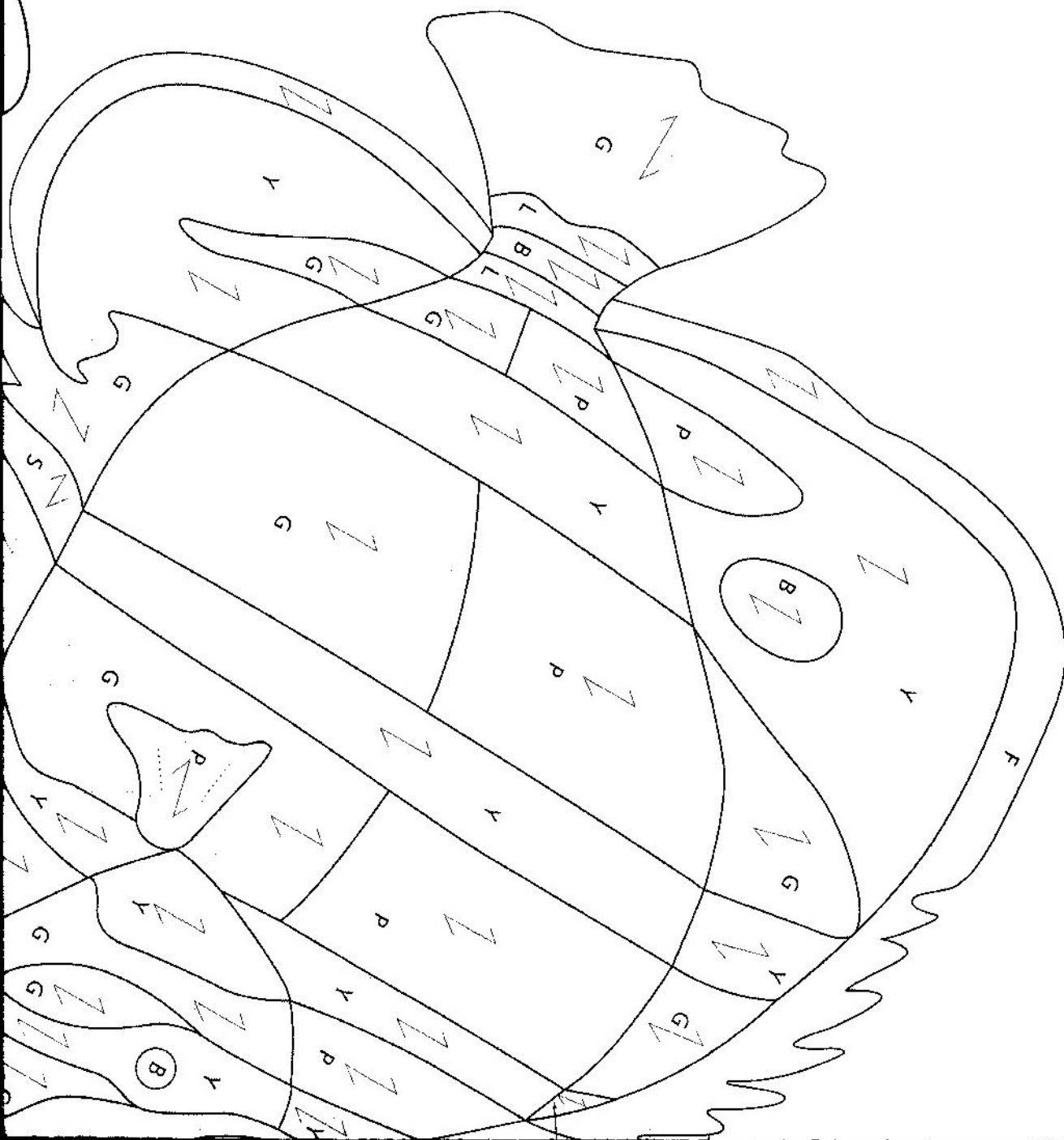


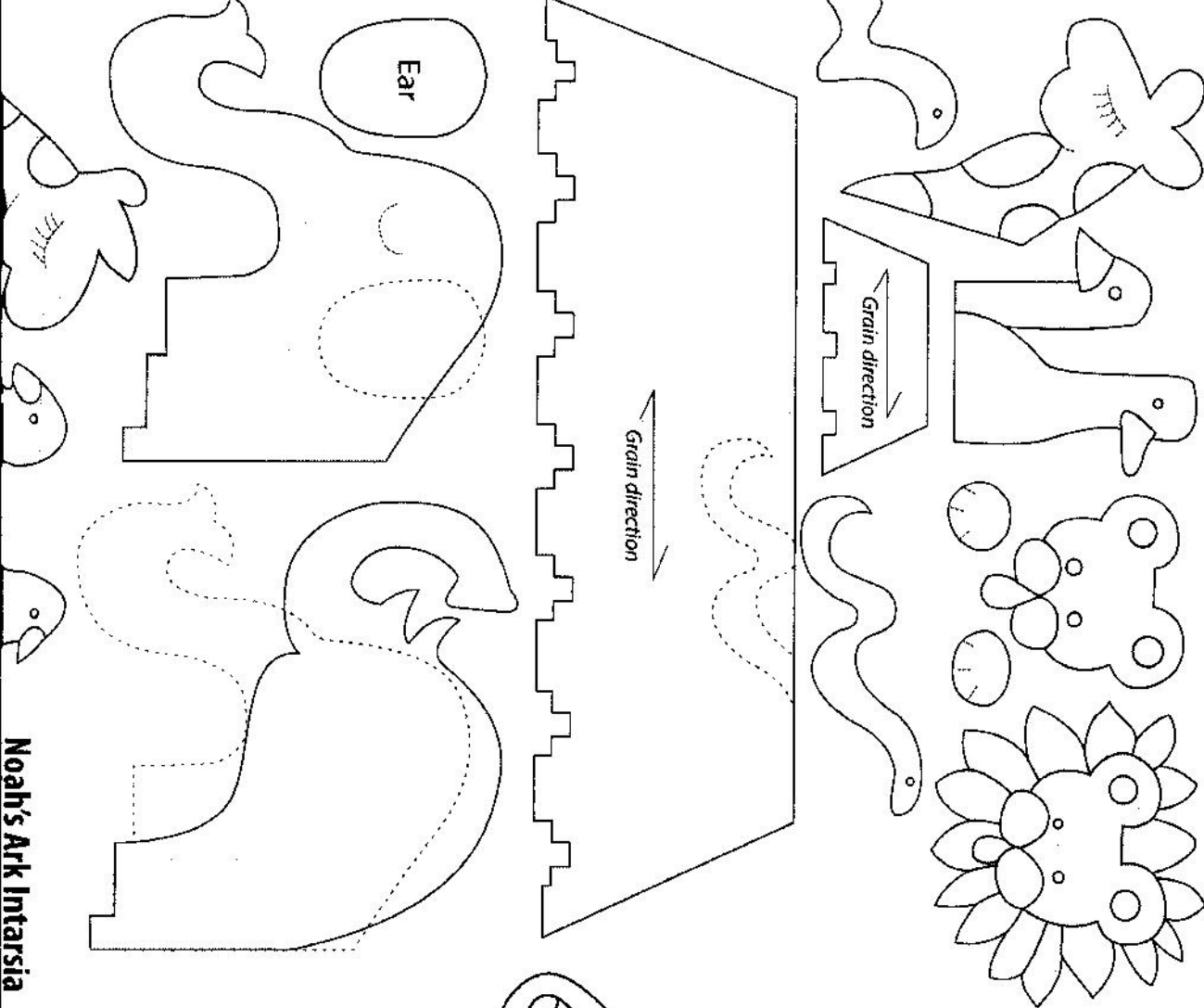
All patterns to be copied at 100% unless otherwise indicated.

All patterns on this pullout section: © 2013 Scroll Saw Woodworking & Crafts

Marine Life Intarsia	20	Making a Wooden Gear Clock.....	48
Shark Bait Kinetic Sculpture	30	Intarsia Mountain Lion	62
Noah's Ark Intarsia.....	35	Making a Tropical Fish Box	72
Celtic Knot Projects.....	41		

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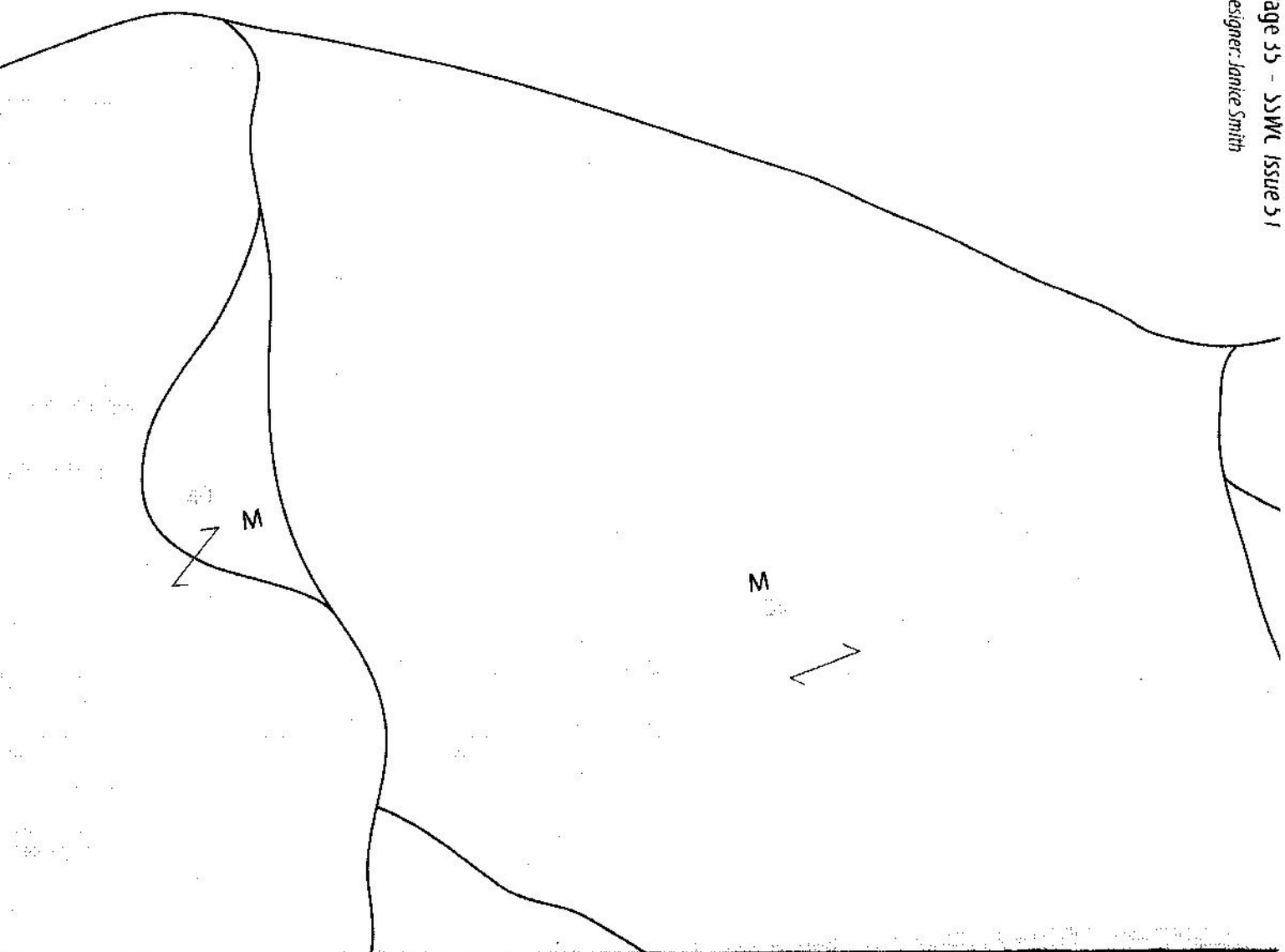
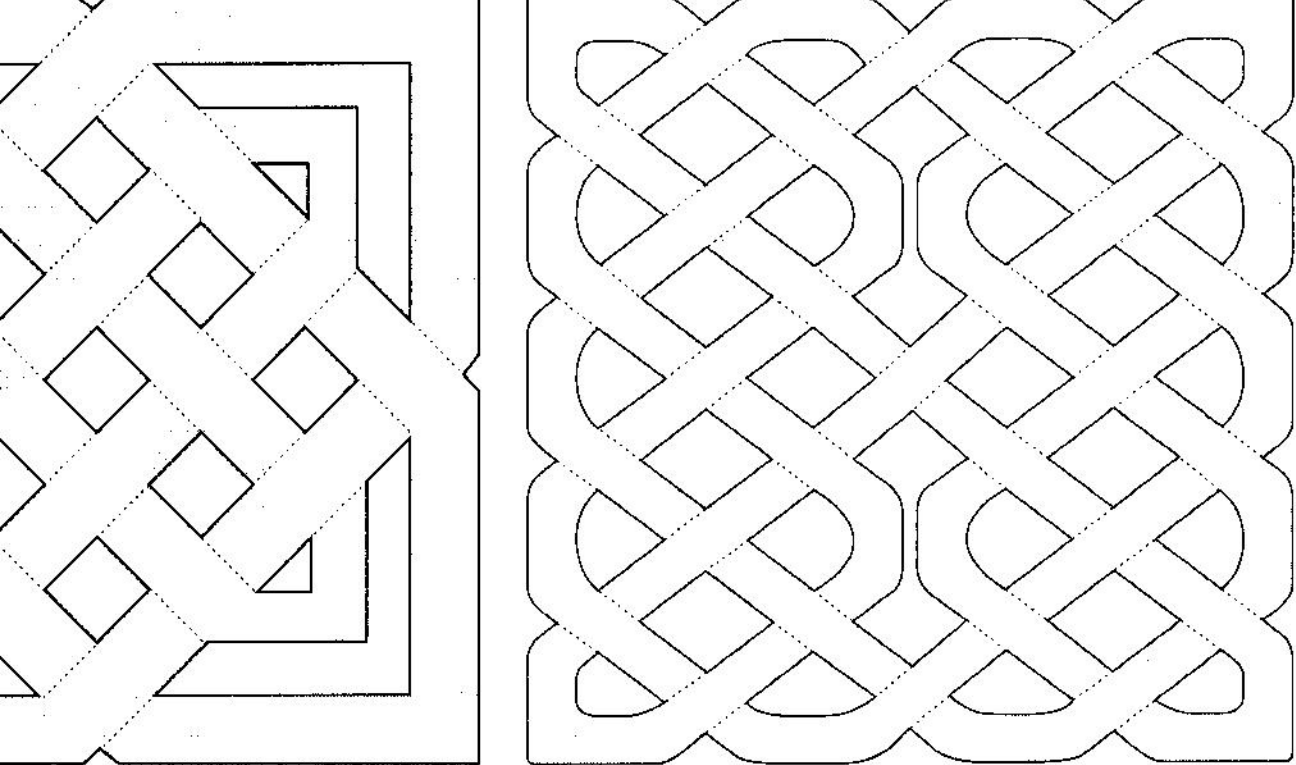
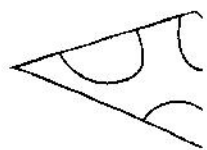


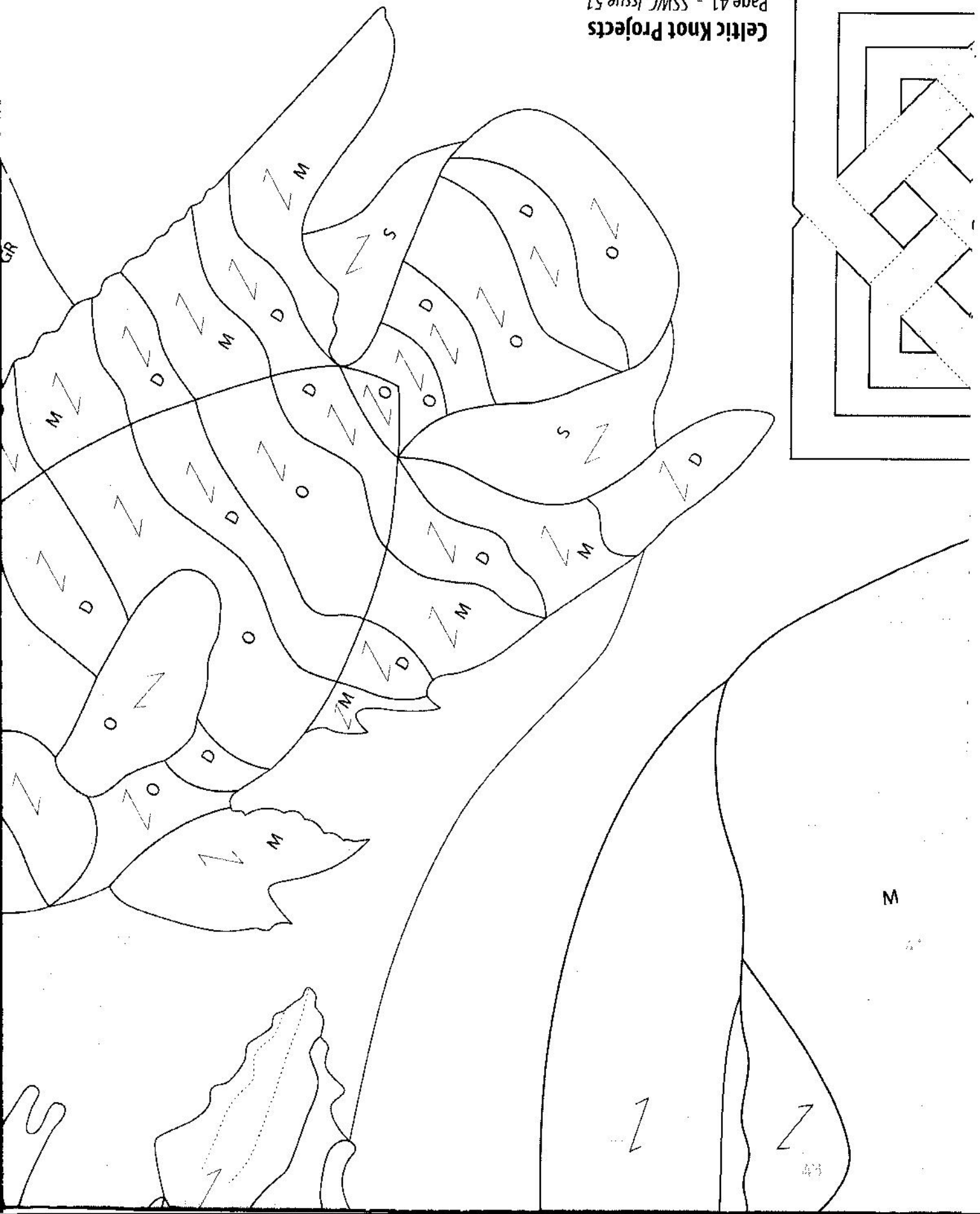
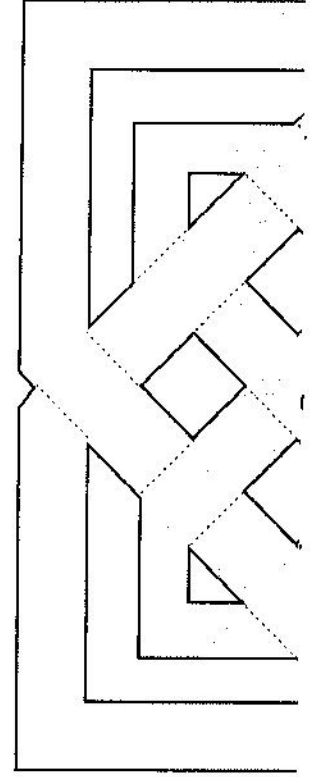
Noah's Ark Intarsia



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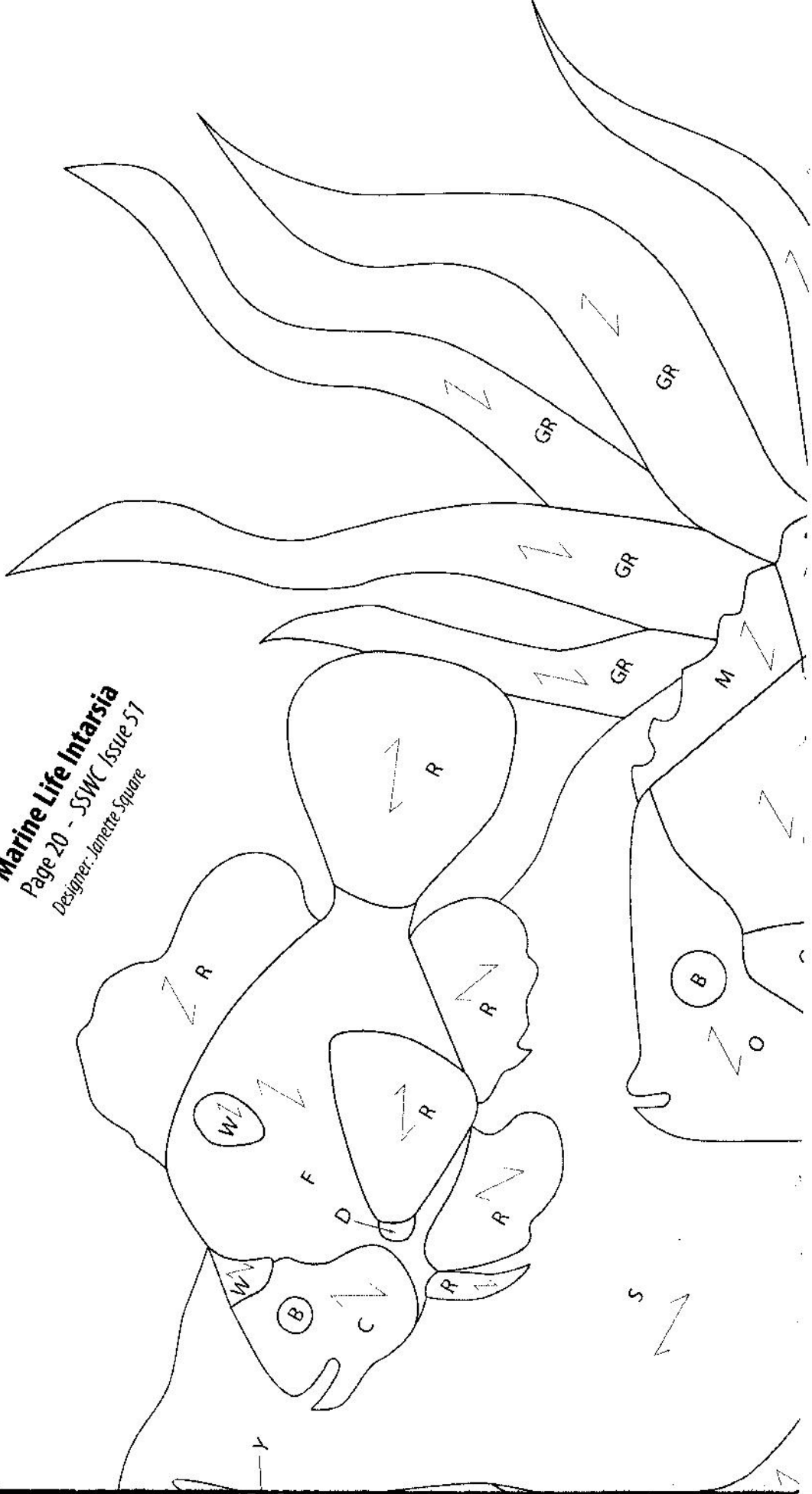
Woodburn
 whiskers



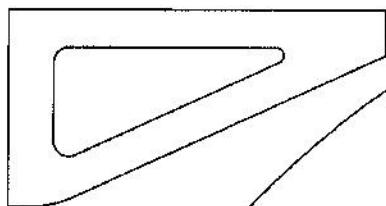


Marine Life Intarsia
Page 20 - SSWC ISSUE
Editor: Janette C.

Life Intarsia
#20 - SSWC Issue 57
Designer: Janette Square



Back frame
bracket



meter

11

12

1

10

Hour hand

$\frac{9}{32}$ "-diameter
hole

$\frac{1}{4}$ "-diameter
hole

Ratchet

Minute hand

$\frac{1}{4}$ "

$\frac{7}{32}$ "-diameter
hole

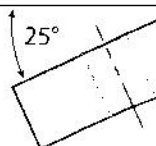
Inner drum

Cut 2

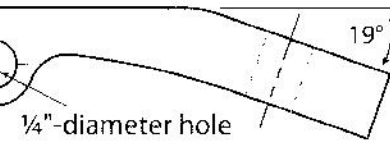
Pawl

$\frac{3}{16}$ "-diameter
hole

Outer
Cl

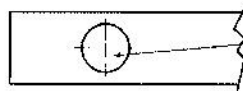


Escapement

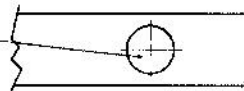


$\frac{1}{4}$ "-diameter hole

8



$\frac{1}{4}$ "-diameter
holes (2)



7

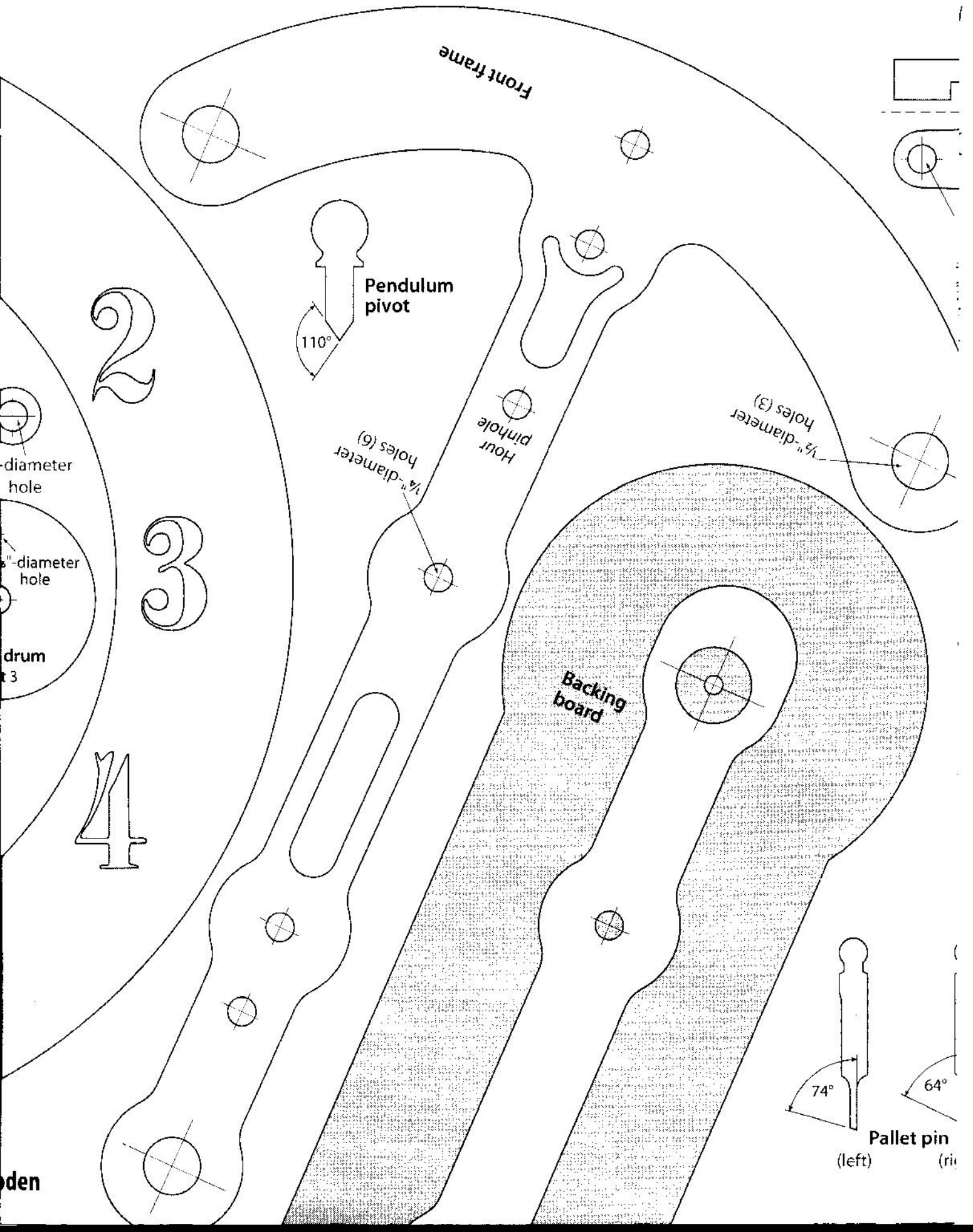
6

Clock face

5

Pendulum
head

Making a Wo
Gear Clock



Painting template

Exact centers measuring strip
Shark and fish

Base - 1/2" plywood
5/64"-diameter
holes (6)

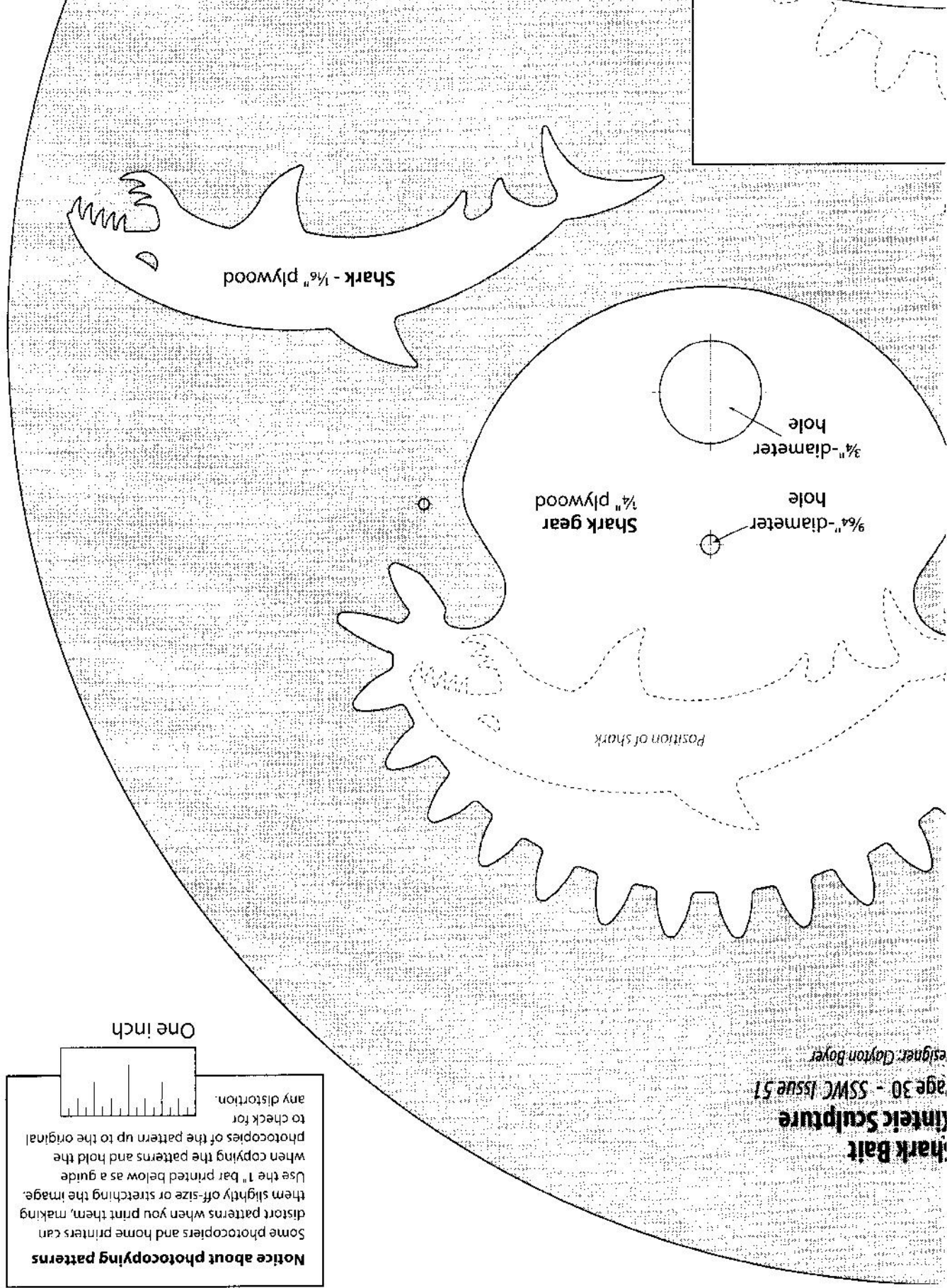
Fish - 1/4" plywood
Cut 5

5/64"-diameter
holes (3)

1/4"-diameter
hole

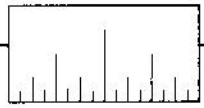
Yoke

k support
 Fram
 3/16"-dia
 Drill dui
 Fran
 spac
 Cut
 50mm c
 3/32"
 Pawl



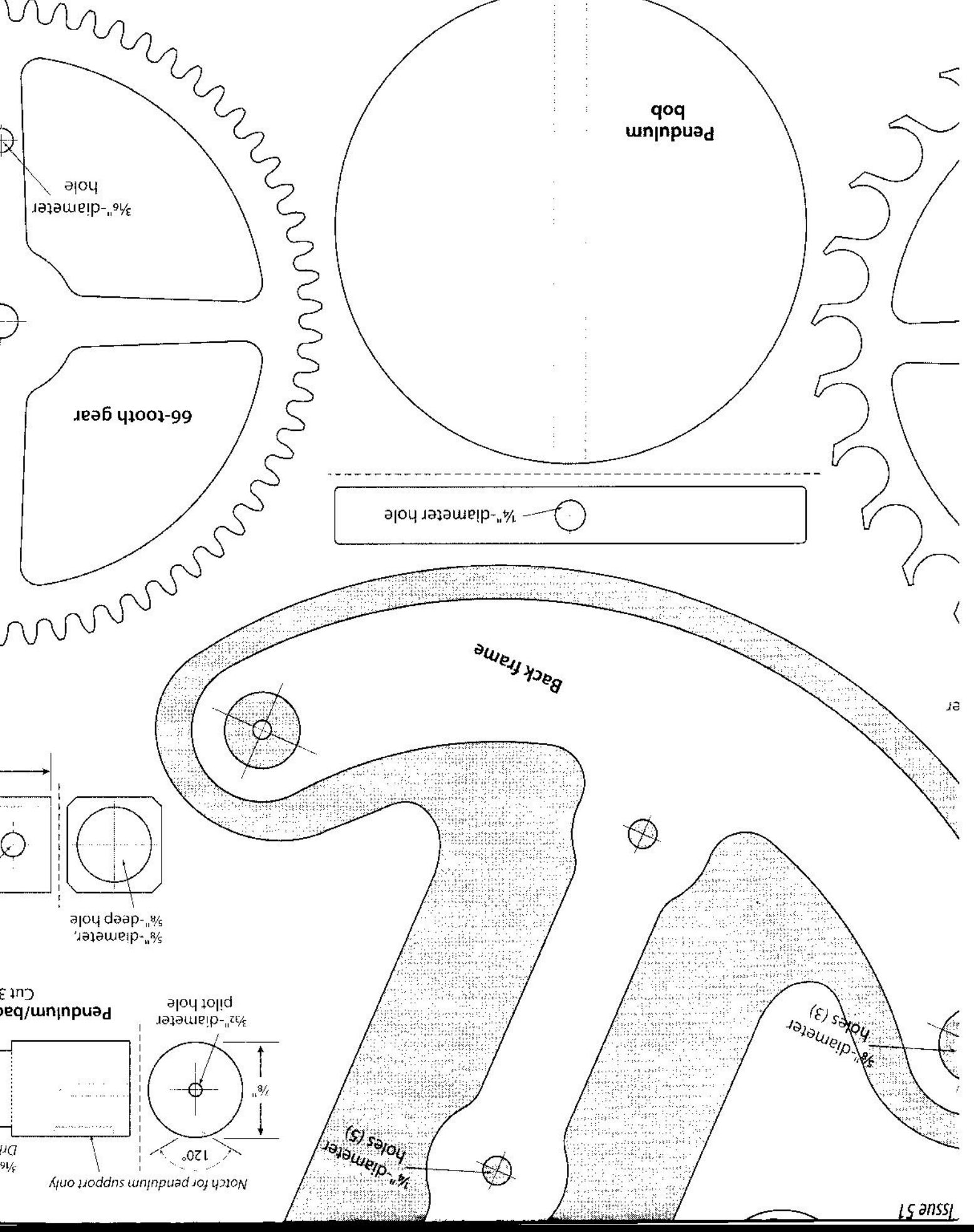
Notice about photocopying patterns

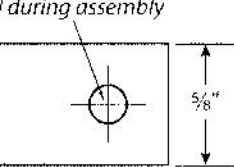
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One inch

Shark Bait
Antic Sculpture
 age 30 - SSWC Issue 51
 Designer: Clayton Boyer



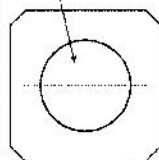


Support block

Frame pinhole
3/16"-diameter hole
Drill during assembly

1/2"-diameter,
3/8"-deep hole

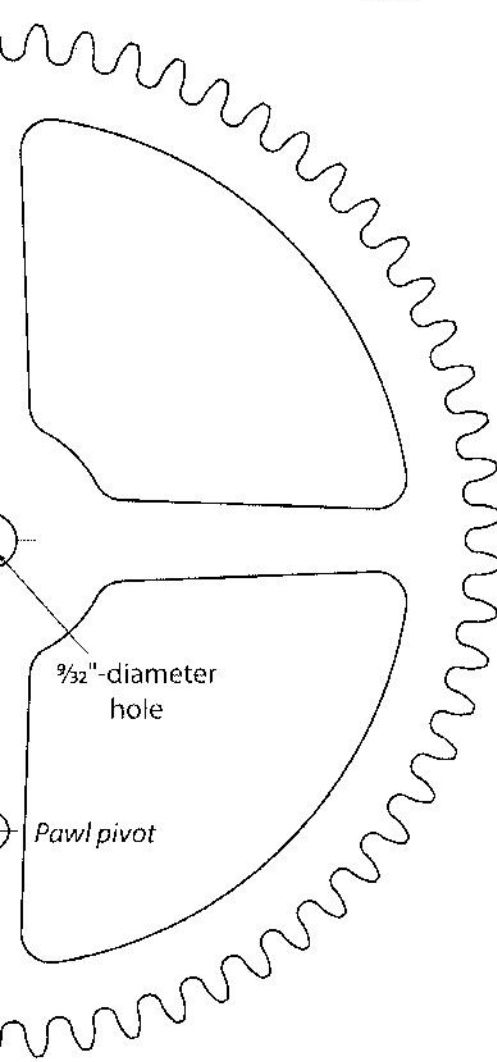
Frame
spacer
Cut 3



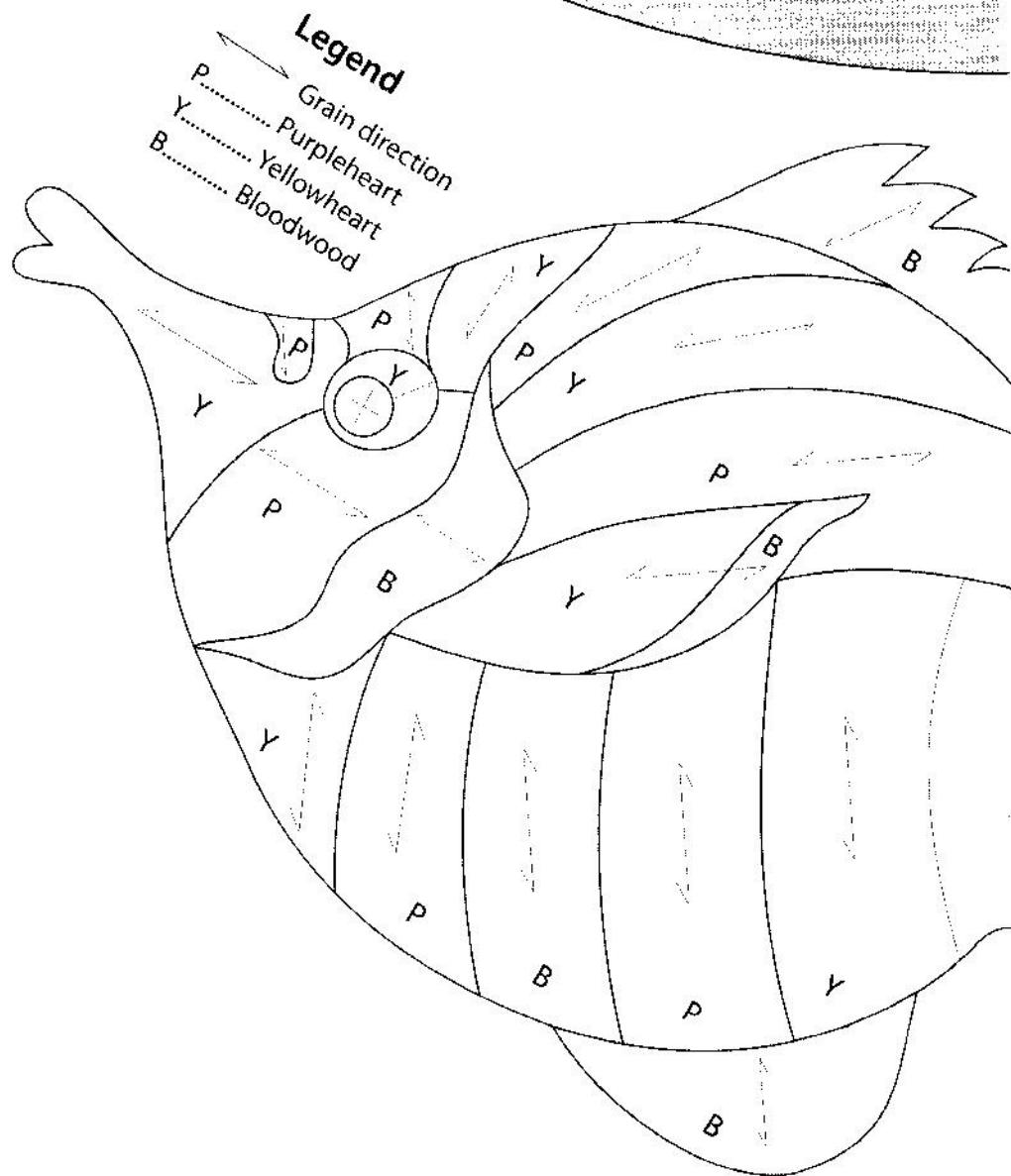
50mm critical



Frame pin
Cut 3



First spray your fish a color of
white areas in the pattern ab
Spray white paint over patter



our choice. Cut out
e. and align over fish.
onto fish.

Making a Tropical Fish Box

Page 72 - SSWC Issue 51

Designer: L. Kim Braa

1/4"-diameter
hole