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Singapore ball p68



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Weekend workbench p54

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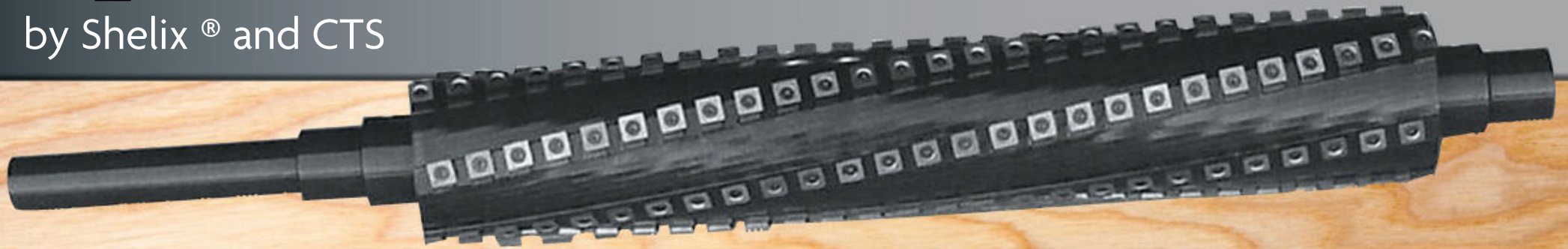
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It all seems impossible until you know how.



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from the editor Sawdust

Gravity always wins is my introductory statement when demonstrating how to craft hand-cut dovetails. Over the years I have always tilted the tailpiece in the vice so the cut is vertical. I start the cut with the saw perpendicular to the surface and then tilt the blade to the vertical. Of course, I always stand at the bench and move my body so I am always in line with the tool. On page 12 you can read how David Barron's dovetail guides change the paradigm, allowing you to tilt the saw with confidence and cut repeatable dovetails with amazing accuracy, all while sitting on a stool!

YouTube is full of fabulous tutorials on how to solve woodworking problems. David Barron has a wealth of clever and insightful videos to enjoy. Life is too short to subscribe to them all, however I do have a soft spot for Rob Cosman "Live". I am transported back to my Canadian workshop and can just about smell the Douglas fir and white pine he often uses. The team at Japanese Tools Australia has developed an informative set of YouTube videos that show you how to sharpen chisel and plane blades, as well as how to adjust a blade in a Japanese plane (and how washi is made).

Col Hosie also goes live online on a Sunday and takes you through the project at hand. In May I was surprised to see the centreline technique I developed in issue 168 being showcased and then improved upon by Col.

You are never too old to learn something new!

Happy woodworking!

Chris

Chris Clark, Editor

Australian Woodsmith acknowledges the Cammeraygal people, Traditional Custodians of the land on which this publication is produced, and pay our respects to their Elders past and present. We extend that respect to all Aboriginal and Torres Strait Islander peoples today.



This symbol lets you know there's information online at: www.australianwoodsmith.com.au. There you'll see bonus cutting diagrams, articles on techniques, jigs and a lot more. If you don't have access to the internet, contact us on (02) 9439 1955.

Tips & Techniques



ZERO-CLEARANCE TABLE SAW INSERT

After purchasing a new table saw, I needed to make extra zero-clearance table inserts. The problem was adjusting the table insert to be flush with the top of the table. I decided to drill oversized holes in each corner, which ended up being about one-and-a-half times the size of my set screws. I countersunk each side, then I filled each hole with epoxy. The countersunk holes are important to lock the epoxy in place from both sides. Then I just drilled and tapped the epoxied

holes as normal. Be sure to keep track of the hole's centre for when it comes time to tap. Since these tapped holes aren't through steel, you should use as long a set screw as possible to utilise as many threads as you can, providing extra strength and stability to the insert.

As you can see from the pictures, I now have my 12mm zero-clearance table insert with a set screw in each corner to adjust the height.

Michael Behrmann



▲ Once the epoxy cures, remove the painter's tape and drill through the epoxy. Then tap it to accept the set screw.



▲ Once the insert is set in place, use an Allen key to adjust each set screw until the insert is flush with the saw table.

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SAFETY IN THE WORKSHOP

Safety devices, such as riving knives, guards on table saws and guards over router bits have been deliberately left out of the line drawings in *Australian Woodsmith* projects in order to make them easier to follow. It goes without saying that where safety devices have been supplied by the manufacturers you should use them. We encourage the use of push sticks as good work practice.

Exercise vigilance and the greatest of care when using power tools, whether stationary or portable. Keep all your tools sharp and well maintained. Wear protective eyewear, a dust mask and a hearing protector when appropriate. By limiting distractions and developing safe work practices you will go a long way to avoiding workshop accidents. So, work safe fellow woodworkers. -Editor



PANEL CART WORKSTATION

I made a grid-based workstation for sheet goods out of framing stock clamped on a rolling cart. It's the perfect height for unloading panels from my truck and cutting them to size. The cart is made from four 1200mm boards interlocked with

two 2400mm boards. Notches are cut in each 90 x 45 that fit the thickness of their mating piece, loosely holding the boards together and making them easy to replace.

Donald Dunstan



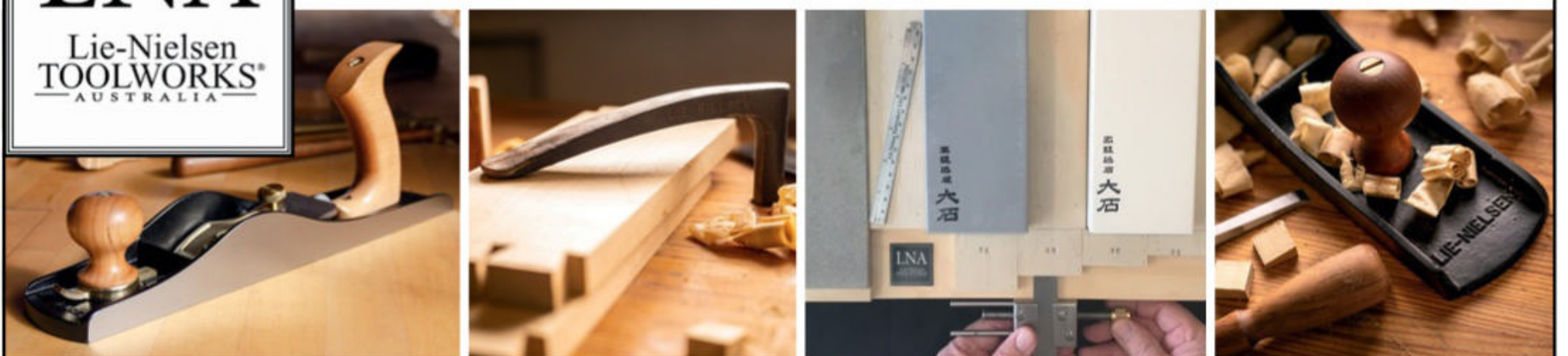
▲ These cutouts, which I made by boring out most of the waste at the drill press and chiselling them into a semi-circle, allow clamps to hold the frame to the cart.



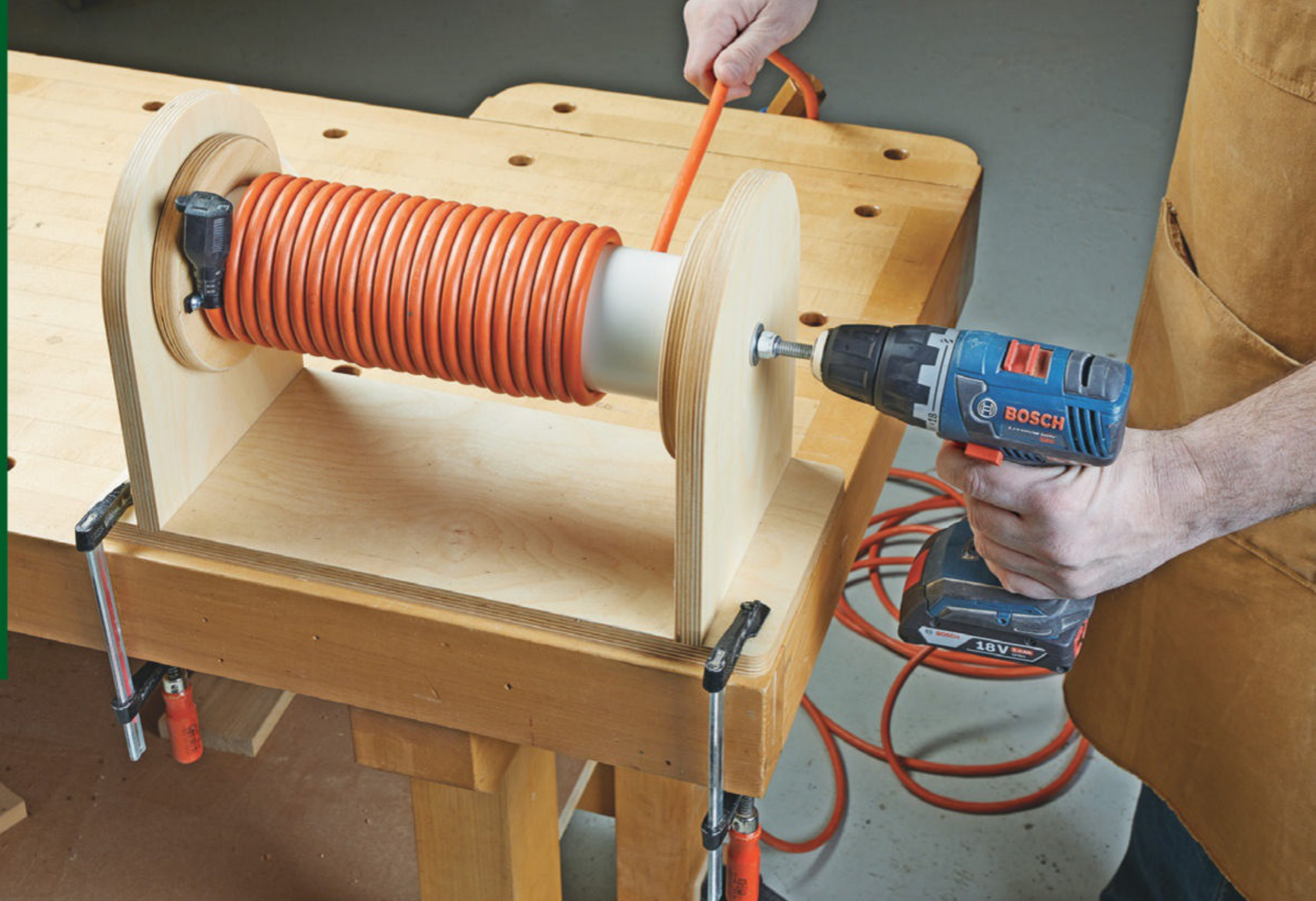
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While the loose end of the cord plugs into the wall, the reel itself can

be moved around the workshop to where you're working. When it comes time to pack the cord up, all you need to do is clamp the reel down, tighten a hand drill chuck over the threaded rod and run it until it's all reeled up.

Following the drawing and detail opposite, the cord reel can easily be made from 19mm plywood, some hardware and a little time in the workshop.

Gene Adams

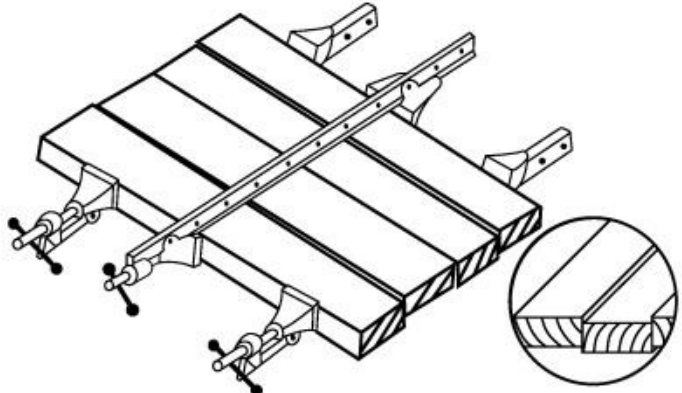
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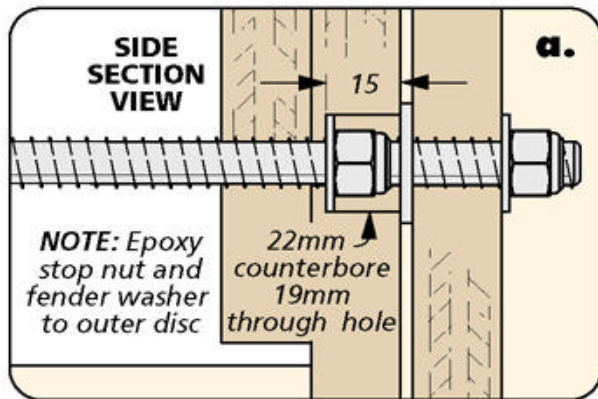


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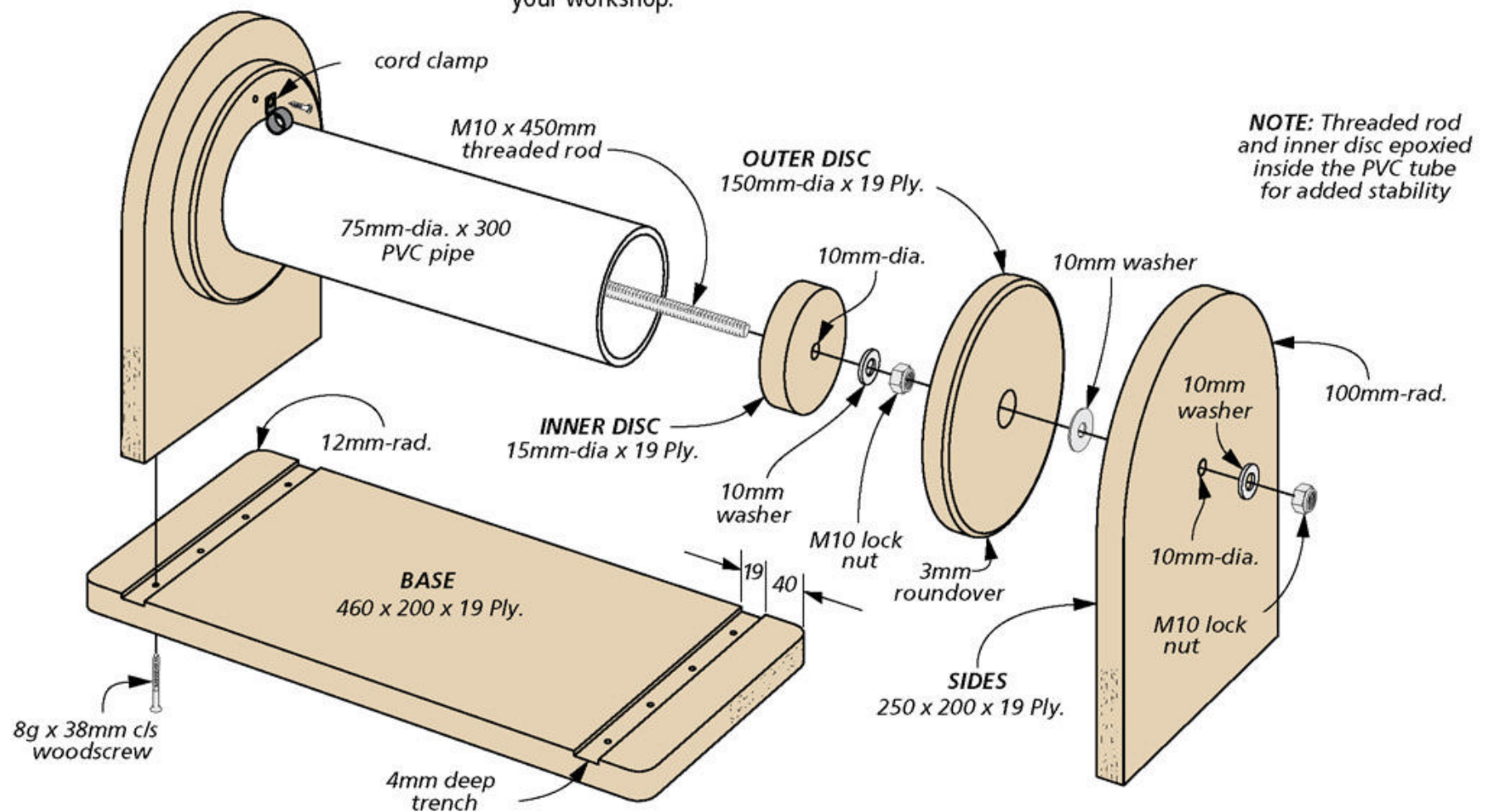
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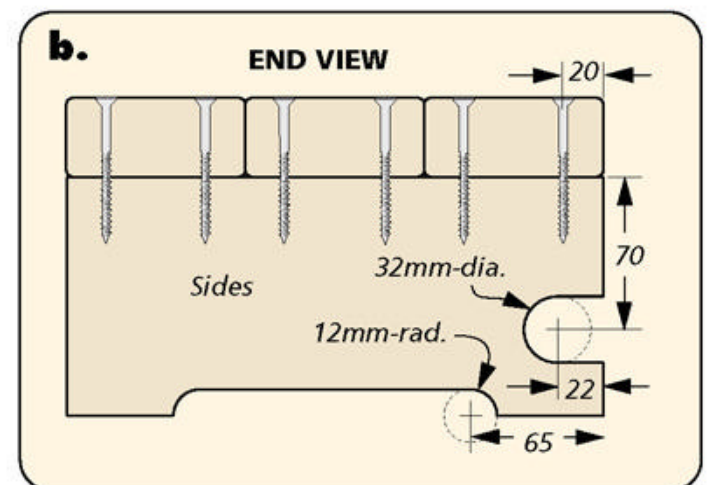
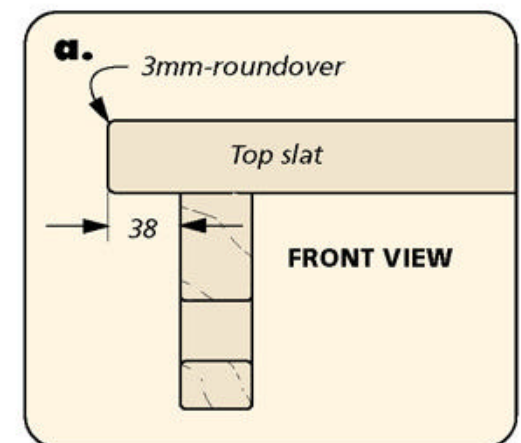
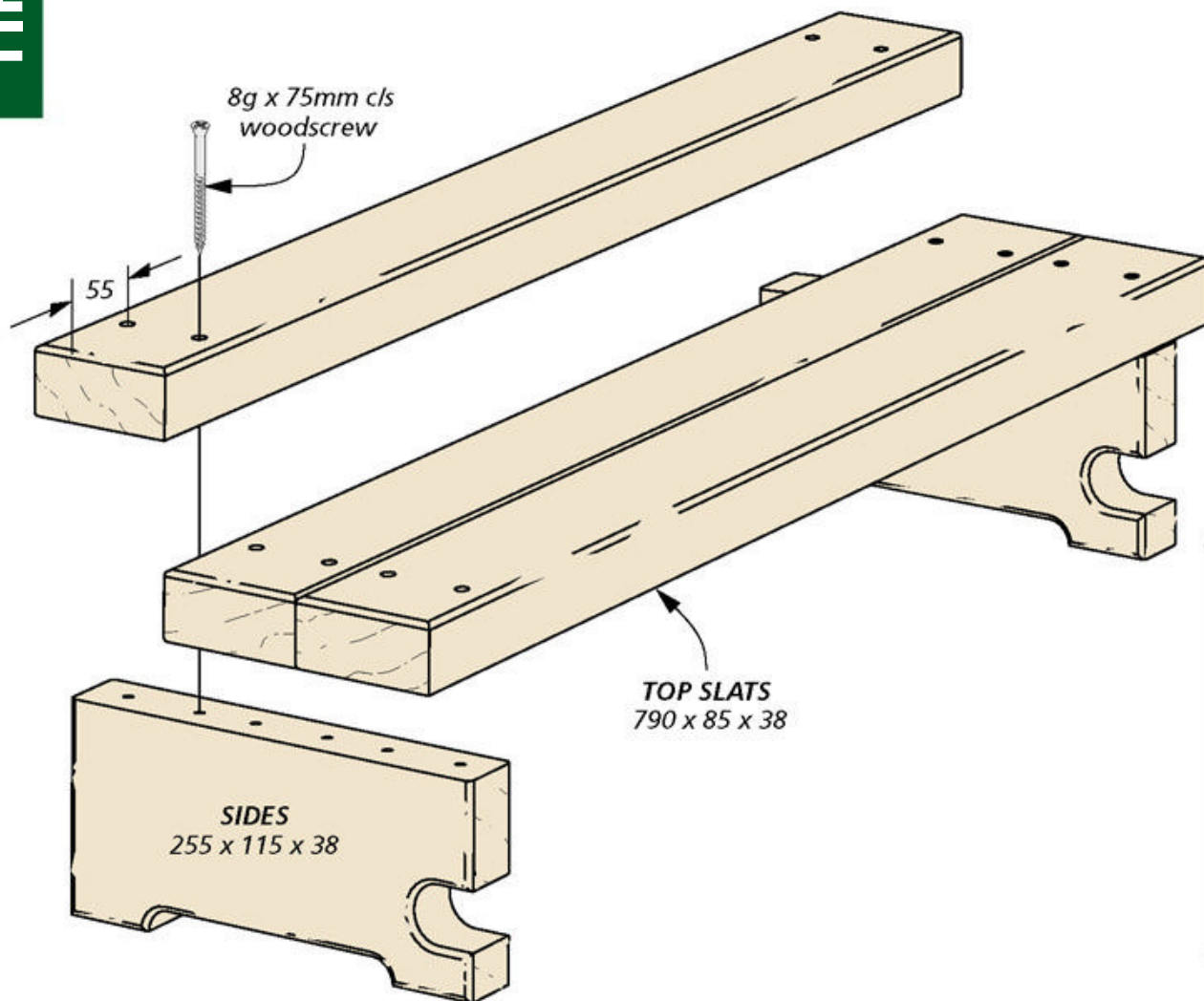
▲ Moving the reel to wherever it's needed provides you with a portable power outlet anywhere in your workshop.



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Normal workbench heights are fine for most work, but for many people, fine detail work at that height will have them hunching for hours. This “back-saving” benchtop is amazingly rigid and solid when clamped to the top front of your workbench. Your workpiece is then clamped up at a comfortable height, whether you’re cutting dovetails or carving. The project can be made to fit you, and best of all, it only takes an hour or so of workshop time and a few pieces of spare scrap lying around.

Larry Poore



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Next issue of *Australian Woodsmith* on sale 4th August 2022 - Issue 171



In our next issue we visit Japanese Tools Australia and investigate how Christian uses a pottery wheel as a lapping station! The techniques we look into include mixed media inlaying and cutting grooves and slots. The weekend project is a neat little mantelpiece chest. The designer project is a set of kitchen bench stools, while the heirloom project is an iconic Harvey Ellis drop front desk. The Moxon vice workshop project challenges you to cut deep dovetails on a bandsaw (or by hand). As usual we feature clever tips and techniques from our generous readers.



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The pleated HEPA filter canister has a huge surface area that captures 94% of the fine dust as the air exits the extractor. What you need in an extraction system is a continuous flow of air sweeping

away chips and dust as your machines do their work. If the filter clogs, the flow of air drops and the efficiency of the system is compromised. This new machine features an automatic process that kicks in every 10 minutes to remove any dust that is clogging the HEPA filter. This automatic agitation shakes out the dust caught in the HEPA filter and allows it to fall to the collection can at its base.

The Flux series of extractors has set a new benchmark for dust extraction. The foam eggshell baffles that line the doors and walls make this new generation of extractors quieter than previous models. The easy-to-remove hexagonal dust collecting bin locks tight in position under the cyclone cone. It has a window that allows you to see the amount of debris in the bin, plus the system has an LED warning system that alerts you to the bin being full.

The finish quality from the Taiwanese



factory is second to none. What you need is a deep pocket and a day to assemble this machine. The real question is; what price do you place on your lungs? Available from Carbatec (carbatec.com.au).



DAVID BARRON DOVETAIL GUIDES

When you follow David Barron's instructions for the construction of his delightful small chest of drawers on pages 62-67 you will realise that on page 67, he just magics up a whole bunch of fine dovetails out of nowhere!

David has posted a wealth of instructional videos on YouTube that take you step-by-step through the process of cutting dovetails, blind dovetails and piston fit drawers. The key to his dovetails is the magnetic guides he has developed.

David Barron is not the first person to pop a rare-earth magnet into a dovetail guide, however he has finessed his guides so they are second to none and done a great job sharing his prowess at cutting dovetails. As you can see, the guides are made from extruded aluminium and are machined to create 1:4, 1:5, 1:6, 1:7 and 1:8 ratio pins and tails.

The underside of the guides features non-slip fine abrasive pads that anchor the guide in place. The rare-earth magnets are recessed and covered with a super slippery polymer. These clever guides lock the saw blade in place and keep it true as it cuts away the waste.

David does not use a sliding bevel to mark out his dovetails. The guide itself incorporates all the angles needed to cut tight and true dovetails.

Seeing is believing. Go to YouTube and search "David Barron Furniture" and start watching David use his guides to make dovetail joints with ease. When ordering the guides, you will notice that the price drops when you enter your Australian address (exports are VAT exempt).

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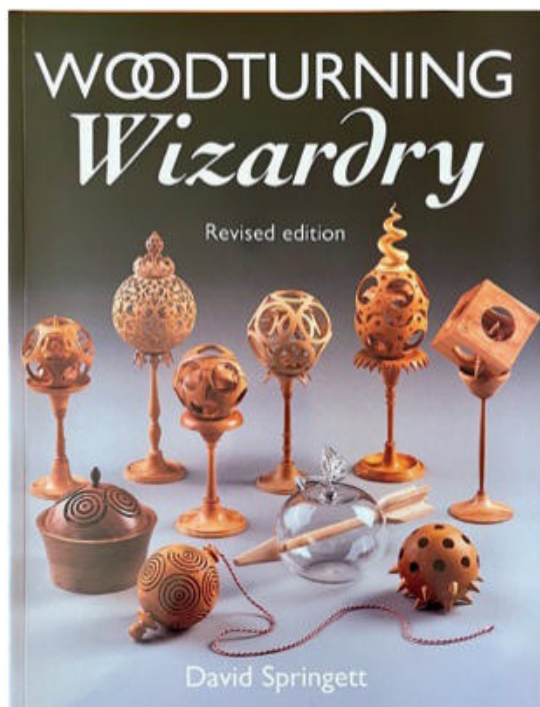
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WOODTURNING WIZARDRY

The Singapore Ball featured on page 68 is a challenging turning project and contains a heartfelt acknowledgment to David Springett. David was inspired by a tradition of clever French woodturners who, 150 years ago, developed



ways of turning balls within balls with the most primitive of lathes and turning tools. David himself spent his working life teaching woodwork in UK high schools and is of a certain vintage that had him multi-skilled and able to make and heat treat his own turning tools.

Woodturning Wizardry was first printed in 1993 and is a wonderful distillation of French woodturning skills and traditions. The cover of the book features six and a half wooden globes turned on lathes. Chapter one of the book talks about European timbers and their turning characteristics. Chapter two details how to make the jigs and chucks needed to turn globes on a lathe. Chapter three dives into the dark arts of making and heat treating the curved tools needed to cleverly slice out a globe from a globe so you have two or three globes within globes.

Chapter four takes you step by step through the process of turning perfect

spheres. Without giving too much away about this recently updated tour de force of intricate turning skills, one secret I will reveal is how to turn an arrow and have it penetrate and pass through a glass bottle. David explains how you first turn the arrow and craft the fletching and the arrowhead. A hole is then drilled through a bottle with a masonry drill that matches the diameter of the arrow shaft (with the aid of a lubricant). The arrowhead is then soaked in boiling water for 15 minutes and then carefully crushed between the jaws of a vice until it is the same dimension as the arrow shaft. Three days later it is removed from the vice and inserted through the bottle. The arrowhead is then dipped in boiling water for five minutes and is observed to return to its original profile like magic! This delightful 192-page book is full of the magic of clever and inspirational woodturning.

Available from Booktopia (booktopia.com.au).

HAFCO WOODMASTER OS-140 BOBBIN SANDER

Bobbin sanders open up a whole new world of curves for the woodworker. The elegant and organic cove on the top of David Barron's awesome small chest of drawers on page 62 (and my interpretation on page 76) is made possible with the help of an oscillating bobbin sander. Bobbin sanders rotate and oscillate at the same time, allowing you to remove the bandsaw cuts from concave surfaces as well as crafting finger pulls on drawer bottoms etc.

I used a Hafco Woodmaster OS-140 from Hare & Forbes Machinery House to create this whimsical Huon pine sculpture as well as to sand the coves



seen on the cover of this issue. Weighing in at 34.5kg, the OS-140 stays put while standing on the bench. As you can see, the square table tilts up to 45°, giving you even more creative possibilities with the sander. The bobbin rotates at 1425 rpm and at the same time oscillates 24mm up and down 26 times a minute. The machine comes equipped with five 115mm-long abrasive sleeves and bobbin drums (1/2", 3/4", 1", 1 1/2" & 2"). If you want to create a 24mm-wide cove in a piece of timber all you need to do is pop a 3/4" drum in place and tilt your stock until you have a 24mm arc. Lathes create symmetrical rounds; bobbin sanders can go off centre and create sensuous organic shapes that delight the eye. If you are interested in a bobbin sander for your workshop, I think the Hafco Woodmaster OS-140 is well worth checking out.

Available from Hare & Forbes Machinery House (machineryhouse.com.au).





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Jurassic Bunya Bunya

Araucaria bidwillii is a living fossil, it is a remnant tree of Gondwana and has relatives in South America.



▲ The huge bunya bunya cones can weigh 10kg and contain 60 delicious nuts.

Allan Cunningham spent two years botanising in Brazil between 1814 and 1816 (he had been commissioned by Sir Joseph Banks to collect specimens for Kew Gardens). It was while in South America Cunningham documented and named *Araucaria araucana*. The tree was prized by the Araucani people of the Arauco district because of the huge edible nuts it produced and the resin it oozed.

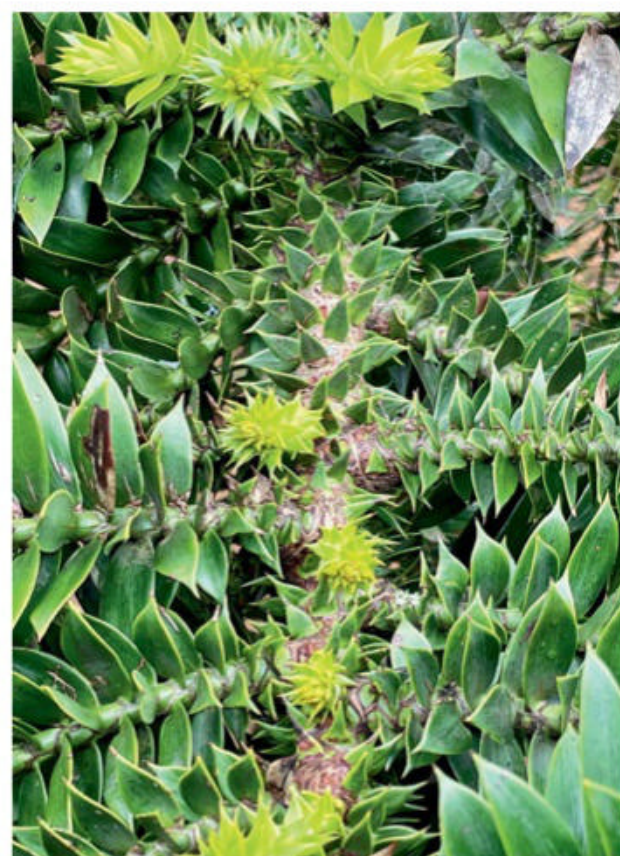
The tree thrived in the greenhouses of



Kew Gardens. We know it today as the Monkey Puzzle tree because it was said a monkey would find it a puzzle to climb a tree whose limbs were covered in hard and sharp whirling leaves.

In 1816 Allan Cunningham boarded another vessel and made his way to New South Wales where he found similar species of *araucaria*. John Bidwill collected and named the Bunya Bunya in 1842. Its fruit is twice as big as its South American cousin.

The Bunya Bunya and its fruit featured on these pages are from the gardens at Arthur Boyd's Studio at Bundanon on the south coast of NSW. I was fortunate to be visiting the week the two Bunyas dropped their fruit. After being awestruck by both the art and frenetic style of Arthur Boyd I asked the staff if I could collect a nut. The answer was yes, providing I took care when under the canopy.



▲ A monkey would be puzzled trying to climb a tree with whirling leaves on each stem.



▲ Bunya bunya nuts are huge! The hoop pine table top could be bunya bunya. They are related species.



▲ The bracts broke away in groups of three. The middle bract contained the hard nut. These were a staple food for First Nations people who ate them raw or roasted.

BUNYA BUNYA PINE

My "go to" resource when researching a rainforest species is Morris Lake's CSIRO imprint *Australian Rainforest Woods*. On page 24 Morris explains that the female cones grow up to 30cm in diameter and form at the top of the tree. The male strobili are borne on the lower branches of the same tree and form 20cm-long narrow sausage-like cones.

The timber that is cut from the bunya bunya pine is so similar to hoop pine that it is often sold together (the table above is made from hoop pine).

Unlike hoop pine that is grown in plantations, bunya bunya has become more of an ornamental tree for gardens and parks. As you can see, it has a distinctive cone-shaped canopy that features branches that grow nearly perpendicular from the trunk. The leaves are bright green and really do look alien.

The tree is found in the fossil record and really is an amazing link to the Jurassic period. Dinosaurs would have grazed on the fruits, maybe pterodactyls swept down and harvested the cones with their clawed feet. It may be that the coal being mined in the Bowen Basin was once bunya bunya.

ABORIGINAL FOOD SOURCE

Bunya bunya trees take about 24 years to mature and produce fruit.

Morris details how in the Bunya Bunya National Park you can still find old trees with notches cut into them so they could be climbed and the fruit harvested.

In the past a tree would be owned by a family and passed on through the son to the next generation. The trees fruit each year; however, they produce a bumper crop once every three years. When the bunya trees were ripe for harvesting, representatives from tribes as far away as the far west of Queensland/Northern Territory border would gather at the Bunya Mountains for their annual corroboree to celebrate, settle tribal disputes and socialise. The seeds would be eaten raw or smoked on a camp fire.

RECIPES

Before you can enjoy a bunya bunya nut you have to crack it out of its hard case. This can be done with a hammer or a serious nut cracker. Once you have your nuts you can stir-fry them with garlic, shave them raw onto a salad or puree them with garlic, parmesan and basil to make a pesto. There are lots of recipes out there on the internet. [W](#)



▲ The bunya kernel is hard to extract. A popular modern dish with bunya at its heart is a pesto.

Gluing up with Sandbags

When regular clamps won't do the trick and a vacuum bag is not feasible, try sandbags.

When you hear folks say you can never have enough clamps, it usually means they've been through the experience of making something without considering how they're finally going to put it together. As resourceful as we are, even the most dextrous of us can become all fingers and thumbs when it's time to glue up and, despite there being a clamp for most eventualities, there will always be the odd shape that just won't play ball.

It pays then to have a trick or two up your sleeve and in this case they come in the form of sandbags, or, more accurately, various shapes and sizes of sandbag.

With more than a little help from an experienced sailmaker I made a selection of bags to demonstrate some of the ways they can be used. The bags are made from a heavy gauge cotton drill fabric filled with sharp sand. It's possible to buy kiln-dried sand from a builders merchant but any dry sand is just as good.



▲ An assortment of bags with different amounts of sand will give you plenty of options.



▲ When not in use as part of an efficient assembly line sandbags also make a very good rest for tools with a delicate edge.

SLOPES AND MITRES

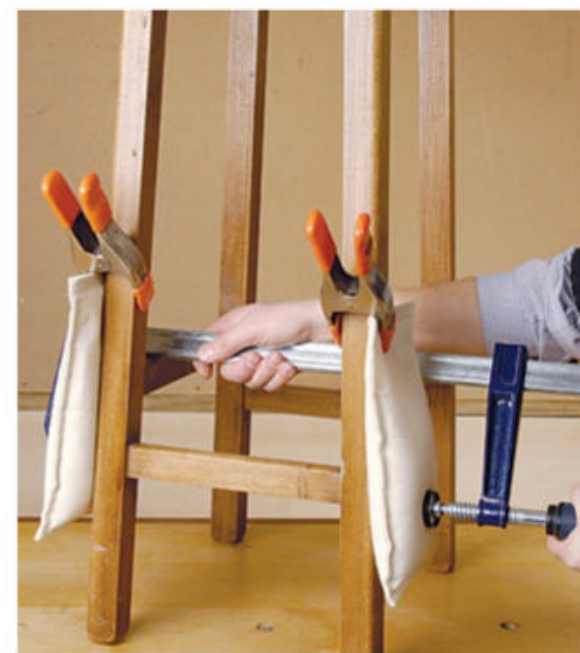
It's not unheard of to use biscuits or a loose tongue to strengthen joints like the one shown in the photo at right. It can, however, prove difficult to close the joint without distorting the shape of the structure. Using a combination of pressure blocks and a sandbag, you can often find a solution quickly to do the job.



▲ Use a sandbag to fill the void between pressure blocks on angled joints.

A second pair of hands

I alluded earlier to being less than dextrous when it comes to gluing up and nothing is more frustrating than trying to hold blocks of wood in place to protect the surface from the jaws of clamps. A pair of sandbags clipped in place will make the task of clamping sloping edges a great deal easier. The sand becomes remarkably compact under pressure whilst distributing the pressure over a wide area.



▲ As a second pair of hands sandbags can be used to replace wooden blocks.

Repairs to finished work

Tight curves, whether on new work or existing components like this Alvar Aalto stool, are awkward to put under compression with just clamps and blocks alone. A sandbag and a suitably shaped piece of packing to compress the sand can be clamped into place with the bag moulding under the pressure of the clamp to the exact shape of the curve. Under pressure from the clamp, the sand becomes quite firm whilst taking on the shape of the curve without distorting it.

The seat on this stool has a definite but gentle dip across the middle. In all likelihood it will have been an original feature, but as the laminations are start-

ing to separate it is important to make the structure sound again without losing the curve. A flat board placed across the top would certainly have brought the laminations together but flattened them. A large sandbag was used instead. The best method I've found to ensure good results is to shake the bag to distribute the sand evenly, then drop it onto the surface. You may need to gently manipulate the sand with a suitable spreader to make sure contact is being made all over the surface and this is where it becomes important to have dry sand. With a suitable flat board and in this instance a caul, apply pressure evenly to the bag. **W**



▲ Our stool has an obvious shape that needs to be preserved.



▲ A fuller bag works better on tight curves.



▲ After a shake, drop the bag onto the surface.



▲ Distribute the sand evenly across the area.



ADDING HEAT FOR ANIMAL GLUES

For a lot of repairs the most appropriate adhesive is animal glue and as this is used warm, you can extend the opening time by warming the sandbag up in a microwave beforehand. Try placing a warm bag over the dry joint before applying the glue to gain some extra time.

Washi

Paper mulberry, the Pacific, shoji and the art of making paper.

Washi translates as Wa (Japanese) Shi (paper). It has been made in Japan for at least 1300 years and is the preferred paper for calligraphy, certificates, origami, shoji screens and lampshades.

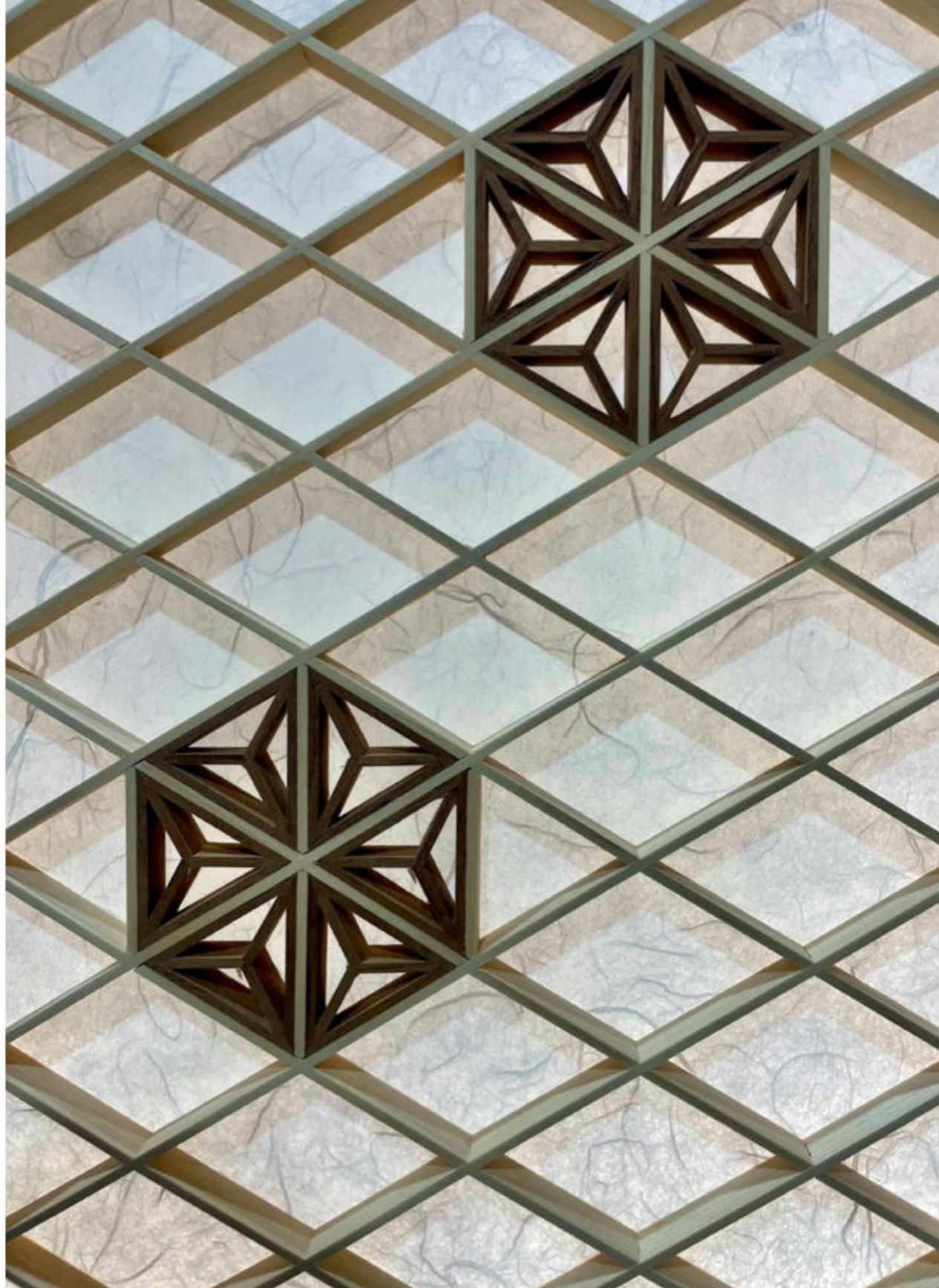
The craft of making paper from the inner bark of the paper mulberry (*Broussonetia papyrifera*) has become an artform in more than just Japan.

The tree itself is a native to Asia and has been used by different cultures for at least 2,000 years to make paper for sacred texts as well as for screens, costumes and even umbrellas.

THOR HEYERDAHL & KON-TIKI

In 1947 the Norwegian adventurer Thor Heyerdahl bravely set off from the coast of South America on a balsa log raft to prove that ancient peoples from that continent could have colonised the Pacific. As brave as Thor was, his theory has been undermined by both modern DNA evidence and the paper mulberry. Both link Polynesian migration to Taiwan. The flow of people, plants, dogs and pigs across the Pacific is the reverse of what Thor thought.

Fijian and other Polynesian cultures revere the cloth made from the inner bark of the Taiwanese paper mulberry tree. Across Polynesia it is a community effort to pound the bark into the Tapa cloth that is gifted at marriages and other cultural events. It is an amazing link to the culture of paper making in Japan.



▲ Jason Bennett (wigwood.com.au) is a master of the art of making Kumiko screens and lamp shades.



▶ The paper mulberry has deep cultural roots in Asia as well as the Pacific.

WASHI AND SHOJI SCREENS

The screen above is a typical example of shoji panels that are used to both diffuse light and at the same time add some privacy to Japanese homes. Rice glue is used to bind the washi to the Kumiko frames. When the paper ages or is damaged, a soap and water mix is applied



▲ Fijian Tapa cloth is made by pounding paper mulberry strips together with the aid of sweet potato root extract.



▲ The white inner bark of the paper mulberry is harvested in autumn, dried, soaked and then stripped into fibres.



▲ After the mulberry fibres are boiled with soda, neri is added to evenly distribute the fibres as they settle onto a bamboo rack.

to the paper above the thin frames and left to soak through, dissolving the glue. The paper is then stripped from the screen, the frames cleaned and a new washi glued and trimmed into place.

WASHI MAKING

Traditionally washi has been a "winter crop" for farmers in Japan. Washi requires lots of paper mulberry bark, plus plenty of clean cold water to both suspend the fibres and keep bacteria at bay.

The first step is to harvest 25mm-dia stems from the paper mulberry and bundle them together in 900mm lengths so they can be steamed.

The bark is then stripped from the stems so that the inner white xylem can be separated from the dark outer bark. The inner fibres are then boiled with soda ash. When this mix cools a viscous solution of neri is added (an extract from the roots of sunset hibiscus). The

neri helps suspend the fibres so that they settle evenly when the solution is ladled onto bamboo racks.

It is at this stage the washi can be textured with drops of fresh water or have organic elements spread about to create a more artistic washi.

The 900 x 600mm washi is then dried on the rack, peeled off and stacked in sheafs. It is an artisanal product, with local variations, treasured throughout Japan.

These days washi is also made on

an industrial scale so that large shoji screens can be designed and re-skinned economically. The industrial rolls are 920mm wide and hold 30m of washi.

The thinnest paper in the world is 0.02mm-thick handmade Hidaka washi. It is nearly transparent and is used in art restoration.

A visit online or in person to Japanese Tools Australia will open up a whole new world of washi and its clever application. [W](#)



▲ Decorative washi is an artform in its own right. Blossoms and leaves can be added to the mix.



▲ Making washi is a craft industry that was and is a way for farmers to make money during winter.

Wood Insert Joinery

Crafting joinery and connecting pieces of wood into larger assemblies is the part of woodworking I enjoy most. Learning different joinery methods can enhance your enjoyment of woodworking and even open up new possibilities.

I gravitate to a few well-practised techniques as a result of this searching and learning. With this in mind, let's take a mid-level look at a joinery category I call wood insert joinery — dowels, biscuits and dominos.

THE SPECTRUM. For a frame of reference, let's string out our options on a line. On one end are simple joints: nails, screws and glued butt joints. On the other end are more complex wood-to-wood joints like dovetails, mortise and tenon, half laps, etc.

Wood insert joinery lies closer to this traditional end. Project parts are joined with pre-made wood connectors that are glued into matching recesses. The learning curve is eased by relying on specialised jigs and power tools.

One benefit of all three of these options is that pieces are cut to size without needing to take the joinery into account. The applications for each of these methods overlap. So I'd like to help you sort out the advantages of each one. Oddly enough, each of these solutions also have attracted some criticisms. We'll look at those as well.

DOWEL JOINERY

We'll get the ball rolling with dowel joinery. It's the simplest and oldest of the three options. The process uses a jig and a hand drill to form holes in the mating surfaces of the parts. The photo on the bottom of the previous page shows an inexpensive jig that I've used with good success (refer to Sources on page 81).

REPUTATION. Unfortunately, this joint carries the stigma of low quality. I think it's a victim of guilt by association having been in the company of ne'er-do-wells like particleboard and flat-pack furniture.

On the other end of the spectrum, masters of the craft like the late James Krenov and Tim Coleman routinely use dowels

in high-end furniture pieces. The difference in outcomes lies in minding a few key details: sizing, number and length.

SIZING. A strong bond requires a snug fit of the dowel in the hole. So the first order of business is to select a drill bit that matches the size of the dowels. The jig matters, too. If the bit has too much play, the holes can end up wallowing out and be too large.

Speaking of sizing, larger dowels create stronger joints. The diameter of the dowel should be one third to one half the thickness of the part it fits into.

NUMBER. One road to stout assemblies is to maximise the glue surface. The way to accomplish this is to increase the number of dowels. One every 50mm is a good starting point.

Dowels require precision in drilling for the parts to align. The more dowels, the greater the chance that small errors will add up to a misalignment.

LENGTH. Dowels are at their best when you use longer dowels in a joint. This increases the rigidity of the assembly.



▲ An inexpensive jig and some dowels lets you create strong frames, case pieces and even small tables.

Clearly, there are limits here. I shoot for a dowel to extend at least 30mm or more when drilled into the end of a rail. On the other side, a dowel should penetrate half to two-thirds into the width of a stile or the thickness of a panel.

FRAMES. Dowels are found in frames, cases and chairs. But their speed and efficiency is best put to use in joining frame parts.



▲ Dowels can be used to join a wide variety of project parts. But they excel when creating frame and panel assemblies, like doors. A simple jig and a drill are the only tools you need for success.

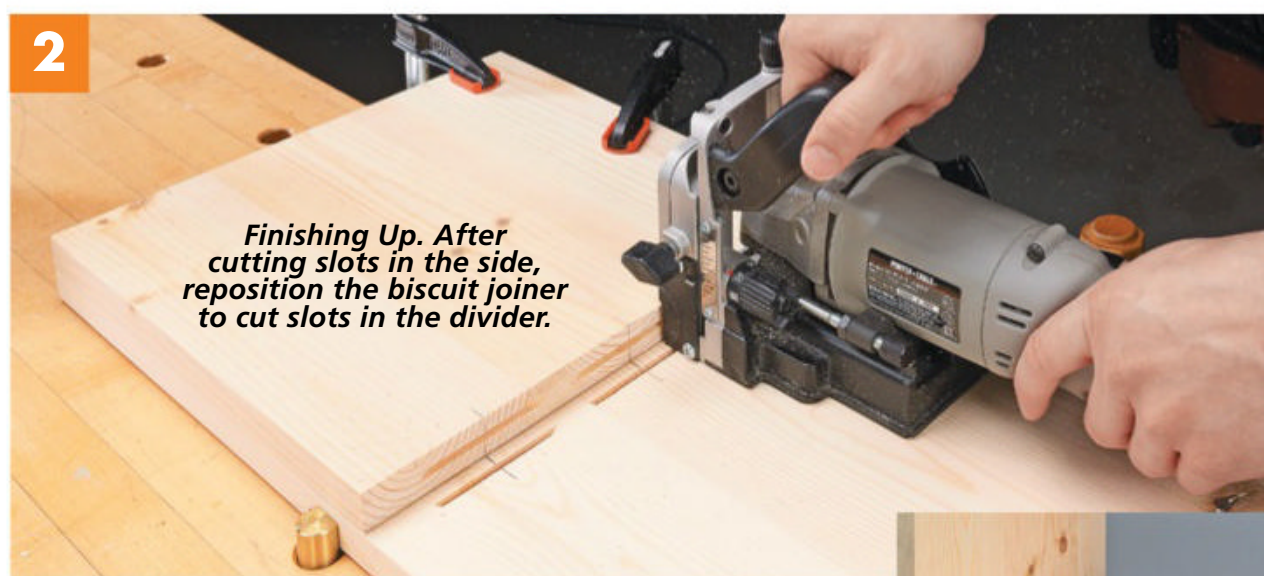
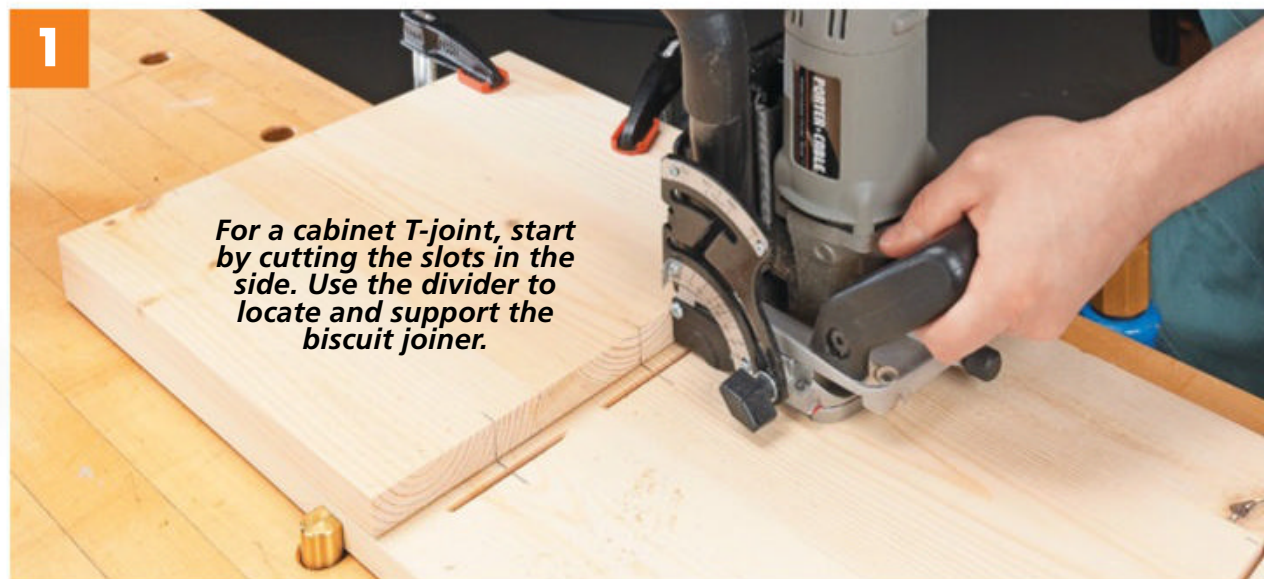


▲ Biscuit joiners use a small saw blade to scoop out a slot to hold the solid-wood biscuits. You can set the joiner to cut one of three sizes.

BISCUIT JOINERY

Taking a step up the complexity scale, biscuit joinery offers several advantages. The blade of a biscuit joiner cuts a shallow, curved slot in each mating piece. A football-shaped biscuit is glued into the slot creating a solid connection. Think of it as a close cousin to using splines or tongue and groove joinery. Besides being fast, the joint makes aligning the parts a breeze.

FLEXIBLE PRECISION. The slots a biscuit joiner creates match the thickness of the biscuit for alignment. But they're slightly longer. This gives you some wiggle room for keeping edges and ends flush. As a side benefit, you still get great results even if you are less than precise in lining up the tool with your layout marks. When selecting the size of biscuit, always choose the largest one that will fit the width/thickness of the stock.



Alignment & Strength. Biscuits are ideal for creating strong cases in both solid wood and plywood. Using the base of the tool as the reference surface makes adding dividers quick and easy.

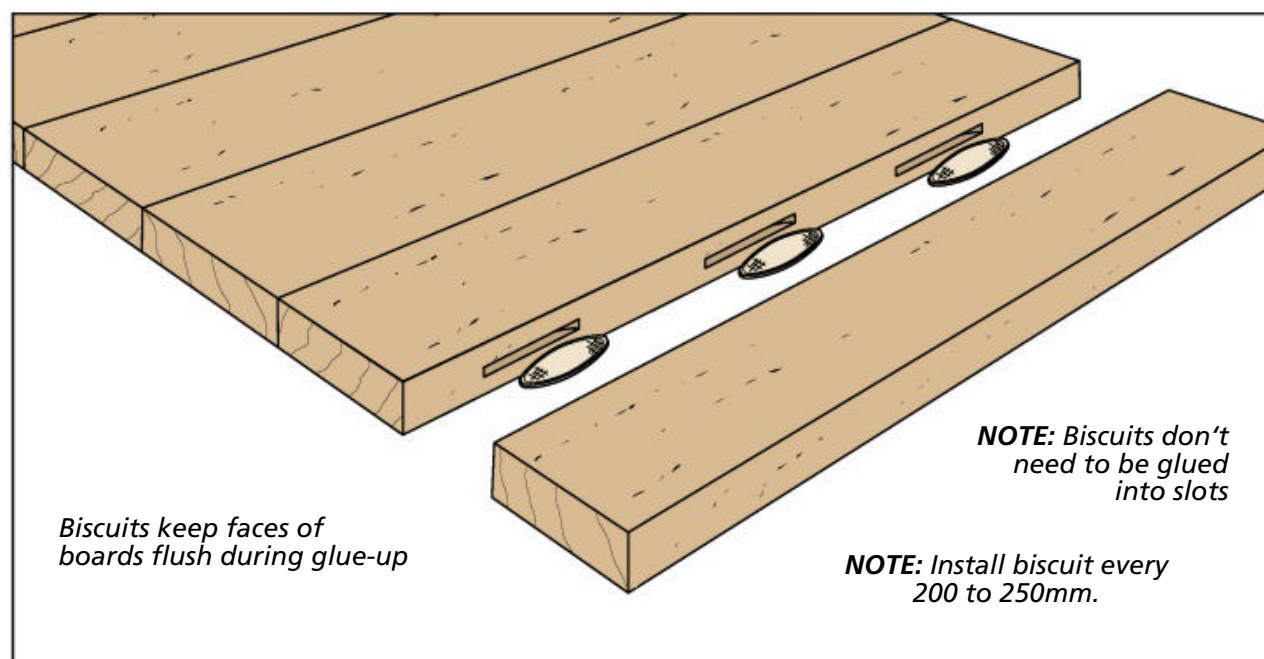
APPLICATIONS. If we stick with the tongue and groove analogy, you can connect the dots to find applications for biscuit joinery. The determining requirement is whether the workpiece can accept the slot

without it being visible. Because of this, I find that biscuits aren't the best choice for frame and panel assemblies.

Where they do shine is creating cases in either plywood or solid wood. Plywood is notoriously inconsistent in thickness, so cutting snug-fitting trenches becomes an exercise in frustration. But with biscuits, a few quick plunge cuts keeps the project moving along.

Another place where biscuits shine is when parts need to align. For example in gluing up large solid wood panels or attaching edging to plywood panels. The biscuits keep reference faces aligned and saving you grief — and a lot of sanding.

REPUTATION MATTERS. Biscuit joinery rode an initial high wave of popularity, then it seemed to fade just as quickly. I think this was a result of its “do-it-all” claims. For those who take the time to learn the strengths, biscuit joinery makes a lot of sense.



Solid Wood Panels. Large panels can be tough to glue up flush. To minimise planing and sanding, add some biscuits to keep the boards level prior to assembly.



▲ The Festool Domino joiner works like a cross between a plunge router and a biscuit joiner. The spiral bit spins and oscillates side to side to create an elongated mortise.

▲ To create a domino mortise, you line up the centre of the tool with a centreline marked on the workpiece. Plunge the bit into the workpiece until you contact the stop, then retract the bit.

DOMINO JOINERY

You'd be forgiven if the power tool shown above caused you to do a double-take, thinking it was just another biscuit joiner. That similarity ends when you check out the bits and connectors it uses in the photo below.

The Festool Domino joiner (I'm showing the smaller DF500 in this article) combines the practicality of a biscuit joiner with the robust durability of loose tenons.

Loose tenon joints are usually created with a router jig and custom-made tenon stock. With the domino, the machine cuts mortises in a limited range of sizes. Then at assembly time, you just plug in pre-made tenons (dominos) to join the parts.

The dominos are designed for a snug

fit in the mortises. You do have the option for creating mortises that provide some side-to-side movement to align parts.

WHAT IT'S GOOD FOR. Let's go back to the three types of assemblies we've been considering: frame and panel, plywood casework and table-type bases. Just like dowels and biscuits, there's nothing stopping you from using dominos on any of these construction types.

The ability to change bits and size the joinery to suit the material makes it the most versatile of the three joinery options. Based on my experience, I find this joinery is best suited for making bases. Beyond tables, it's the kind of structure you find in stands, dressers, buffets and even workshop carts.

Another good application is when you need to build doors that incorporate solid-wood panels. Here you can't glue the panel in place due to seasonal changes in humidity. So the corner joints bear all the stress. Thicker, longer dominos will handle that better than dowels or biscuits.

GREEN FEVER. I hesitated including domino joinery in this article since only Festool makes the tool. But not including it seems like a deliberate exclusion.

Festool aficionados trumpet the quality and performance of anything with the green label. While detractors consider their products overpriced, over-engineered solutions in search of a problem.

I get it. The domino is a sweet tool, but it's targeted at professionals whose time is money. Hobby woodworkers who may have a much smaller budget for specialised tools, may balk at the buy-in price of over \$1,700.

MAKING DECISIONS. Woodworkers often are tempted to compare tools and techniques looking for the "best." It's a false competition and way too loaded with subjective values.

Dowels, biscuits or dominos can simplify your joinery process. Your choice depends on the work you do, your budget and need for speed. After that, it's a matter of taking the time to master the tool in order to make your projects the best they can be. **W**



▲ The DF500 joiner accepts 4mm, 5mm, 8mm and 10mm bits (right to left). The sizes of domino tenon for each one is shown next to the bit. The dominos are made from beech for tenon-like strength. Refer to Sources on page 81.



Tenoning with the Router



▲ All you need for quick and accurate tenons on workpieces of any size is a router and a handy jig.

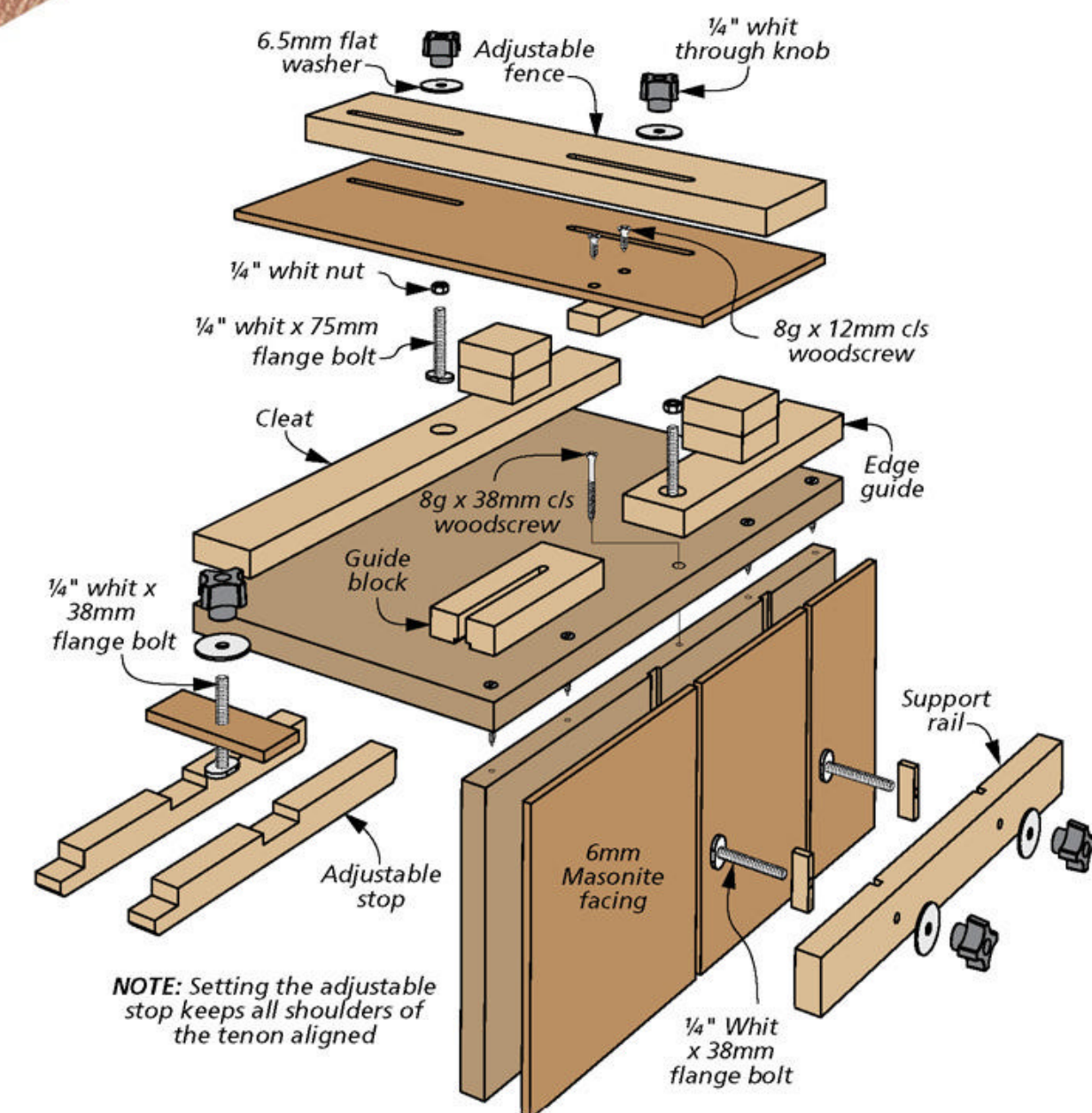
Mortise and tenons might be my favourite joint. They're strong, reliable and easy to hide if you don't want to see them (though I've always enjoyed the look of through tenons myself). Tenons aren't too hard to make most of the time. I tend to cut my tenons on the table saw, as it is usually a quick process. However, when it comes to long or oddly shaped workpieces, tenons can get a little more difficult.

The project I'd been working on was coming along nicely, but the next step presented a real challenge — cutting a tenon on the ends of several long rails. At the table saw, I would have to set up a support to keep it balanced, and even then the leverage can cause a piece to twist away from the mitre gauge when cutting.

While brainstorming how to fix this problem, I had an idea: what if I could move the cutter instead of moving the piece? What if I could just clamp the piece down and rout the tenon? Thus this jig was born.

TENONING JIG. There are three major parts to this jig: the fence, the adjustable stop and the base (which includes the cleats and edge guide). It features an adjustable support rail, as well as a double-sided adjustable stop. The base is "L" shaped to fit over the side of your bench. This gives the tenoning jig two ways of cutting: one for the cheeks and one for the edges. In both methods the workpiece is held in place while a fence guides the router. To cut the cheek, the workpiece is held flat in the top part of the jig. To cut the edge, the workpiece is placed against the side of the jig.

Though this jig was created for longer pieces, it's also built to work on pieces of



varying size. Thanks to the support rail and fence, the jig can hold long or short pieces while cutting tenons of varying sizes. Even better, the adjustable stop ensures that the shoulders are perfectly aligned all the way around the tenon, and that multiple tenons will all be identical.

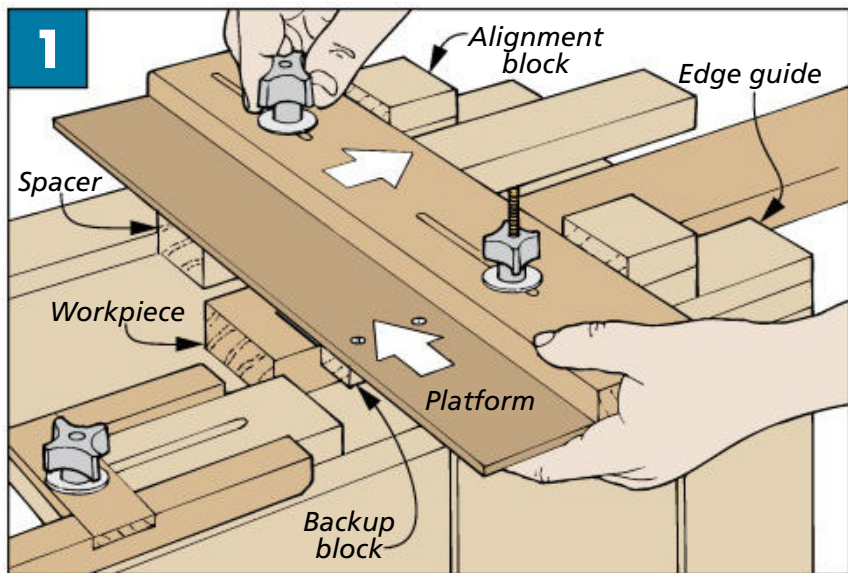
A firm grip on the router is the key to machining a successful tenon.

Before you switch on your router it is wise to think about the direction the router bit will "pull" the moment it is turned on. A cutter spinning at 24,000rpm really does have a mind of its own and will race across the workpiece like a horse bolting across a paddock if you don't rein it in.

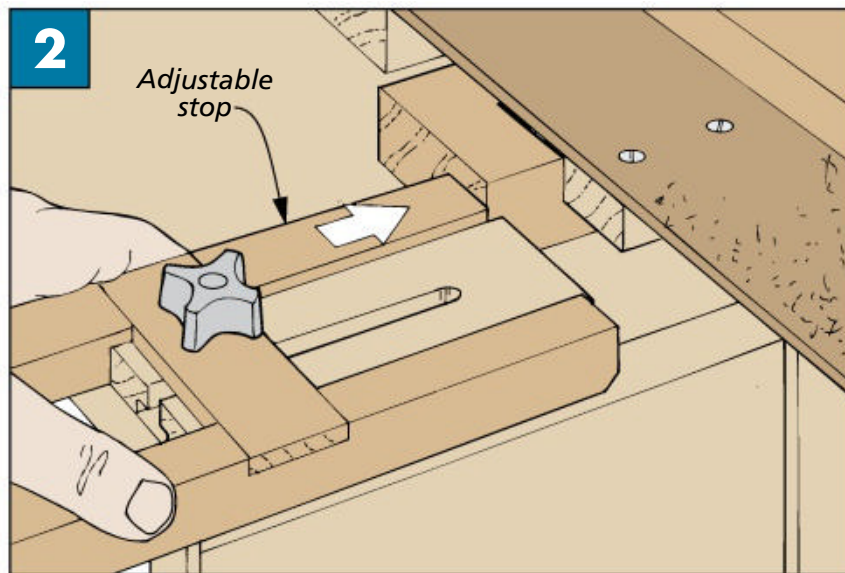
Woodsmith
GO On-Line Extras

For complete plans and directions to build this jig visit our website at australianwoodsmith.com.au

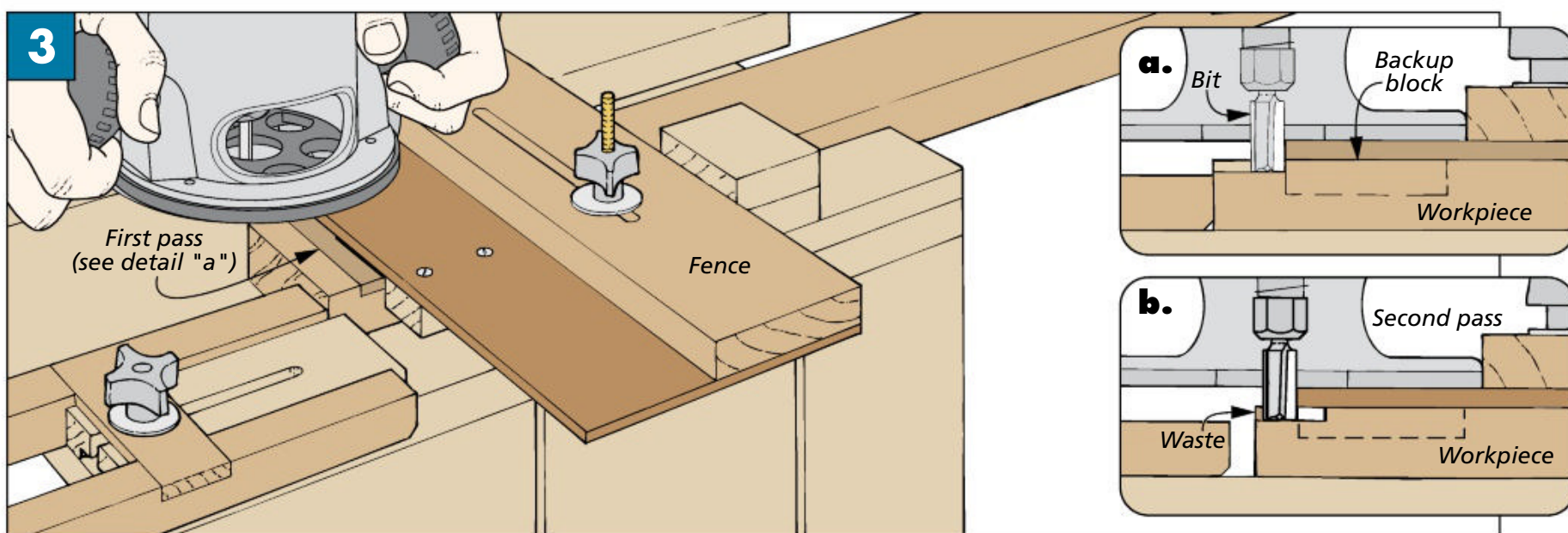
It becomes second nature to work from left to right when cutting rebates, profiled edges and machining tenons with a router. The router will want to "climb" from right to left; starting the cut from the left side puts you in charge of the cut. When you work from left to right the cutter will pull the router towards the fence and give you a sense of control as you cut the tenon. When you are machining deep cheeks it is important to make several shallow passes with the cutter.



Position the Workpiece. After positioning the workpiece in the jig, slide the fence forward until the backup block butts up against it. Tighten the fence to lock it in place.



Set the Stop. Now slide the adjustable stop against the end of the workpiece and lock it in place. The stop ensures that all four shoulders align.



Cut the Cheek. With the base of the router riding against the fence, cut the shoulder of the cheek first (detail 'a'). If you need to make additional passes to complete the tenon, loosen the fence and slide the workpiece away from the top (detail 'b'). To finish the cheeks, flip the workpiece and repeat the process.

USING THE JIG

One nice thing about this jig is you can set it up and rout a tenon in a matter of minutes. Once everything is set, just start with the cheeks, then go to the edges.

CUTTING THE CHEEKS

First, I laid out one of the shoulders of the tenon and made a single line across the face of the workpiece. A square-shouldered cut depends on two things: the position of the workpiece in the jig and the location of the fence.

SET-UP. The fence should be square to the edge of the workpiece. To ensure this, I placed the workpiece against the edge guide and pushed the fence against the alignment blocks. Since the blocks are square to the edge guide, this is all that's needed to square up the fence.

To make sure the router bit cuts pre-

cisely along the shoulder line, I slid the workpiece in until the shoulder aligned with the reference edge. Then I slid the fence forward until the backup block contacted the workpiece (Figure 1 above). There's a risk of chipout as the bit cuts through the edge of the workpiece, but having the backup block against the piece will support the wood fibres and reduce chipout.

Next, I took a piece of scrap the same thickness as my workpiece and slid it under the unsupported end of the fence before tightening it down. Using a chunk of scrap as a spacer helps the fence apply even pressure once it's tight.

ROUTING. The fence locks the workpiece in place so you can rout the first shoulder, but how do you get the shoulder on the opposite side to align with it? The jig features an adjustable stop, making it easy

to get the exact same set-up for the other cheek (Figure 2).

With the adjustable stop set, rout the cheeks. Some tenons may need a few passes to remove all the material. I found the best way to get this was to establish the shoulder first, then loosen the fence and slide the workpiece back for each subsequent pass (Figure 3). Remember to use the same bit here as you used to cut the reference edge. Along with this, remember to keep the same point on the router base in contact with the fence for each pass to stay consistent.

CUTTING THE EDGES

With the cheeks cut, you can turn to routing the edges of the tenon. While the process of cutting is the same, the set-up here is slightly different.

FINISHING THE TENON. I first set the piece on the support rail and raised the rail until

the top edge of the workpiece butted against the platform (Figure 1 below.) Tightening the knobs locks the rail in place while you rout.

To make sure the fence is parallel to the base, slide a second spacer underneath the fence. The workpiece also needs to be flat against the side of the jig, so slide the end of the workpiece against the adjustable stop, then push the fence over until the backup block is against the workpiece. The stop will keep all the shoulders aligned. Now tighten down the fence and the support rail.

At this point, it's just a matter of routing the edges. As with the cheeks, some pieces may require several passes. After I had the first edge finished, all I needed to do to complete my tenon was flip it over

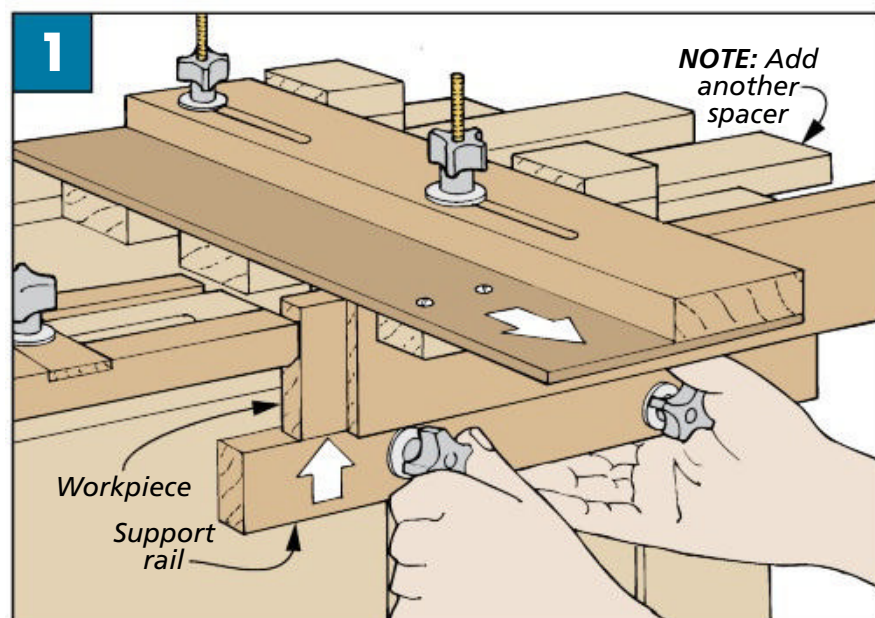
and repeat the process.

With all this in mind, what's the advantage of using this jig and a router instead of the table saw when cutting tenons? Aside from being able to cut pieces that would scratch the ceiling above the table saw, I found that this jig truly excels in speed. It really shines when you need to cut a number of identical tenons for a project and does feel safer to use than the naked blade of a table saw.

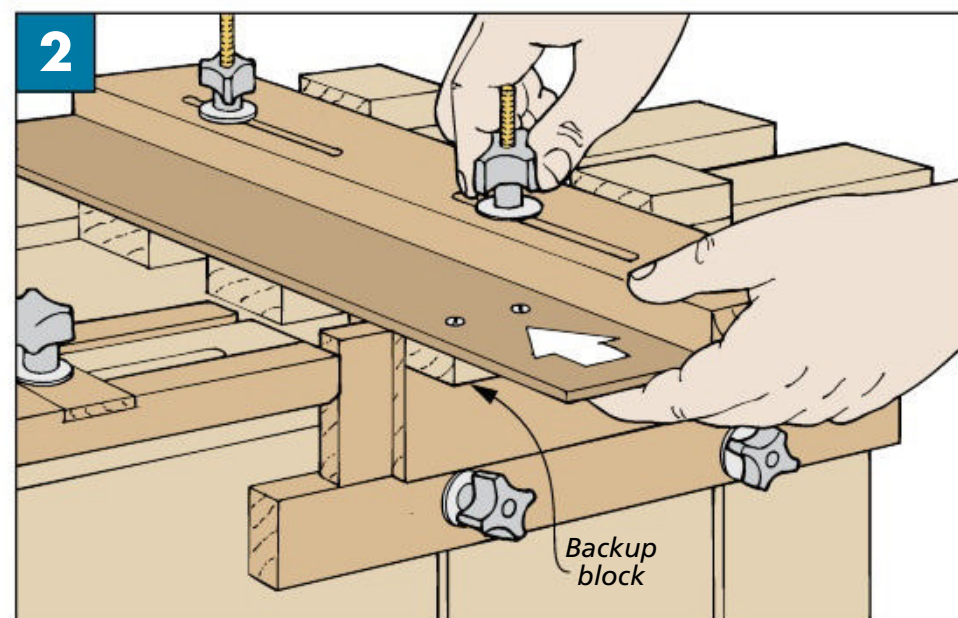
Additionally, by using the adjustable stop, you can be sure that your tenons will all stay a consistent size without much fiddling at all. The jig is an easy way to cut reliable tenons, and it's so simple that you may find yourself bringing it out again the next time you've got a project with mortise and tenons. **W**



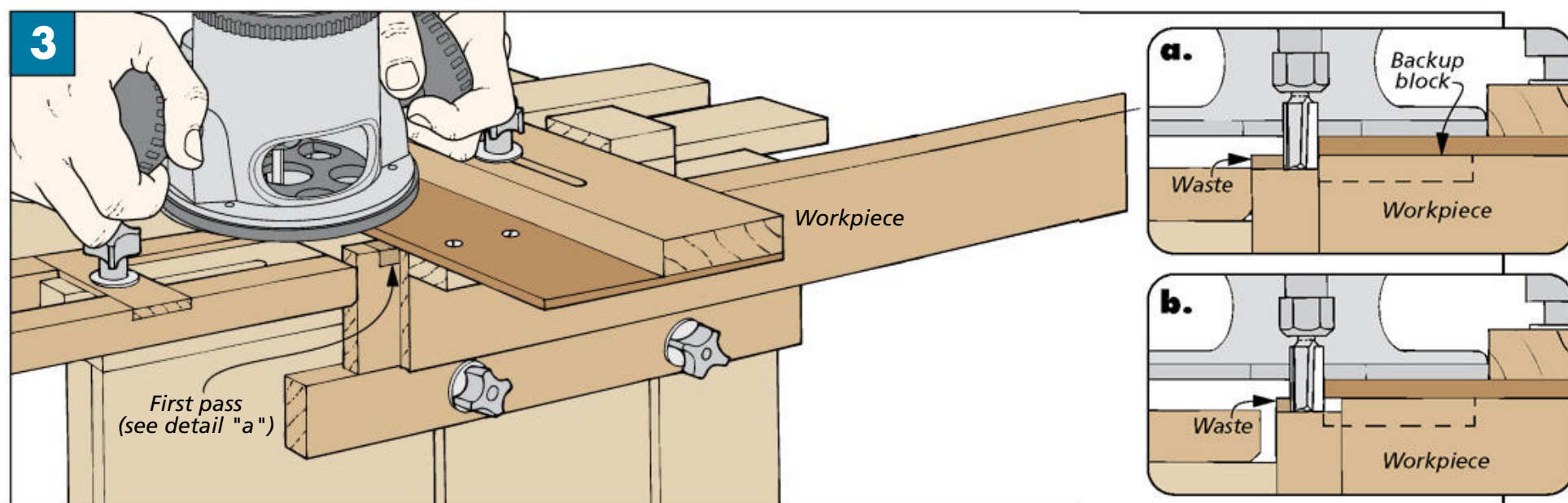
▲ **Backup Block.** To reduce chipout, slide the fence in so the backup block butts up against the workpiece.



Support Rail. Keeping the stop in place, butt the workpiece up against the platform and the stop. Locking the support rail holds the workpiece in place.



Backup Block. Slide the fence until the backup block contacts the workpiece, then tighten the knobs to lock the fence. The backup block helps keep the piece flat and prevents chipout.



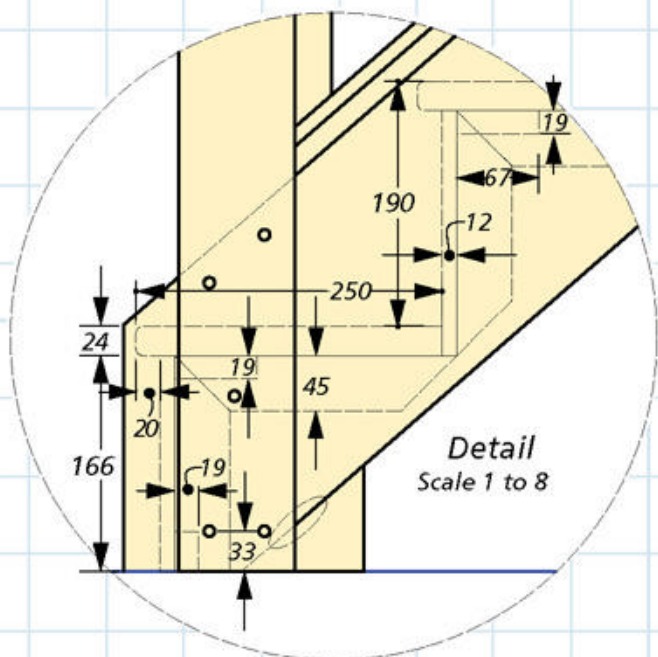
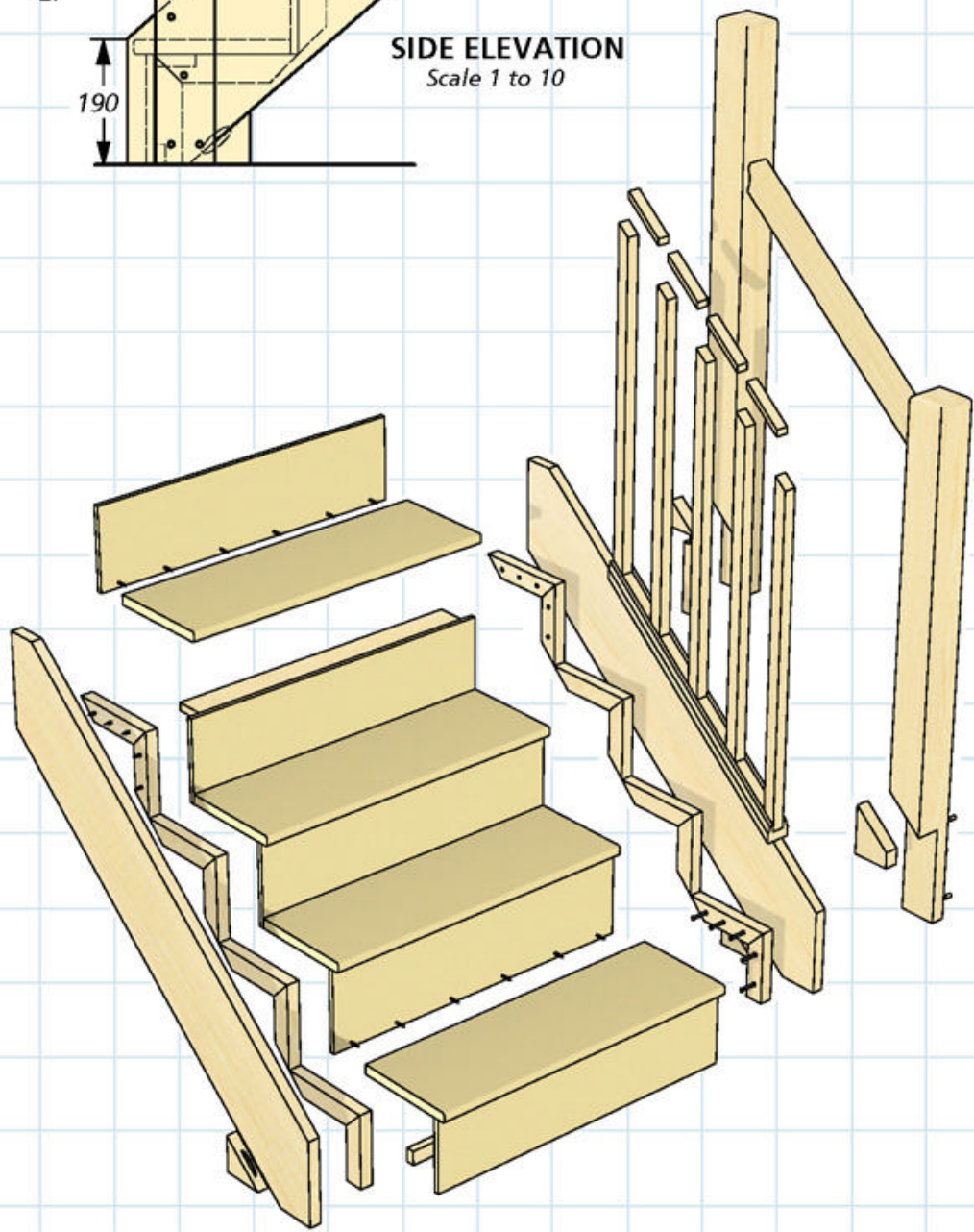
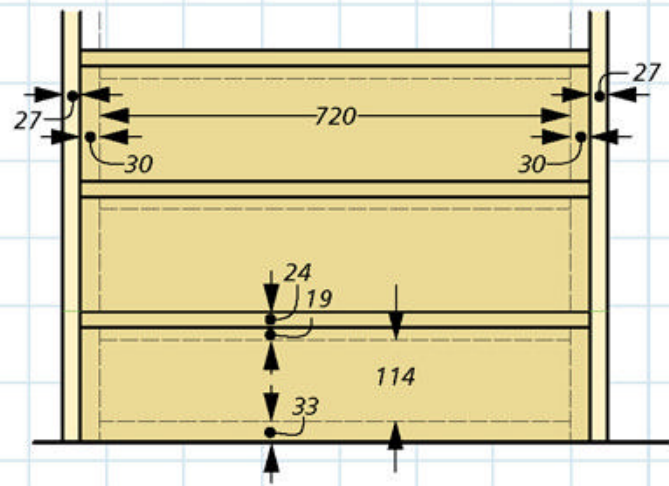
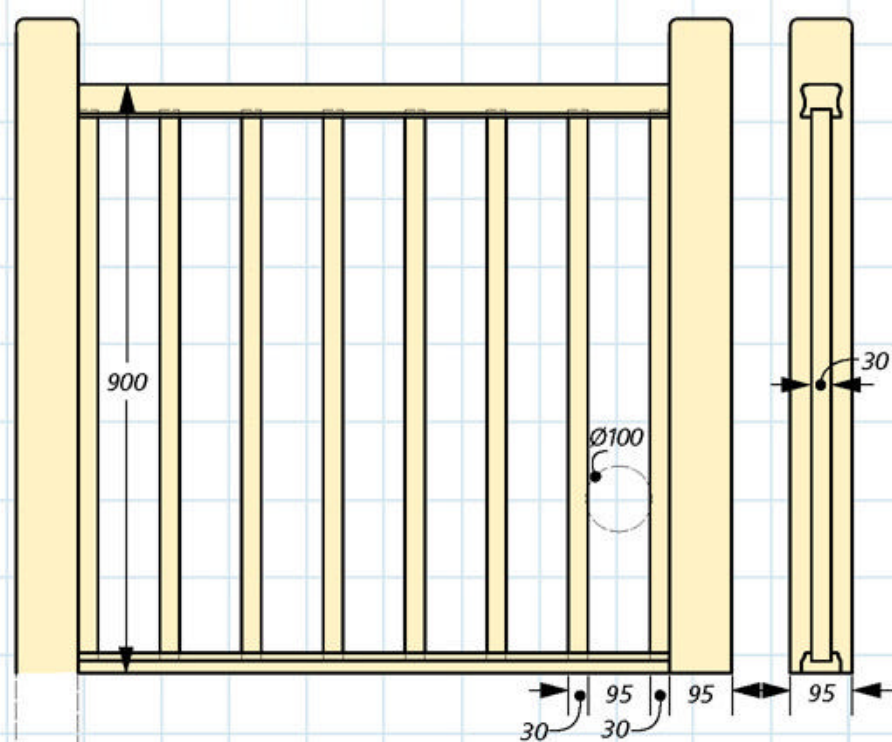
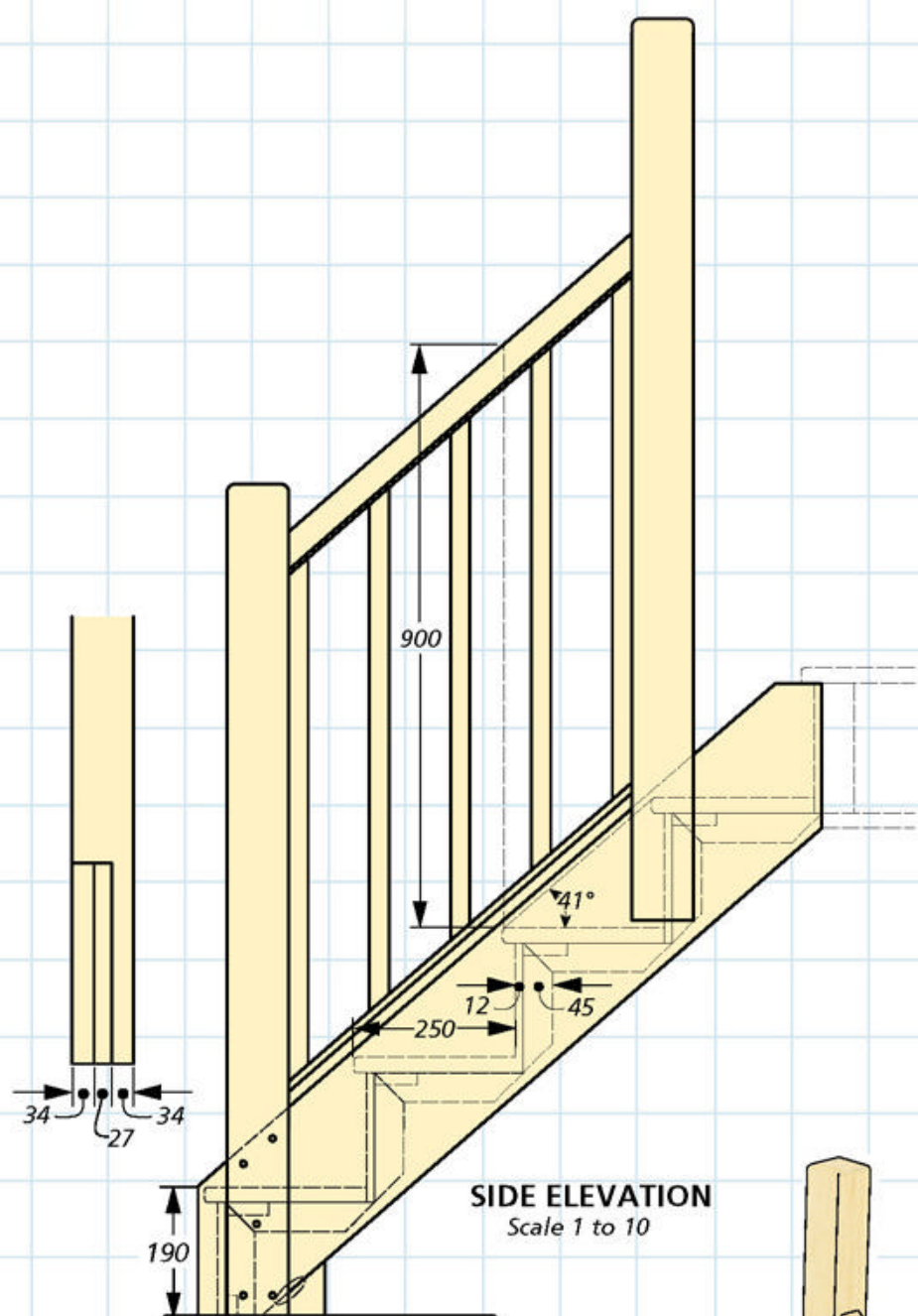
Establish the Shoulder. Again, it may take several passes to rout the edges. Start by establishing the shoulder on the first pass (detail 'a'), then loosen the fence and slide the workpiece away from the stop for each pass after (detail 'b') until all the material is removed. To complete the tenon, repeat the process on the opposite edge.



Follow James Hatter's step-by-step guide to build your own stairs.

Make a Staircase

PHOTOS: JAMES HATTER



This project describes the construction of a set of simple steps, with newel posts, handrail balustrade and spindles. This formed part of a kitchen extension, and was subject to Building Regulations. The information presented here should provide you with the basis to customise a set of stairs to your own requirements.

The steps and risers are made from a water-resistant grade of MDF, with pine supports and side stringers. Using MDF is not only an economical choice, it is stable and will not "squeak" as the seasons change.

The assembly is held together with adhesive and screws. Jointing biscuits are used for attachments to the bottom of the stringers. The handrail and base rail use commercially available pine mouldings. These include a rebate to take 30 x 30mm cross section spindles. Newel posts were formed using 95 x 95mm DAR pine stock.

DESIGN CONSIDERATIONS

The muscle memory we develop over time has us unconsciously understanding that the rise in a stair is always consistent and falls between 170 and 190mm. We walk up and down stairs without looking at our feet. This is especially important for the elderly and the blind. Stairs need to always have consistent rise and go. Plus, the balustrading needs to be high enough

to stop an adult from accidentally falling over it (865mm minimum height).

The other consideration is the maximum distance allowed between balustrades. That distance is 99mm. A building inspector will have a 100mm-dia ball at hand to check that a baby can't get its head caught between the balustrades.

TIME TO DESIGN

Accurately measure the distance between the levels you wish to include steps. Inspect the surround about the top of your level, and determine firm and secure attaching points. Take into account any obstacles. In this project I wanted to make use of the outer layer of the cavity wall that was towards the top of the level, which reduced the amount of floor space needed at the lower level. You also need to decide the stair width.

Determine the number of steps you will require, taking into account the Building Regulation requirements.

Make a scale drawing, and check angles. Then, make a stringer template using plywood, or MDF, marking all the step positions. Test fit, and when satisfied transfer all the measurements to real stringers.

You may wish to have a handrail and bannister on both sides of the steps, so the methods suggested can be repeated for both sides.

CONSTRUCTION METHODS

Once all the measurements are on the stringers, the stringer can be refined such as adding an attachment to the bottom inside of each stringer, so that it has a wider footprint at the bottom.

Cut supports for each of the steps, and further supports for the step width. In this example, all the supports and stringers used pine. The steps are made of water-resistant grade MDF, which keeps cleaner edges than standard MDF. The step consists of two layers of 12mm MDF glued and the riser uses a single piece of 12mm MDF.

The newel posts are made of 95 x 95mm pine. With commercially made stairs the stringer and handrail are usually mortised into the newel posts; however, in this example, the part where the stringer meets the post is rebated using a circular saw, so that the stringer is mid-position. The piece removed is reduced in thickness, and joined to the other side of the stringer.

The handrail, base rail and spindles, are assembled as a unit, using commercially available handrail, base rail and spacer strips and spindles. These are placed between and attached to the newel posts.

The completed assembly can be finished as required.

BUILDING REGULATIONS

The following provides a summary of the current Building Regulations in Australia. Building codes for Australia can be found at: hia.com.au. Always check the regulations for updates.

Maximum number of steps:

For domestic properties regulations specify that the maximum number of steps in a flight is 18. This is not normally a problem, as a typical domestic installation usually only requires 13 steps. However, this project uses five steps, and it is suggested that a DIYer should only tackle a small number of steps, and leave a full staircase to a professional who

understands the law of landings, winders and distance from doors.

Steepness:

The maximum angle of pitch is 45° and the minimum is 26.5°

Step size:

The maximum step rise is 190mm and the minimum is 115mm. Measuring the landing to the floor and dividing by 5 will give you your rise. For the set of steps on these pages the rise is 190mm. The step depth or 'going' is a minimum of 240mm – these measurements are taken from the pitch point. The step normally has a nose

that projects 16–20mm in front of the pitch line. However, the ratio of sizes must not exceed the maximum angle of pitch requirement of 45° as stated. Any winders must have a minimum of 50mm at its narrowest point. The minimum step width is 600mm.

Handrail, balustrade and spindles:

The height minimum is 865mm above the pitch line, and any spindles must have a separation distance such that a 100mm sphere cannot pass through, so for plain spindles 90–98mm separation is acceptable.

Building the STAIRCASE

1 For my staircase, steps were required to give access to the extension floor below. Accurate measurements were taken, and the width and steps decided, taking into account the required Building Regulations.

2 The first step is to make a template using the measurements taken, and fit to check it meets Regulation requirements.

3 From the template, the stringers can be measured and cut to size, in this example 27 x 215mm pine was used. Additionally, an attachment is biscuit jointed to the lower part to increase the footprint to the bottom part of the staircase.

4 The notches are also cut to fit over the brick protrusions, if this is appropriate.

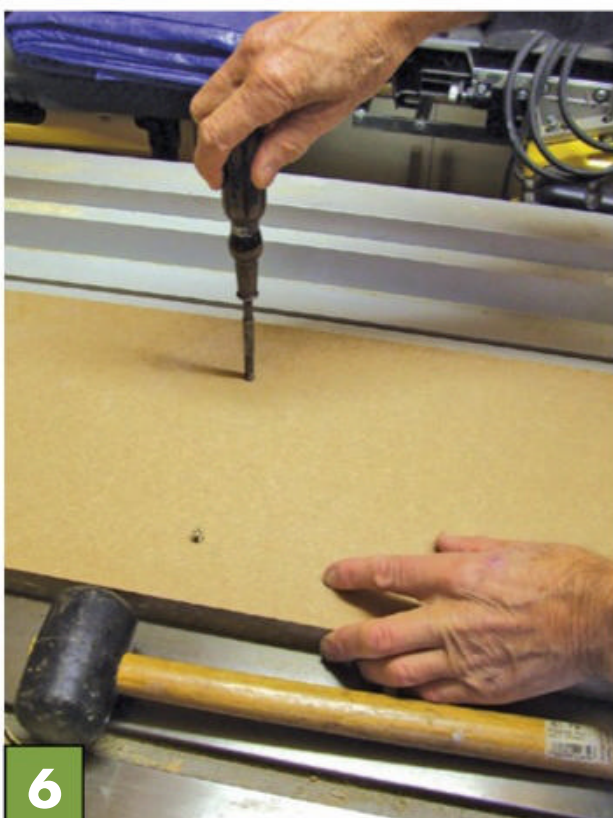
MDF

Solid wood staircases are designed to be adjusted with wedges as the seasons change. When wooden stairs start to squeak it is time to tap home the wedges that lock the treads in place. MDF treads can be glued and screwed in place and will never squeak.





5 Each step is made using two layers of 12mm MDF. These are cut to size, glue is applied and each pair is joined together.



6 Screws are used to pull the two pieces together (clamping risks the pieces sliding across each other).



7 A riser of 12mm MDF is attached to each step, again using both adhesive and screws.



8 Pine step and riser supporting blocks are attached to the inside of each stringer using adhesive and screws.

9 Support the stringers (I used the outdoor table and some newel post stock), attach the steps, then attach risers to the supporting blocks.

10 An added pine support is screwed and glued at the front of each step. The front edge is spaced the nose distance (20mm) plus the MDF thickness (12mm) from the front edge of the step.

11 Apply adhesive to the joining edges of the support blocks and pine support and then locate each step into position.

12 Attach with screws into the support blocks and pine support.

13 Allow the adhesive to set before moving.

14 This view of the rear of the steps shows the supports. The pine supports screwed to the step not only provide an anchoring point for the risers, they also act as a truss and strengthen the step.

STAIRMAKING

Once you get a quote for a flight of stairs you may well consider building your own. Before you start on a longer flight you will need to study the regulations to understand landing dimensions and distance from doors. MDF, PVA, DAR stock and modern screws have revolutionised stairmaking.



9



10



11



12



13



14



15



16

15 Place the completed stair assembly into position and fix in place using screws into the walls as appropriate. The gap to the right of the assembly will have the top newel post inserted.

16 Next, measure for the newel posts to the top and bottom. Both the top and bottom posts are rebated, so that the stringer sits mid-position. Retain the piece cut for the rebate.

17 Make good the inner side of the lower newel post by inserting the piece you have cut out, resizing as required.

18 The top post has an insert for the same purpose, but this needs to be cut to overcome the obstructions.

19 Counter-bored screws and adhesive are used to attach the post to the stringer and the attached insert. Use wood plugs to conceal the screwheads.

20 The handrails, base rails and spindles are assembled as units and then attached to the newel posts.

Commercial handrail stock is profiled so that a hand can glide along the surface. The base rails and the spindles should also be eased with sandpaper or a 2mm beading bit so that the edges are smooth and splinter free. This not only feels better to the touch, it also lets the finish wrap around the stock in a more consistent manner.



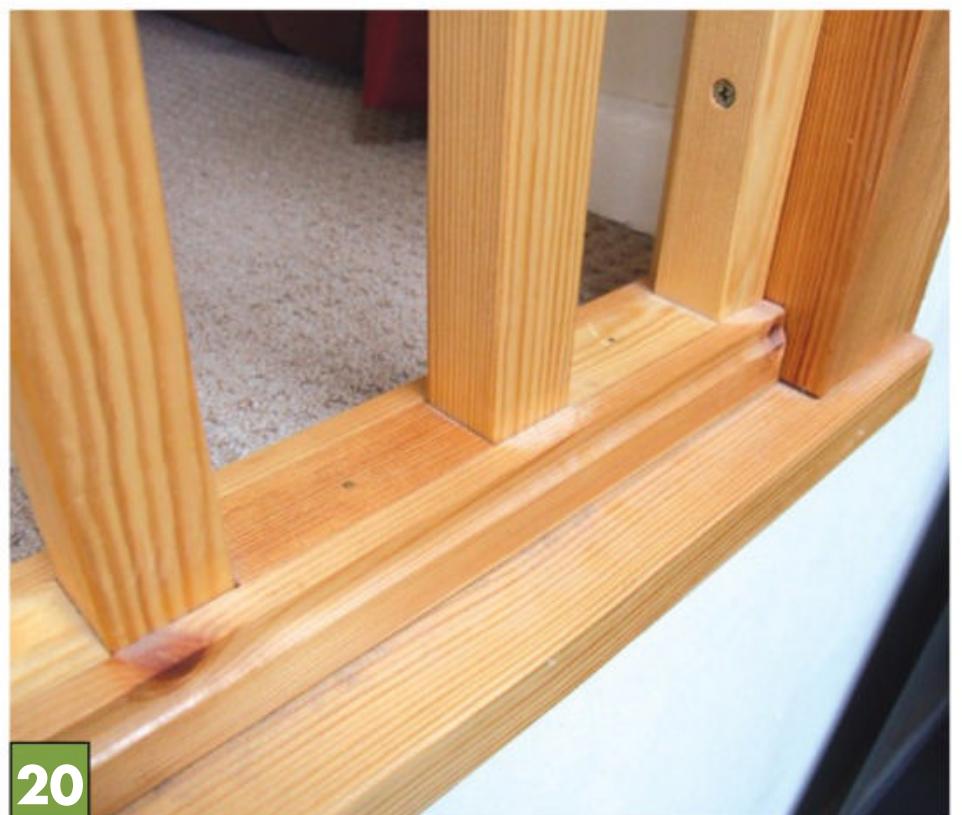
17



18



19



20

21 The bottom view of the completed stair assembly.

22 Inner view of the bottom step showing the supports. The next step was to tile the floor and put the shirting boards in place.

23 Detail of the meeting point between the stair and mezanine balustrading.

24 View of the top balustrade. No 100mm-dia ball will pass between any balustrades.

25 The completed stairs with carpet fitted. **W**



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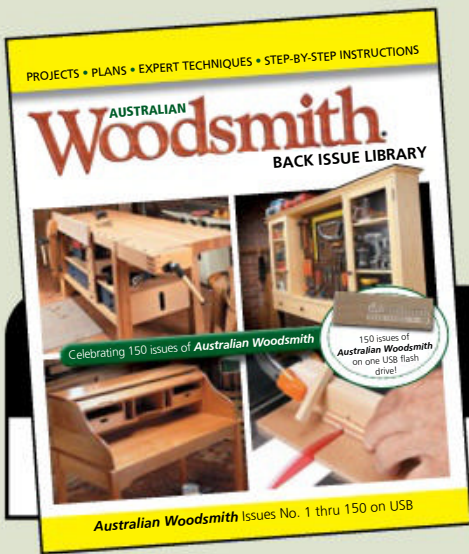
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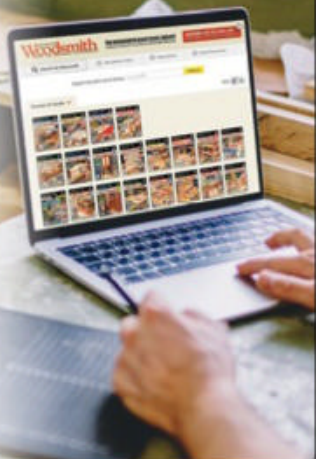
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Kumiko Lamp Shade

There is nothing quite like the warm glow generated by a timber and washi lamp. Add in the intricate and visually challenging patterns of Kumiko shining through the washi and you have an absolute winner. Brian Davey takes us step-by-step through the project.

I have been fascinated with Kumiko panels for a while and had made a few square lamp shades, but square would not do in this situation... it had to be round. My research yielded nothing and so I headed out on a voyage of discovery, and you are welcome to come along and participate in my journey. The lamp shown here is the fourth in the series, two were set aside as learning experiences.

The place to start for me is always

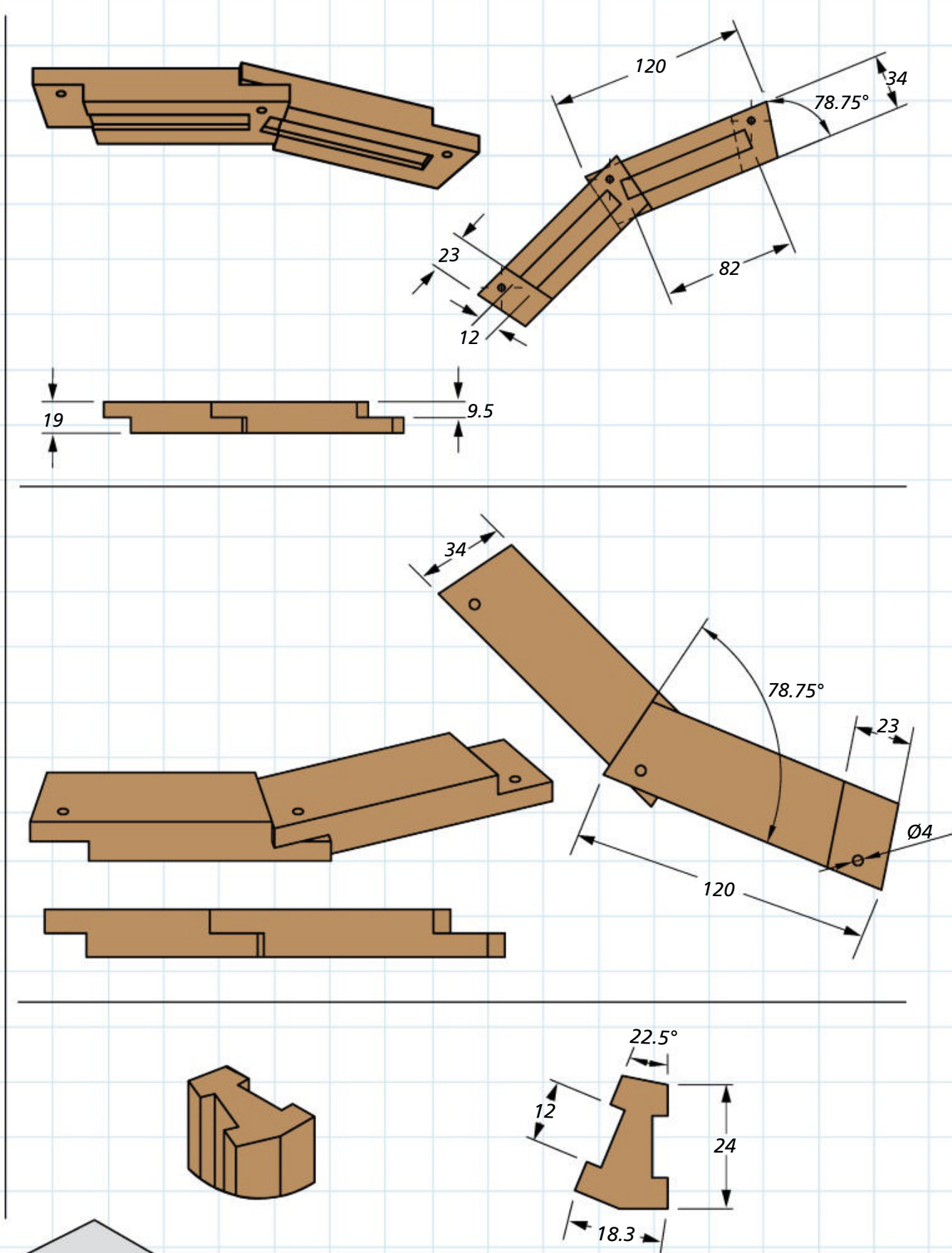
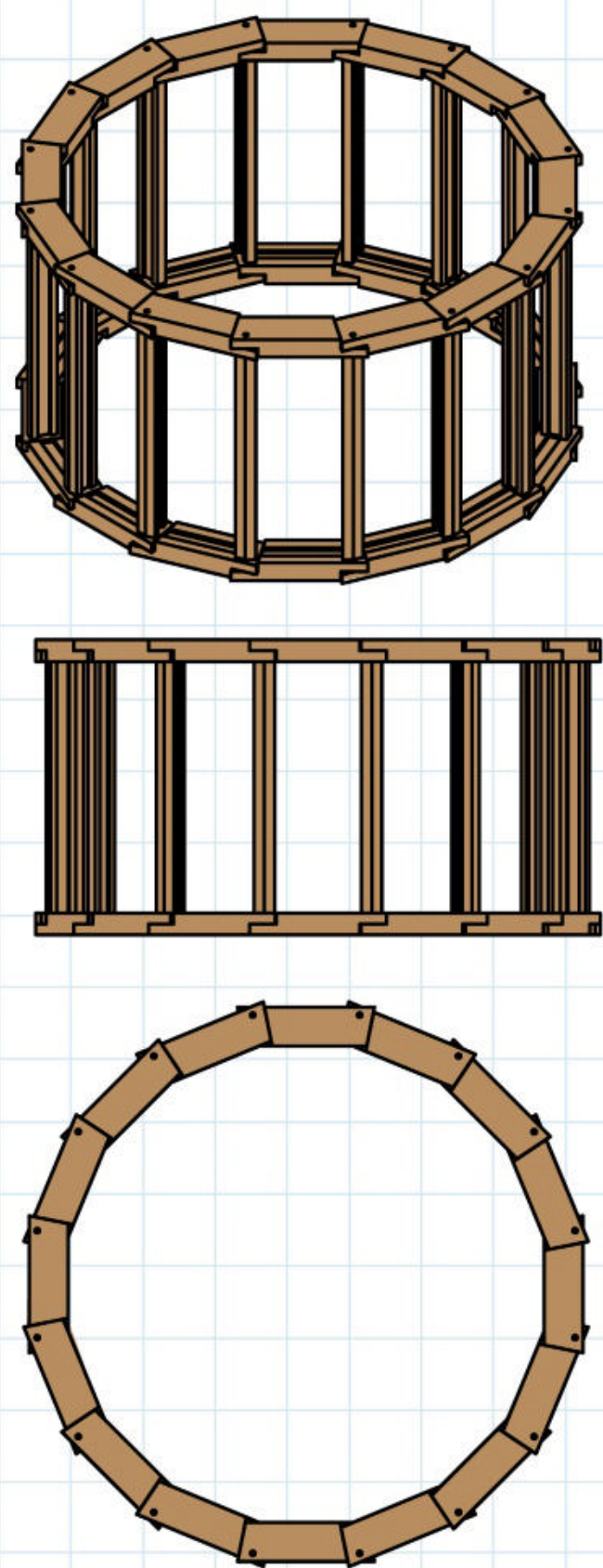
drawing and I find a lot of problems are solved before starting to cut timber if the drawings are correct. The lamp shade frame drawing gives an overall view of how it was going to work. The Kumiko panels are missing here for clarity.

The drawings detail how the upper and lower hexadecagonal rings will be made using dowelled drawbore half lap joints.

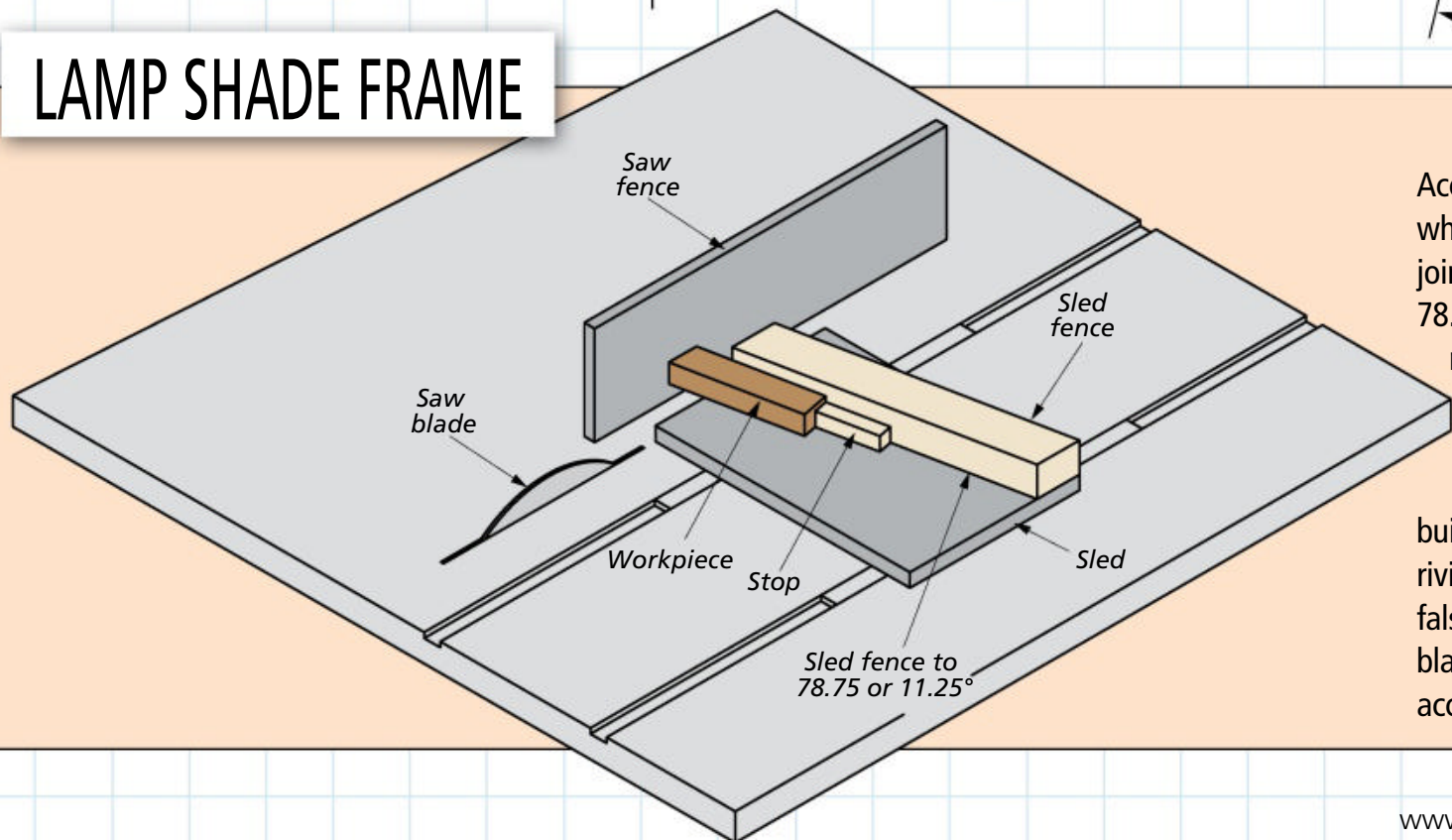
There are 16 segments for each ring.

Please note that dimensions given suit the Kumiko panel sizes that I made. I suggest you make the panels first and then size the parts to match. Note that in these drawings I planned for the panels to be 12mm thick but, as always, things change and I ended up with 10mm panels after I had them cleaned up ready for installation. This is why you must start by making the panels and building the lamp shade frame to suit.

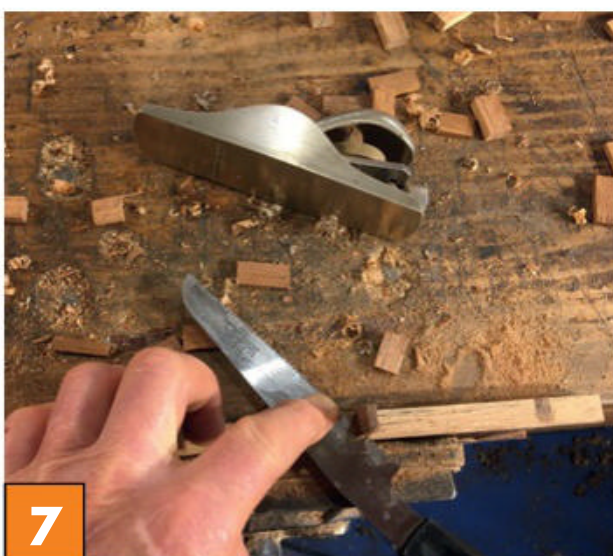
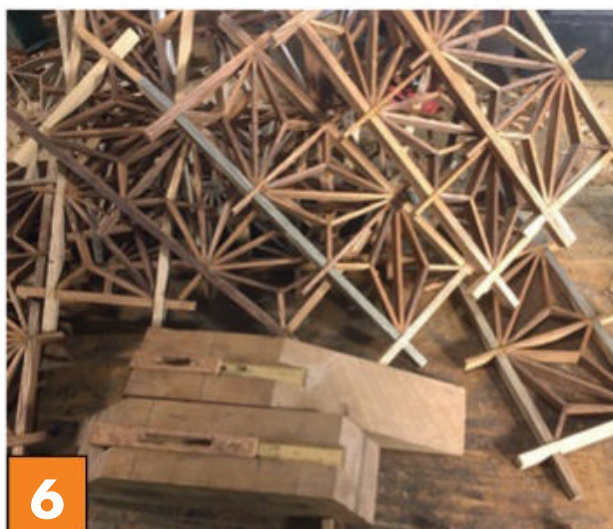
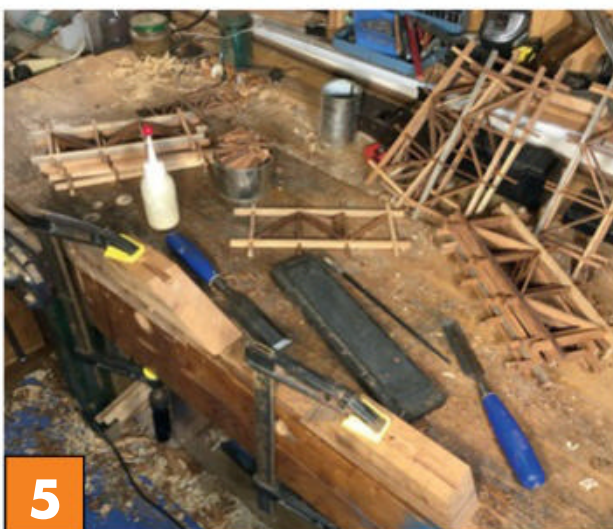
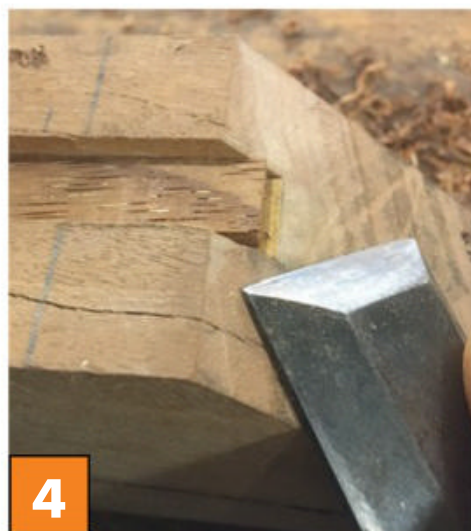
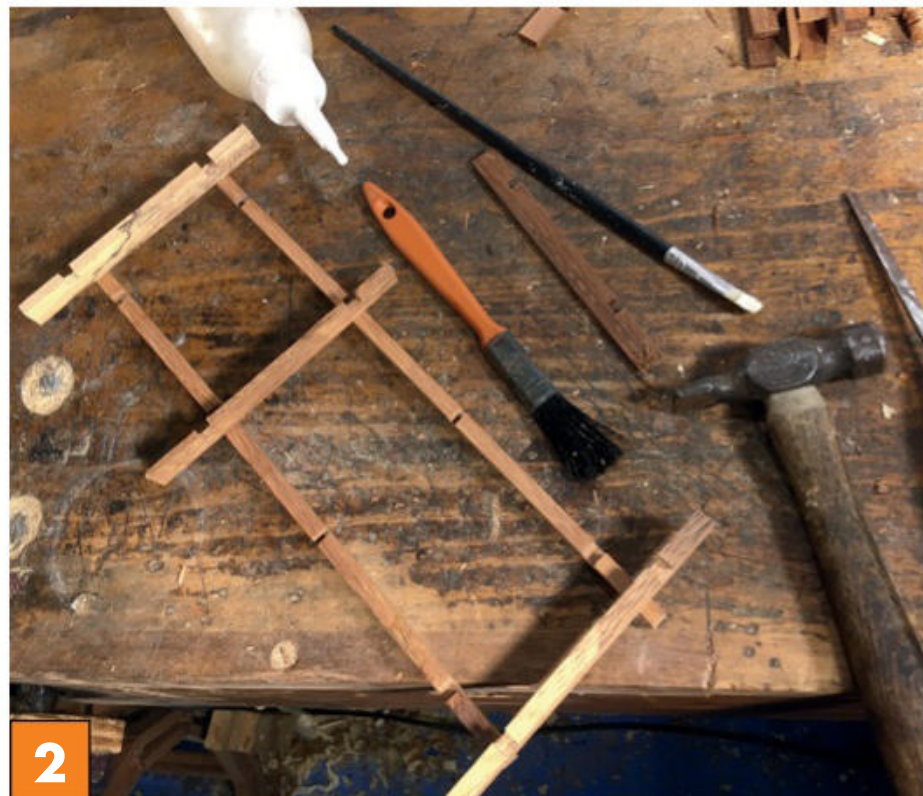
Construction Overview / OVERALL DIMENSIONS: 500mm-dia x 260mm H



LAMP SHADE FRAME



Accuracy is the name of the game when you are cutting 32 half lap joints. Setting a cross slide angle to 78.75° is beyond the tolerance of most table saws. What you might have to do is build a false saw table and route two parallel cross slide grooves in place. Then build a sled to match, remove the riving knife from your saw, clamp the false top in position and then raise the blade. This will give you repeatable accuracy and neat joints.



1 The first step in making the Kumiko panels is to cut all the parts to width and thickness. I started out with 12mm-thick material and ripped and thickened the strips to 3.2mm thick to match the saw blade. I also made a number of pieces 6.4mm thick for the outside of the frames. Then I built a jig to cut the frame housing joints on the table saw.

2 The ladder frames were then glued and assembled. All excess glue carefully removed.

3 Kumiko jigs are available from Japanese Tools Australia or they can be made in the workshop.

4 I used a razor-sharp chisel to shear away the excess, leaving the Kumiko pieces with 67.5°, 22.5° and 45° end faces.

5 The chisels needed to be honed over and over again on a stone so that they were always keen.

6 In total, the 16 panels contained 336 hand-cut Kumiko sticks, more than half with compound angles!

7 I used a flush cut saw to trim away the "horns" and then a block plane to dress the edges.

8 The drum sander was then converted into a thicknesser. The faces of the ladder were sanded flush, changing the thickness from 12mm to 10mm.

9 Traditionally rice glue is used to bind washi to Kumiko frames or shoji screens. Rice glue dries hard and clear and can be dissolved with a damp cloth when it is time to renew the washi. You can easily make your own rice glue by following online instructions. After I had made the rice glue, I cut the washi slightly larger than the frames, rolled the glue onto the Kumiko and built a stack that I could compress under a couple of bricks. When the glue had dried, I used a sharp chisel to remove the excess paper.



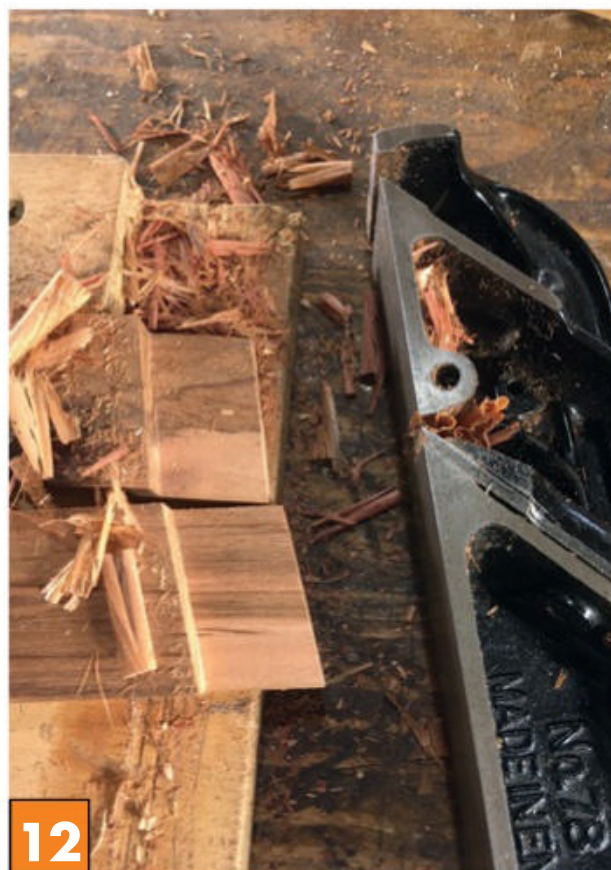
10 With the Kumiko panels complete it was time to focus on the 32 pieces that would form the hexadecagonal top and bottom of the lamp shade. As you can see I used a digital angle cube to set the sliding bevel to 11.25° and then used this angle to tweak the cross slide so it too was set at 11.25° .



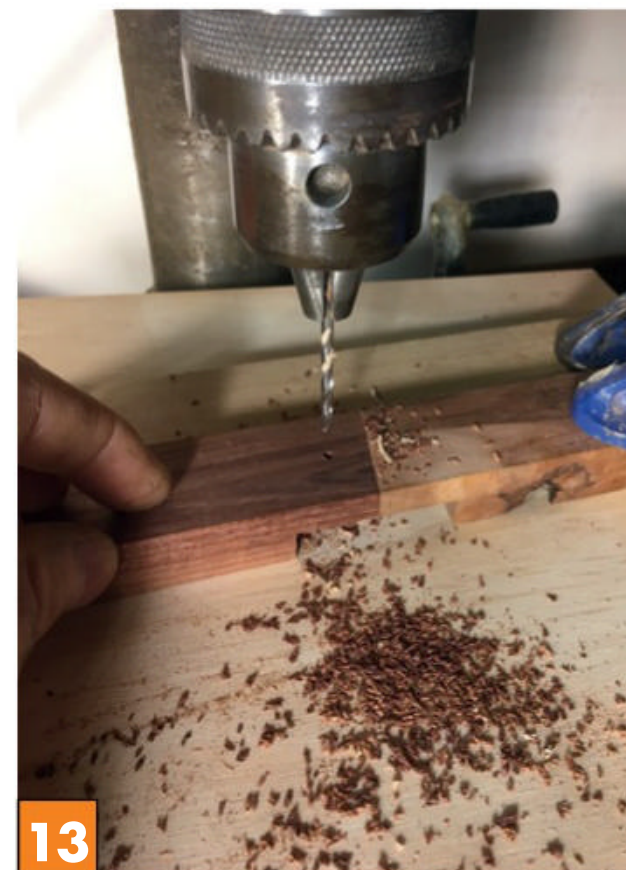
11 With the cross slide set to exactly 11.25° it was time to set the fence 23mm away from the inner side of the saw blade and nibble away the excess for the half lap joints. This process was repeated 64 times with an average of ten passes across the blade for each half lap. That adds up to 640 repetitions across the blade. No room for error or loss of concentration!



12 The rough and uneven surface left by the saw blade was then cleaned up with a bullnosed plane. I planed mating and numbered sections and adjusted the depth of cut until each joint was flush. This was a time-consuming but rewarding process.



13 The next challenge was to drill a 3mm hole in the top section and then another 3mm hole offset 0.5mm so that a bamboo skewer could act as a drawbore dowel and close the joint solid. The first step was to set up a fence and a stopper on the drill press and go about drilling the first hole in what would be the top face of the hexadecagon. I then moved the stopper just 0.5mm and drilled the second hole in the base piece.





14 Next step was to set up a 10mm-dia straight bit in the router table and adjust it so that it would cut a centred groove 3mm deep down the inside face of each piece. After decades of woodworking I always expect the unexpected and did a couple of trial cuts on waste stock. When I was confident the system was working I marked the inside centre with a pencil and went about routing the housing for the Kumiko panels.



15 I glued the lap joints together first in twos, then fours, then eights and finally the whole ring. The first step in the process was to drill 6mm holes in the cauls I was using so the bamboo skewer drawbore pin would not be crushed when the cauls were clamped tight. The second step was to cut the bamboo skewers slightly longer than required and sharpen one end with a pencil sharpener. I applied the glue to the joint, tapped home the drawbore dowels and then clamped the joint closed with a clamp. The drawbores and clamping process produced tight joints and smiles all round.

16 After mounting the ring in a vice I used a flushcut saw to remove the outer "ears" and then a block plane to shoot the end grain and dress the outer sides smooth.



17 With the outside dressed to impress I clamped the ring to the bench and went about cleaning up the Kumiko groove with a hand router (my favourite tool).

18 At this stage I used my scroll saw to cut away about 4mm from the inside edge of each ring. This was so the inner corner of the half lap joint would be removed. This was a challenge to clean up afterwards, but a card scraper was made for this sort of situation and proved to be a very effective solution to the problem. Before I went about applying a finish and assembling the components I softened edges by removing the arris with 240-grade abrasive paper. This process is hardly noticable, however it reduces the chance of splinters, strengthens the edge and gives it a better "feel".

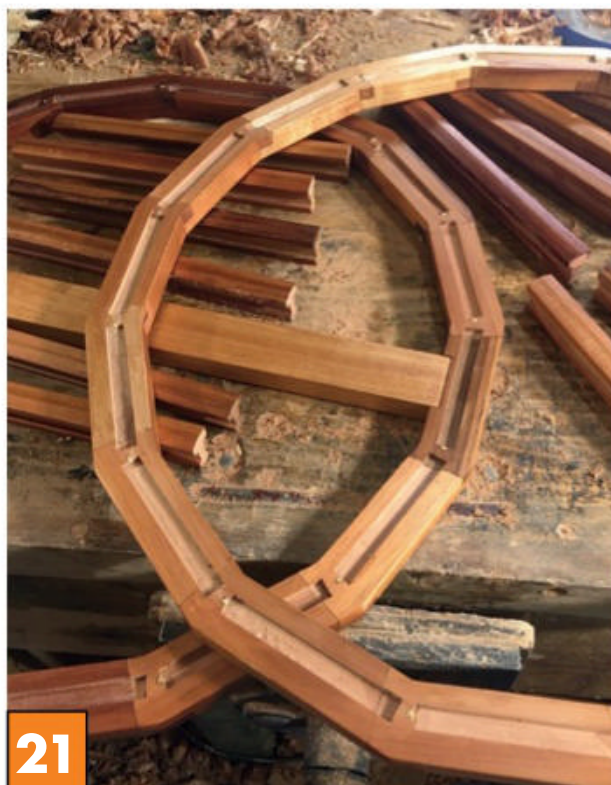
19 Now the uprights were a challenge as they also needed the same angle of 11.25° and were relatively small and so care and push-sticks were required to cut them to size and shape on the circular saw.

20 Once the upright blanks were made, I went back to the router table and cut the groove for the panels. I used the same 10mm bit that I had used for the housings in the top and bottom rings. The uprights were then cleaned up with a plane and cut to length. Again it is important to check the length is correct before cutting all the parts. I used up a few spares before I was totally happy with the size.

21 As I knew finishing the final product was not going to be possible after assembly without getting finish on the washi, I prefinished all parts by sanding with 120 and 240 and then two coats of rubbing oil. I was careful not to apply oil to any of the grooves where the panels would be housed as they would be part of the final glue-up. Note in the picture I have added the cross piece that will support the structure and hold the lamp fitting.

22 Assembly was always going to be a challenge with this many moving parts. With care I placed the panels in the lower ring, added the uprights, then placed the upper ring in place. With a couple of 'F' clamps to help, I fiddled the panels and one by one they slipped into their recesses in the upper ring. Confident that it would all go together, I then followed the same procedure again, but this time I added glue to the grooves that housed the panels in both rings and the uprights. I always put the bead of glue along the inner edge so that if there was any squeeze-out it would not damage the paper and be visible from the outside.

23 The lamp fitting that I purchased from a local light shop was nothing special and required some fiddling to get in place. As all parts had been prefinished the lamp shade just needed final installation in the dining room. Needless to say I was rather pleased with the final result. **W**





▲ The quick-release vice that's integrated into the front of the bench earns its keep in multiple ways. The wood vice face holds parts firmly in place without marring the surface. And the dog holes open a world of workholding possibilities.



Weekend Workbench

A new bench that's heavy enough it can't be pushed around, has lots of storage but doesn't cost a ton of money to build? This is the one.

This simple but sturdy workbench ticks all the boxes when it comes to a reliable workcentre. It's made of a trio of fairly economical materials — 90 x 45 Douglas fir framing stock forms the skeleton, pegboard in the sides and MDF for the shelf and the top. Plus, all this stuff is available at local hardware stores and timber yards.

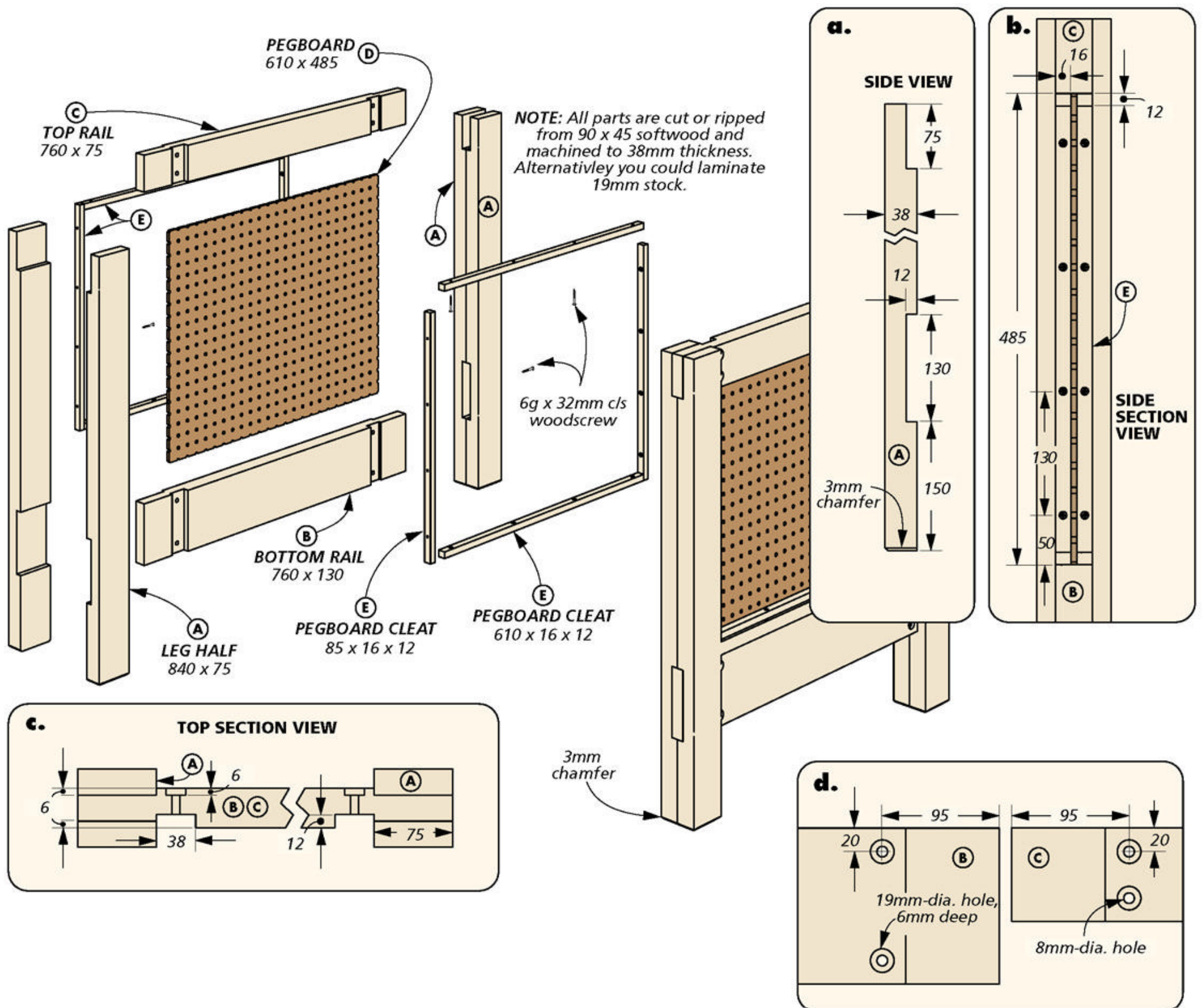
As simple as it is, this bench will excel on multiple fronts. If you need a large flat surface to assemble a project, or repair a chair, you've got it here. But your more focused woodworking desires aren't shortchanged either, notice the heavy duty vice bolted to the front. Also, the wood jaw has a pair of dog holes that align to the holes in the top. So if planing, scraping or most any other woodworking task is at hand, you'll be able to tackle them with your material held firmly in place.

The subject of how much workshop storage you should have is similar to the age-old clamp conundrum — you can't have too much storage or too many clamps. That's especially true when you look at the cabinet here that sits on the shelf of the workbench. So, let's see — a new bench, with added storage options, it's a win-win on all accounts.

If you so desire you could probably build this bench in a weekend (maybe a long weekend). But what's the hurry? This strong bench is going to give you years of service, so take your time and enjoy the journey.



▲ The term "storage galore" isn't hyperbole when it comes to this workbench. The ends of the bench are put to work with pegboard, while the lower shelf hosts a cabinet with plenty of storage options.



Start with the SIDES & BASE

The sides you see above are made up of a pair of legs that are tied together with rails. The rails are joined to the legs with mortise and tenon joinery. To make the joinery manageable, I glued up the legs from framing stock material. So keep the goal of matching the grain patterns of the leg halves in mind when heading out for the material.

If you take your time selecting the boards for this project, you'll be happier in the long run. I look for the straightest grain possible when shopping. Also, it's a good idea to let the timber acclimate in your workshop for a while.

LEGS. With all the parts cut to length, it's time to focus on the joinery. It's fair

to say that most of the joinery involved in making this bench is right up front when you're making the sides. A lot of problems are solved by using two halves to make the legs. Instead of large open and closed mortises to contend with, you're looking at a rebate in the top, and a trench towards the bottom of each leg half (detail 'a').

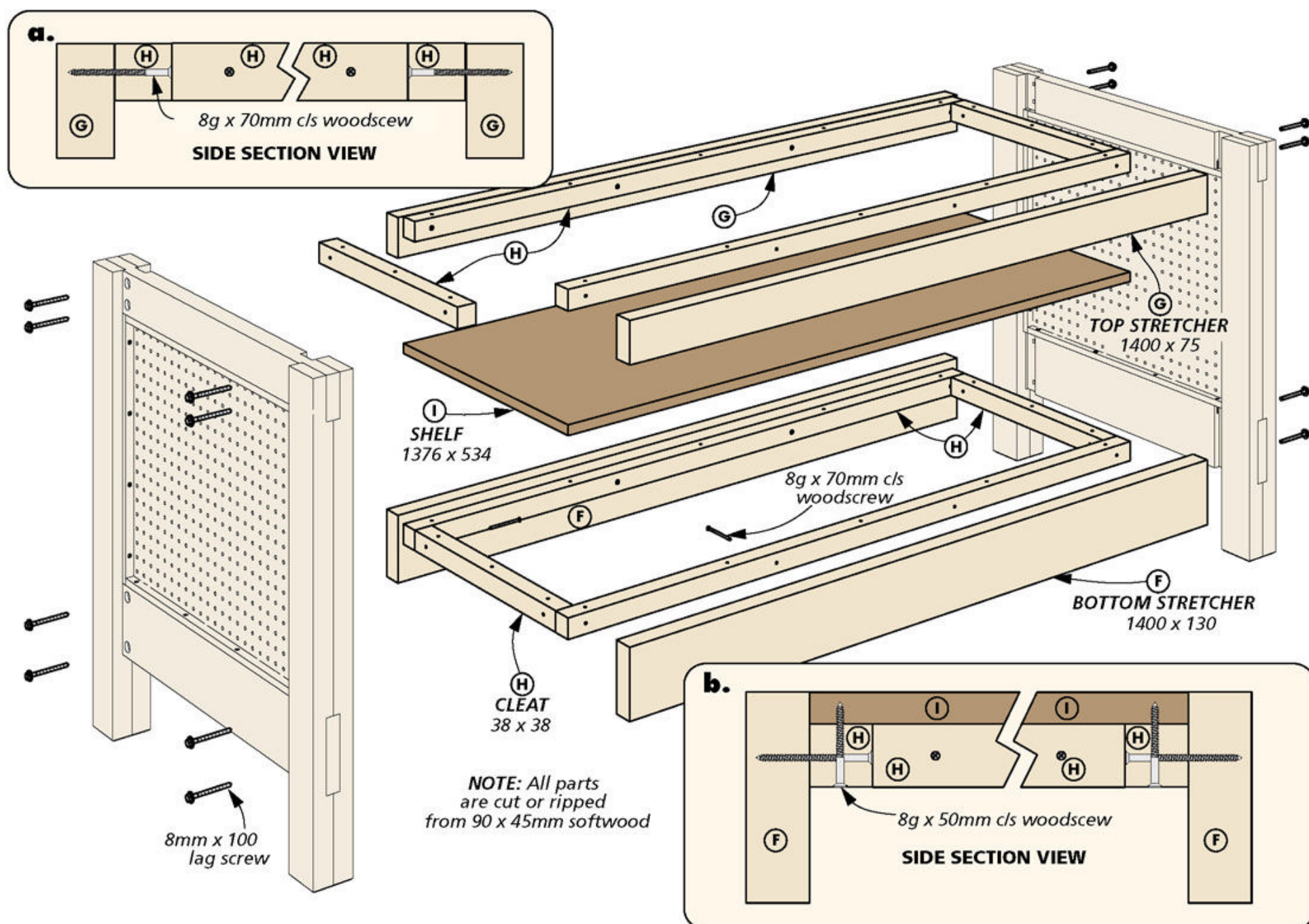
When you're done at the table saw with these parts you can glue them up. I made a spacer to use in the large mortise to keep the halves aligned. While the glue's drying, turn your attention to the tenons and trenches on the rails.

RAILS. Notice in the main drawing above that the rails are different sizes, but the

tenon profiles and the trench depths are identical on both (detail 'c'). I chose to make the trenches for the stretchers first. Then it's just a matter of lowering the dado blade to nibble away the tenons.

All that's left to do on the rails is drill the counterbored shank holes that you see in detail 'd.' Before gluing up the legs and rails, add the chamfer at the bottom of all the legs.

PEGBOARD SCREEN. I confess, I love pegboard. It's a nostalgic thing more than a pragmatic one. It seemed that all my uncles and every adult guy I knew had a pegboard rack in some corner of their garage or shed. The level of organisation was another matter, and kind of a



reflection on that fellow's view of tool stewardship.

At any rate, as you see in the main drawing on the previous page, I trapped a pegboard in the opening of each side (detail 'b'). It's held in place with cleats that are screwed to the rails and legs. After installing these parts, I turned my attention to the stretchers and the bottom shelf.

STRETCHERS, CLEATS & SHELF

Bringing the sides together and creating a solid base for the top of the workbench involves the parts you see in the drawing above. The bottom and top stretchers fit into the trenches you made in the rails earlier and are held there with lag screws.

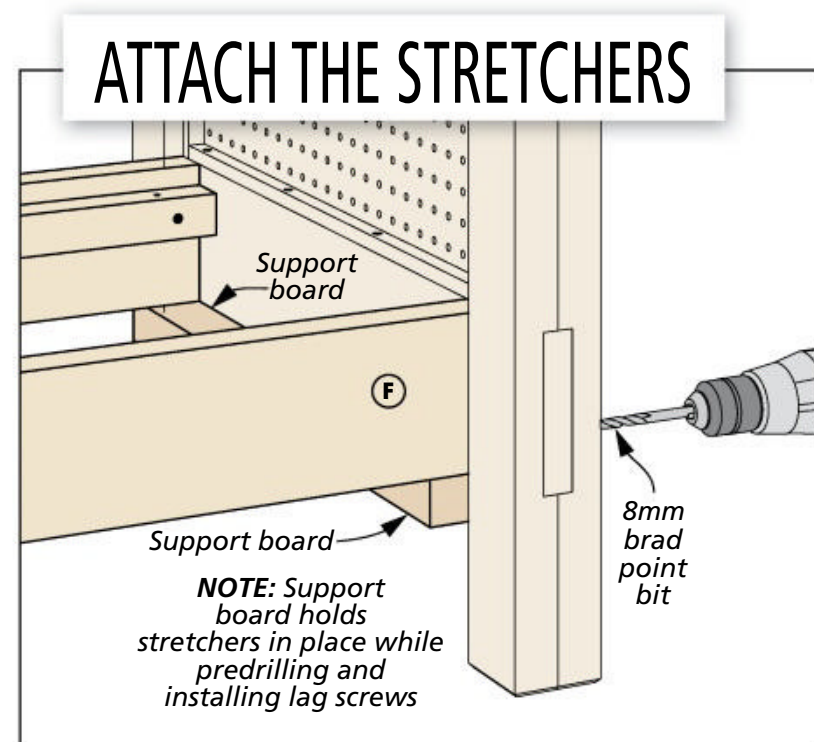
The cleats that you screw to the stretchers in turn tie the shelf (detail 'b') and top (detail 'a') to the base. To start, I trimmed the stretchers to length, making sure all of the cuts were perfectly square. This detail

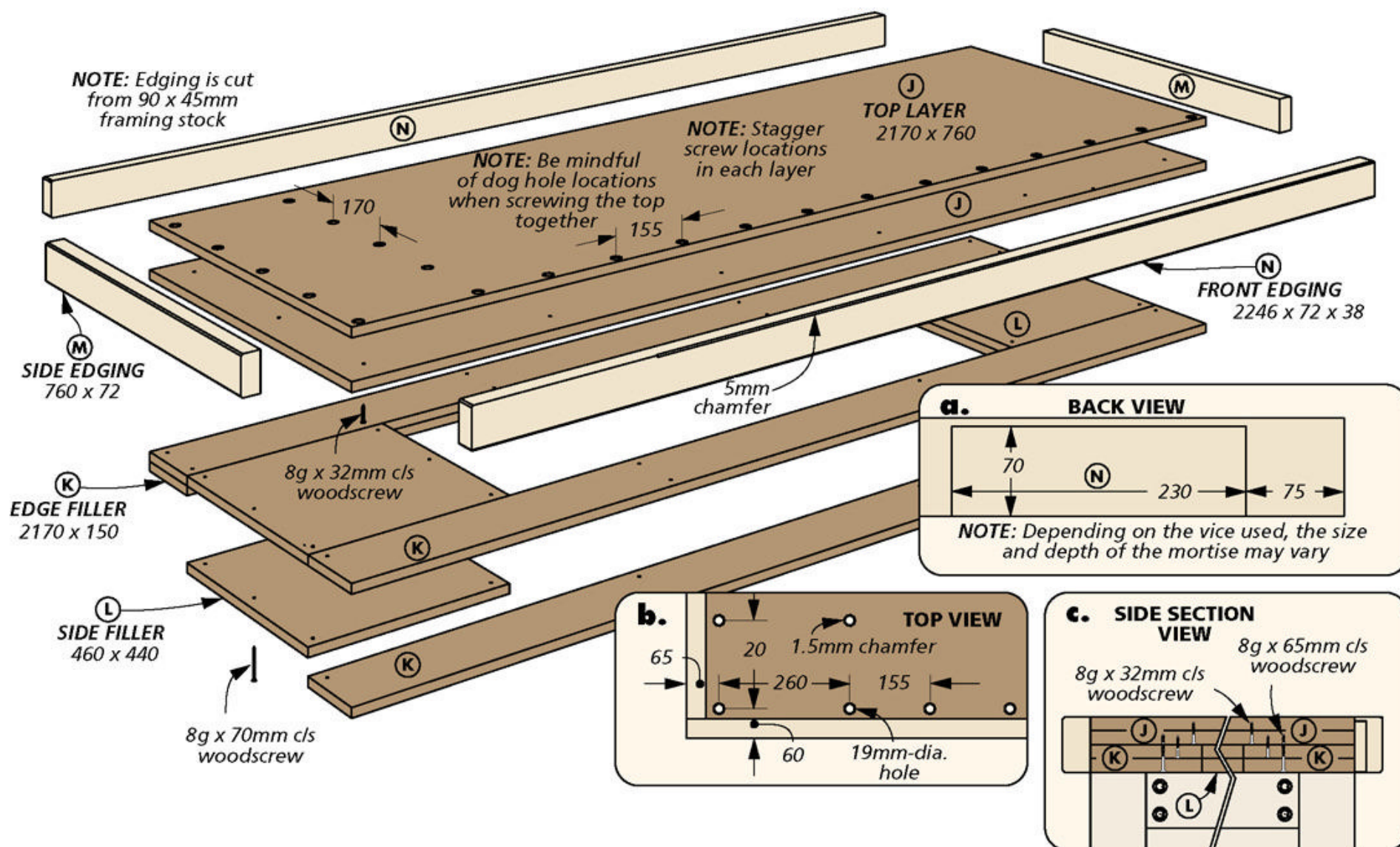
prevents any twist in the base assembly that could lead to a wobble. No one needs that.

SOME ASSEMBLY REQUIRED. To make things easy I screwed the cleats to the stretchers before bolting the stretchers to the sides. Also, as you see in the box to the right, I screwed a support board to the underside of the bottom rails. This let me set the bottom stretchers in place and drill the pilot holes. Then ratchet the screws in place. The top stretchers can sit on the pegboard cleats while you attach them.

Adding the end cleats is the next order of business. They are screwed into the rails on the sides. To finish up this phase of

the project, drop the shelf into its opening and screw it to the cleats from the underside. Before moving on to the top, I decided to spray a couple of coats of lacquer on the base.





Crown the bench with a **TOP & VICE**

The top of this bench is a beast. But it's the kind of beast that you want in your corner. How I'm defining beast here is a large, heavy, flat surface that will help you tame any woodworking project that you throw at it. When you talk about the attributes of heavy and flat, one material comes to mind — MDF, which is what's used here.

The drawings above reveal the ingredients that make up the top, the multiple lay-

ers of the MDF I just mentioned, framed by more 38mm-thick material. And for good measure we've bolted a vice on the end to lend an iron grip when needed. Start by sizing all the pieces that make up the top.

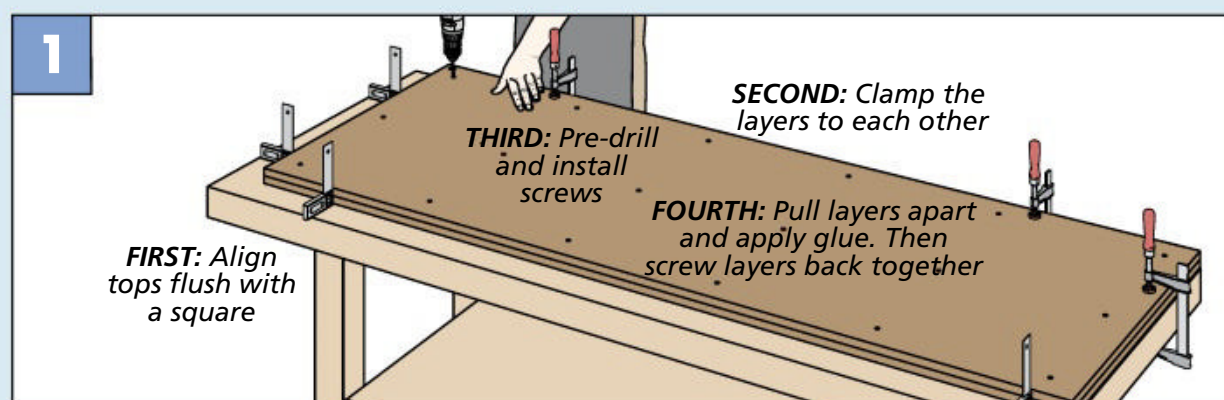
LAYERS. Notice that the top two layers are solid, while the bottom two serve mostly to support the edging, and add a little heft to the bench (detail 'c'). Speaking of edges, that's the most important thing

at the start of the assembly, keeping the edges flush to each other while you glue them up.

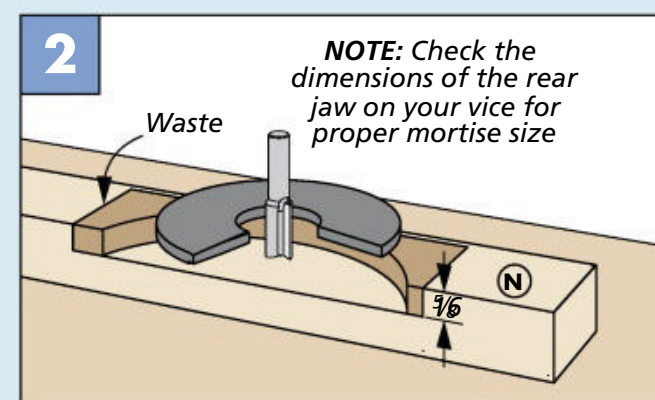
Figure 1 in the box below shows how to get the edges flush. I started with the solid top pieces upside down, clamped together with their edges flush. Screws are going to bring all of the parts together, hold the parts flush and act as clamps as well.

So you need to predrill the pilot holes

PREPARING THE PARTS OF THE TOP



Pre-drilling Ensures Success. MDF is slippery when there is glue involved. To control that problem, I clamped the top two layers together, pre-drilled and then countersunk the holes a bit to ensure everything came together on the top.



Route the Mortise. You'll need to make a mortise in the back of the front edging. It doesn't have to be real tidy to work right.

before the glue-up. Be mindful of the dog hole locations that you see in the main drawing and detail 'b.' When the screw holes are done, separate the layers and spread on some slow-set glue. Now bring back the other layer and screw the two together.

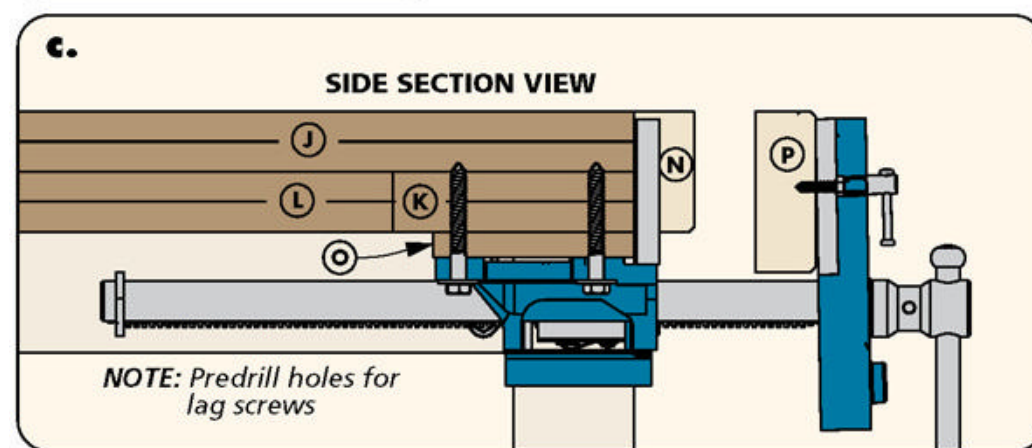
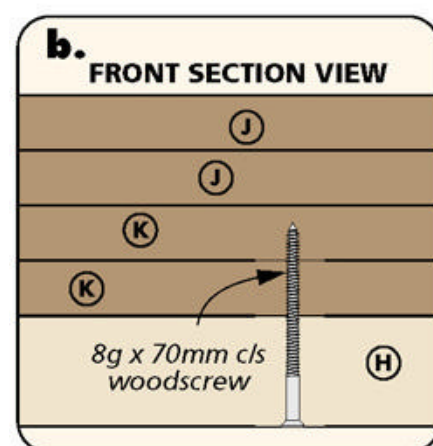
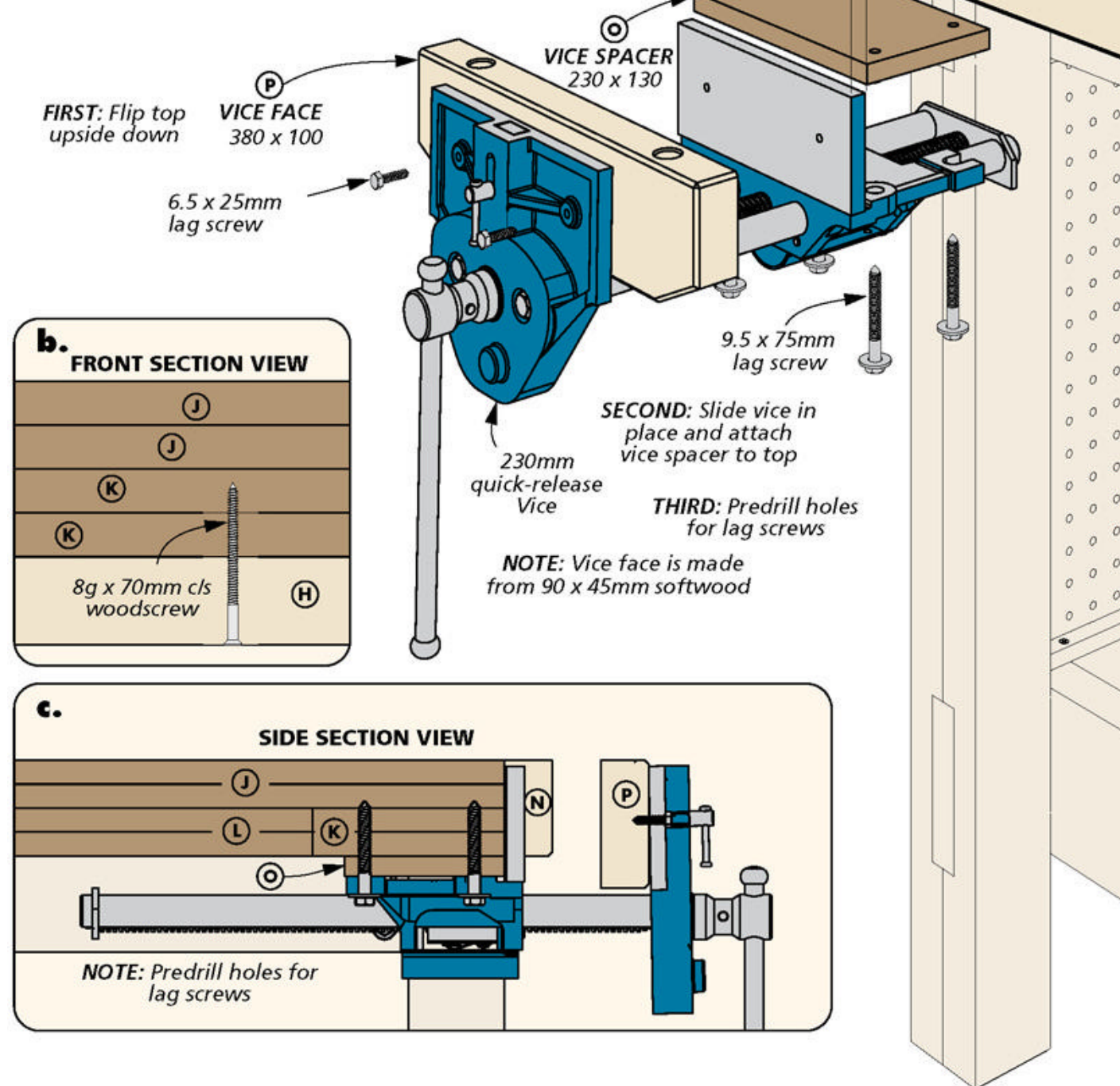
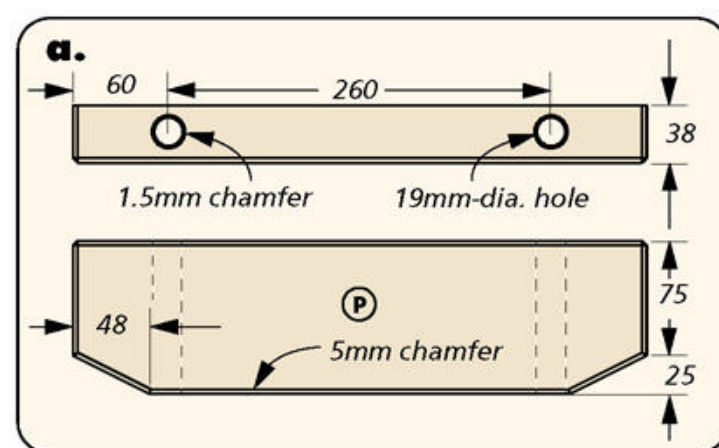
That's the toughest part of putting the top together, but don't completely let your guard down, adding the two filler layers still requires some focus. You'll attach these layers one at a time. Start off with the long front and back edge fillers. Clamp them to the assembled layers, predrill the screw holes, unclamp, apply glue and screw them in place. Again, keep in mind the dog hole locations.

After edge fillers, cut the side fillers to fit the openings then repeat the process to attach them. (Stagger the screws on all layers.) One more layer like this will complete the core of the top. Now you need to round up a friend or family member — one with a strong back — to help you flip the top right side up.

EDGING. The main drawing on the previous page shows the thick edging that wraps around the MDF core. After cutting the parts to length you can glue on the side edging. I don't have clamps long enough to glue the side edging to the top, so I daisy chained my pipe clamps to span the length of the top.

The front and back edging pieces go on much easier. Note in Figure 2 on the previous page that you'll need to rout a mortise in the back side of the front edging. This mortise accommodates the rear jaw of the vice that you'll install shortly.

INSTALL THE VICE. Call back that friend with muscles and flip the top again. It's the easiest way to install the vice. Detail 'c' shows how the rear jaw of the vice fits in the mortise you routed in the edging. You'll need to make the spacer you see in the main drawing above. The goal of the spacer is to keep the top of the vice jaw just below the top of the bench. You



should double-check that with your vice and top before bolting it down.

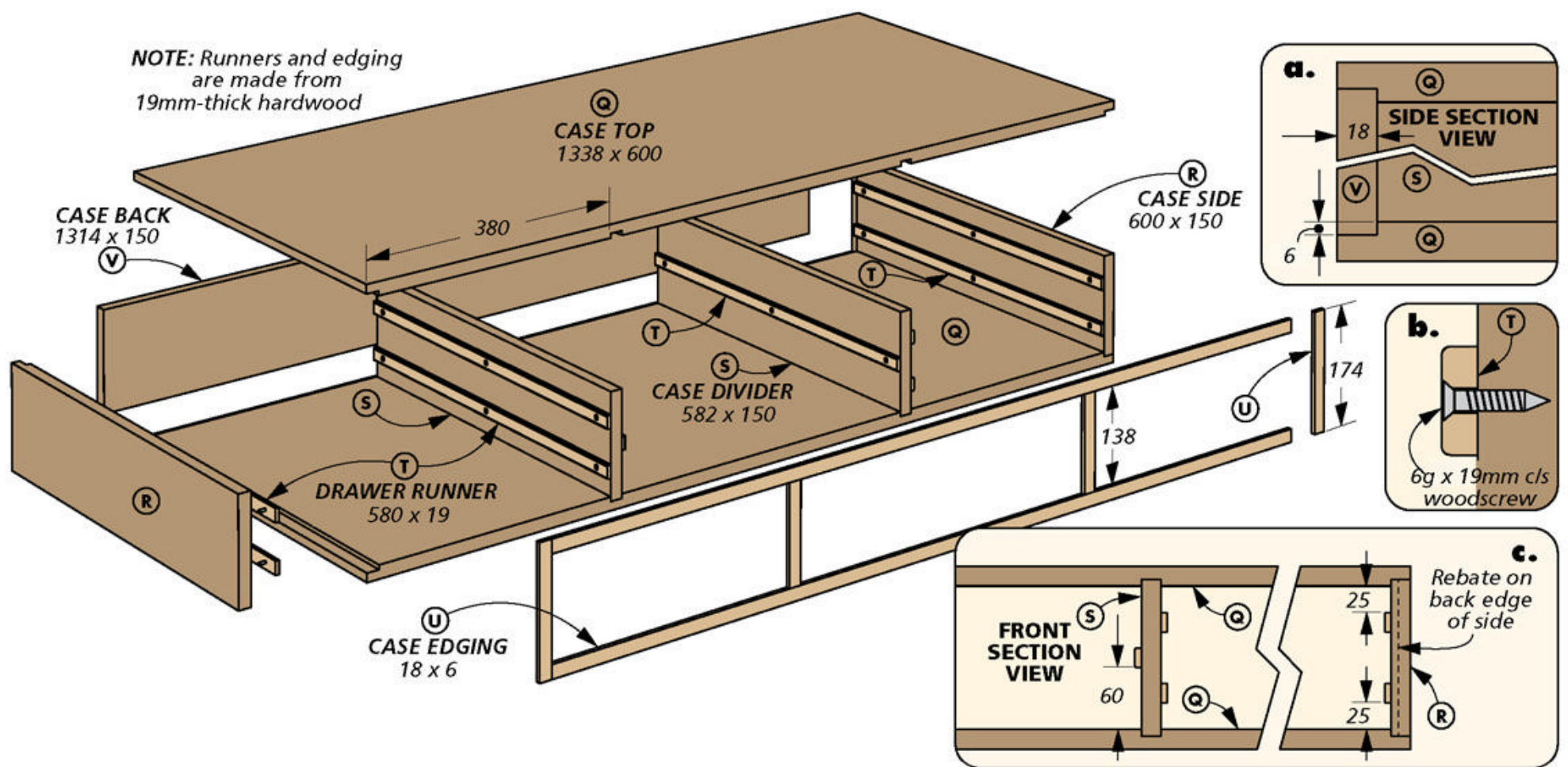
Predrilling is a must in preparation for the large lag screws that hold the vice. For ease of installation, I rubbed a little beeswax on the threads of the screws. Now you're ready to flip the top back over. Once that's done, you better give the muscle man a cold libation and a chair to watch you finish up the top.

DOG HOLES & FINAL DETAILS. After laying out the dog holes (main drawing, and detail 'b,' on the previous page), I used a drill guide to keep the holes square to the top.

After cleaning up all those drill shavings, you need to make the last part for the top — the vice face.

The face is screwed to the front jaw of the vice. Detail 'a' shows that you need to drill dog holes in the top of the face that align with the ones on the workbench. Then cut the bottom corners and chamfer all the outer edges.

All that's left to do before screwing the bench to the base (detail 'b') is to chamfer the edges on the top. Now it's time to build a simple but sturdy storage cabinet for the shelf.



Adding a storage **CABINET**

With the workbench built and out of the way, you can focus on the storage cabinet. It tucks away nicely at the bottom of the bench.

As the drawing above reveals, all of the joinery for the case is done in the top and bottom pieces. Start off cutting the rebates along the edges and back (detail 'a'), then the trenches for the centre dividers (detail 'c'). The remaining case parts (the dividers,

sides and back) are all the same width.

GLUE UP. Gluing up the case is just a matter of keeping all of the parts flush to the front and the dividers square to the top and bottom. A quick check of the front edges with your finger takes care of the former, while a pair of clamping squares addresses the latter. Hold off on installing the back for now.

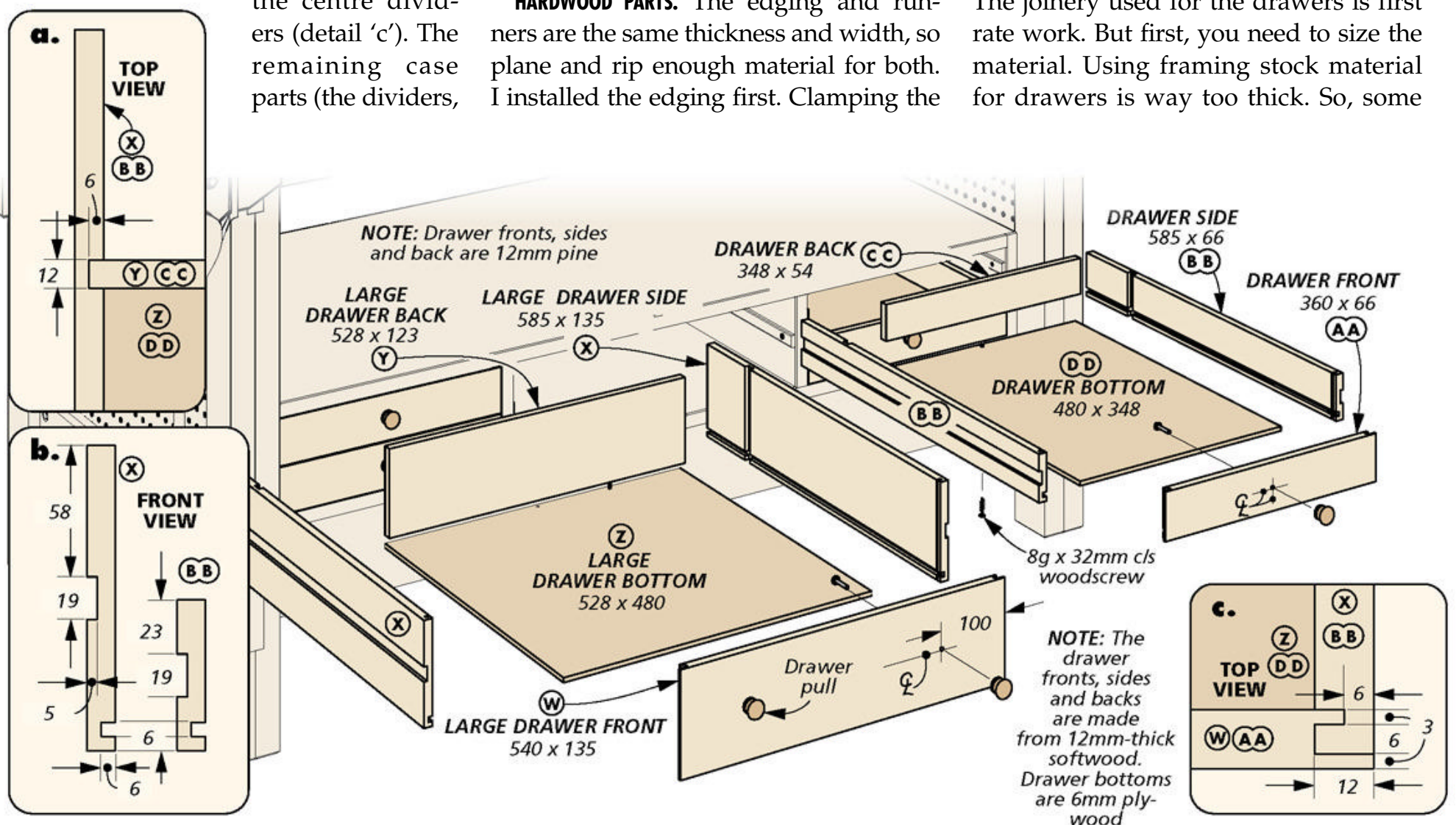
HARDWOOD PARTS. The edging and runners are the same thickness and width, so plane and rip enough material for both. I installed the edging first. Clamping the

edging to the front of the case is a whole lot easier with the back off.

The runners need a little dressing before being installed. First, drill the three shallow countersunk shank holes (detail 'b'). Then ease the edges with a sanding block or a light pass with a chamfer bit.

FIVE DRAWERS

The joinery used for the drawers is first rate work. But first, you need to size the material. Using framing stock material for drawers is way too thick. So, some



resawing is in order to bring the drawer parts to a more appealing size.

RESAWING & SIZING. I left the drawer parts a little oversized while resawing them. When I had finished ripping on the band-saw, I used the table saw to machine all parts to width, then planed them to thickness. Now, back at the table saw I set the fence at 135, placed a length of 90 x 12 stock against it and ripped another so I had a 45mm section to glue together to make the drawer fronts and sides.

LOCKING REBATES. Locking rebates are used to hold the front of the drawer together (detail 'c'). A tongue on the drawer front locks into a trench that you cut into the

drawer sides (detail 'c').

Next up is cutting the grooves in the sides for the drawer runners (detail 'b' bottom of previous page). A 6mm dado blade in your table saw will make quick work of that (or two cuts with a standard blade). Follow this up with the trench for the drawer back (detail 'a,' lower drawing).

Speaking of the drawer back, John Doyle, the designer on this project, decided to sacrifice a little drawer space for the sake of adding the "tails" you see in detail 'a.' Why? This tail lessens that annoying event of pulling the drawer completely out of the cabinet. I believe he deserves a chair and a cold one with Mr. Muscles. Lastly,

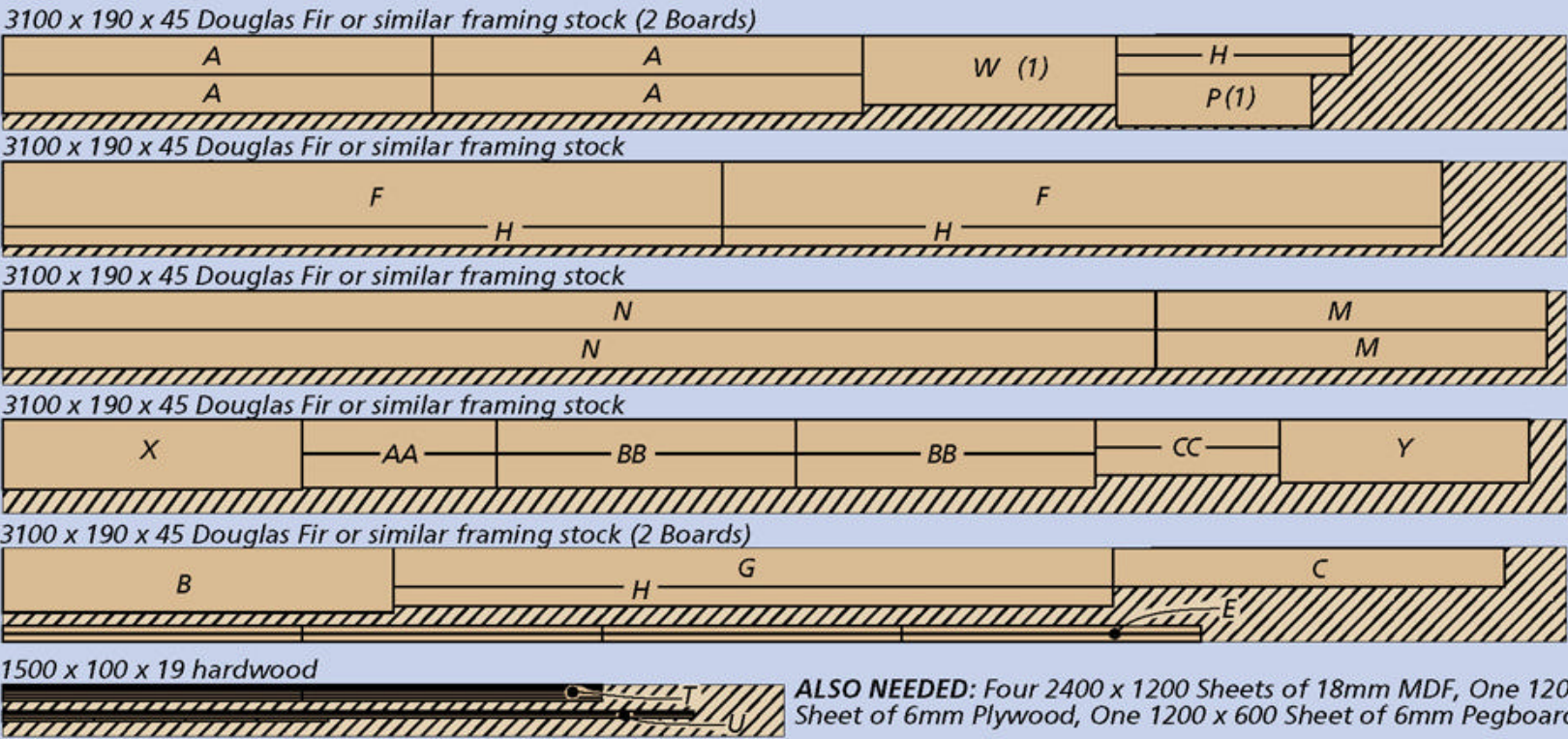
as detail 'b' shows, cut the groove for the drawer bottoms (in the fronts also).

ASSEMBLY. The drawers are ready to be glued up. A handful of clamps and some clamping squares will do the trick. While the drawers are in the clamps, you can cut the drawer bottoms to size. When the clamps are out of the way, slide the drawer bottoms in from the back and screw it to the drawer. This is shown in the main drawing on the bottom of the previous page.

Well, with that, you've got yourself one fine workbench. If you're lucky, Mr. Muscles will help you set up the bench and cabinet in the workshop. [W](#)

Materials, Supplies & Cutting Diagram

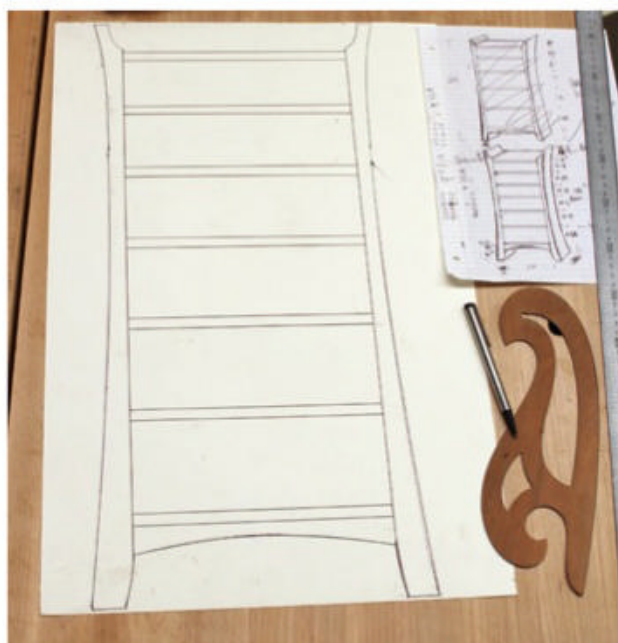
A Leg Halves (8)	840 x 75 x 38	P Vice Face (1)	380 x 100 x 38	• (16) 8 x 100mm Lag Screws
B Bottom Rails (2)	760 x 130 x 38	Q Case Top/Btm. (2)	1338 x 600 x 18 MDF	• (16) 8mm Washers
C Top Rails (2)	760 x 75 x 38	R Case Sides (2)	600 x 150 x 18 MDF	• (67) 6g x 32mm c/s Woodscrews
D Pegboards (2)	610 x 485 x 6 pgbd.	S Case Dividers (2)	582 x 150 x 18 MDF	• (48) 8g x 70mm c/s Woodscrews
E Pegboard Cleats	9m x 16 x 12 rgh.	T Drawer Runners (10)	580 x 19 x 6	• (20) 8g x 32mm c/s Woodscrews
F Bottom Stretchers (2)	1400 x 130 x 38	U Case Edging	13.4m x 18 x 6 rgh.	• (17) 8g x 65mm c/s Woodscrews
G Top Stretchers (2)	1400 x 75 x 38	V Case Back (1)	1314 x 150 x 18 MDF	• (1) 9" (230mm) Quick-Release Vice
H Cleats	7.5m x 38 x 38 rgh.	W Large Drawer Front (1)	540 x 135 x 12	• (4) 9.5 x 75mm Lag Screws
I Shelf (1)	1376 x 534 x 18 MDF	X Large Drawer Sides (2)	585 x 135 x 12	• (4) 5mm Washers
J Top Layers (2)	2170 x 760 x 18 MDF	Y Large Drawer Back (1)	528 x 123 x 12	• (2) 6.5 x 25mm Lag Screws
K Edge Fillers (4)	2170 x 150 x 18 MDF	Z Lrg. Drwr. Btm. (1)	528 x 480 x 6 ply	• (30) 6g x 19mm c/s Woodscrews
L Side Fillers (4)	460 x 440 x 18 MDF	AA Drawer Fronts (4)	360 x 66 x 12	• (5) 6g x 25mm c/s Woodscrews
M Side Edging (2)	760 x 72 x 38	BB Drawer Sides (8)	585 x 66 x 12	
N Front/Back Edging (2)	2246 x 72 x 38	CC Drawer Backs (4)	348 x 54 x 12	
O Vice Spacer (1)	230 x 130 x 18 MDF	DD Drawer Bottoms (4)	480 x 348 x 6 ply	



Small Chest of Drawers

David Barron makes good use of a chestnut board with this small project.

I don't usually make a full-size drawing of my projects but I felt it was essential with this piece. It has lots going on with the shape and I needed to make sure the graduated drawers were in proportion. I'd had a board of quartersawn chestnut in stock for a few years and this seemed the ideal project. The board was purchased part-seasoned. It measured 1800 x 250 x 76mm thick and I managed to use most of it on this small project, which was quite a surprise.

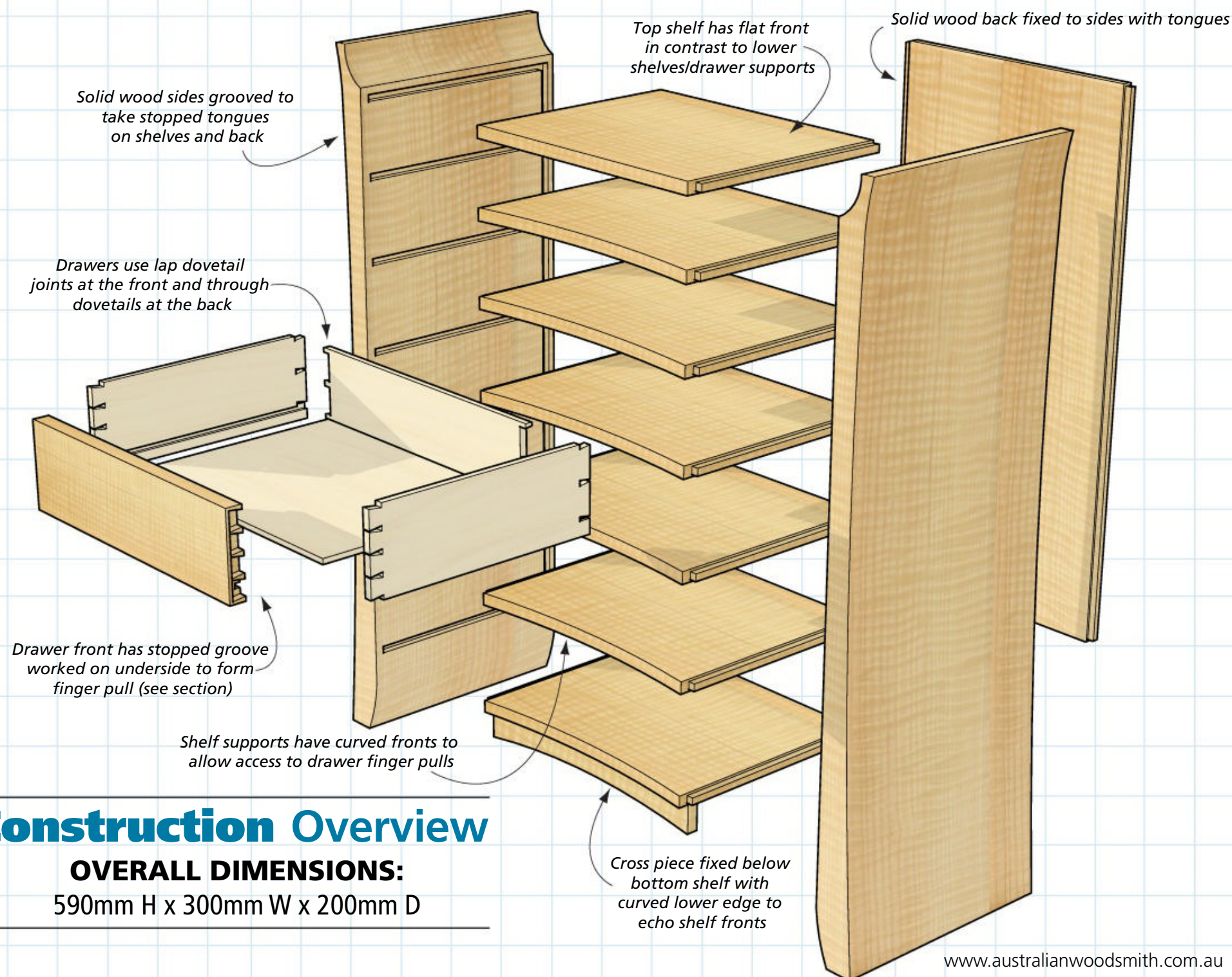
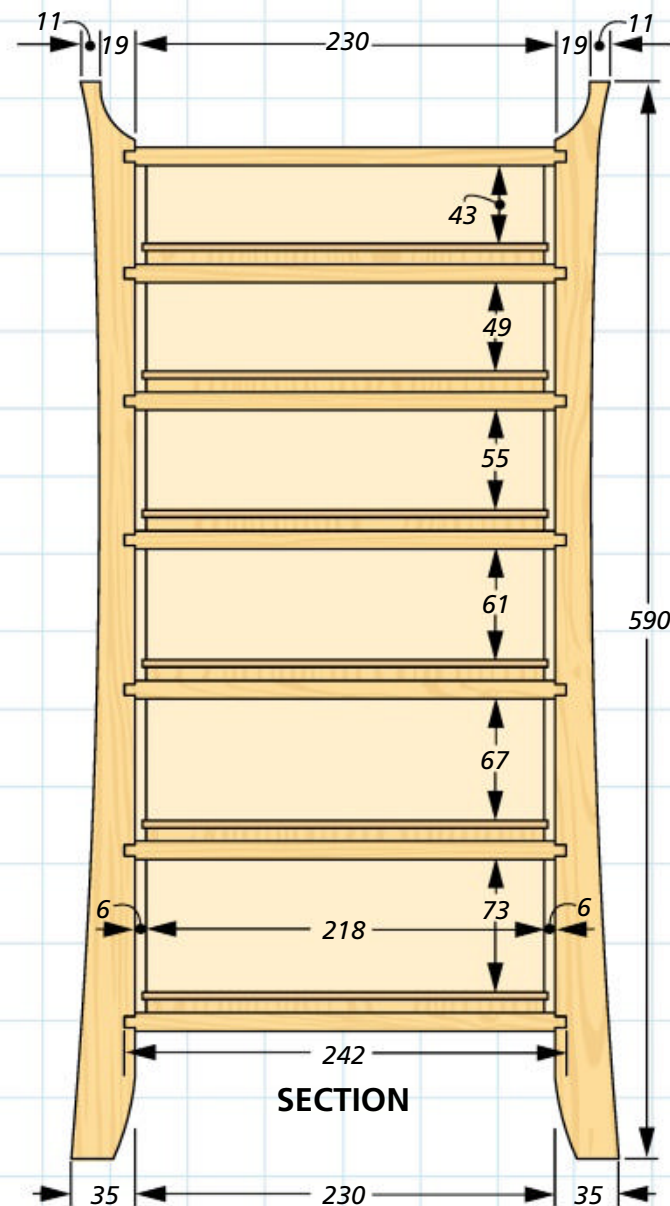
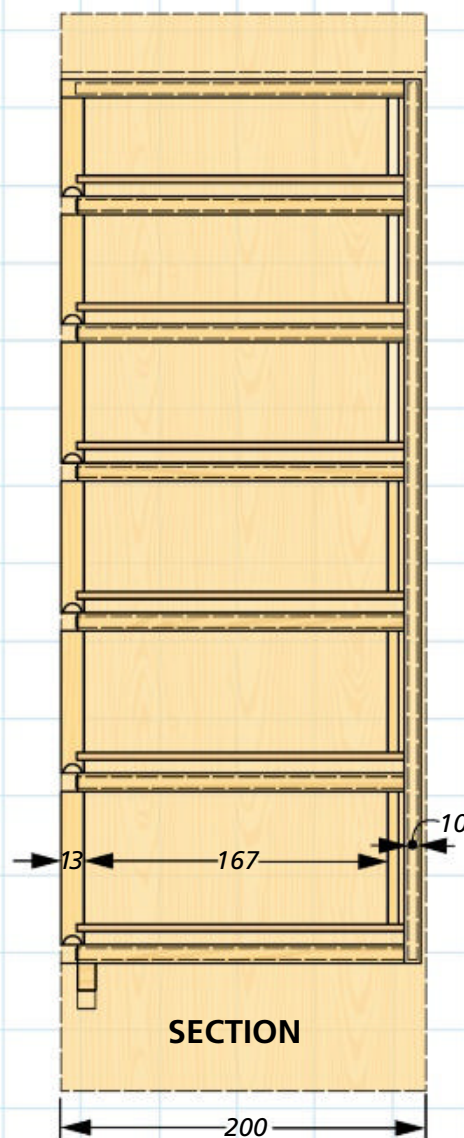
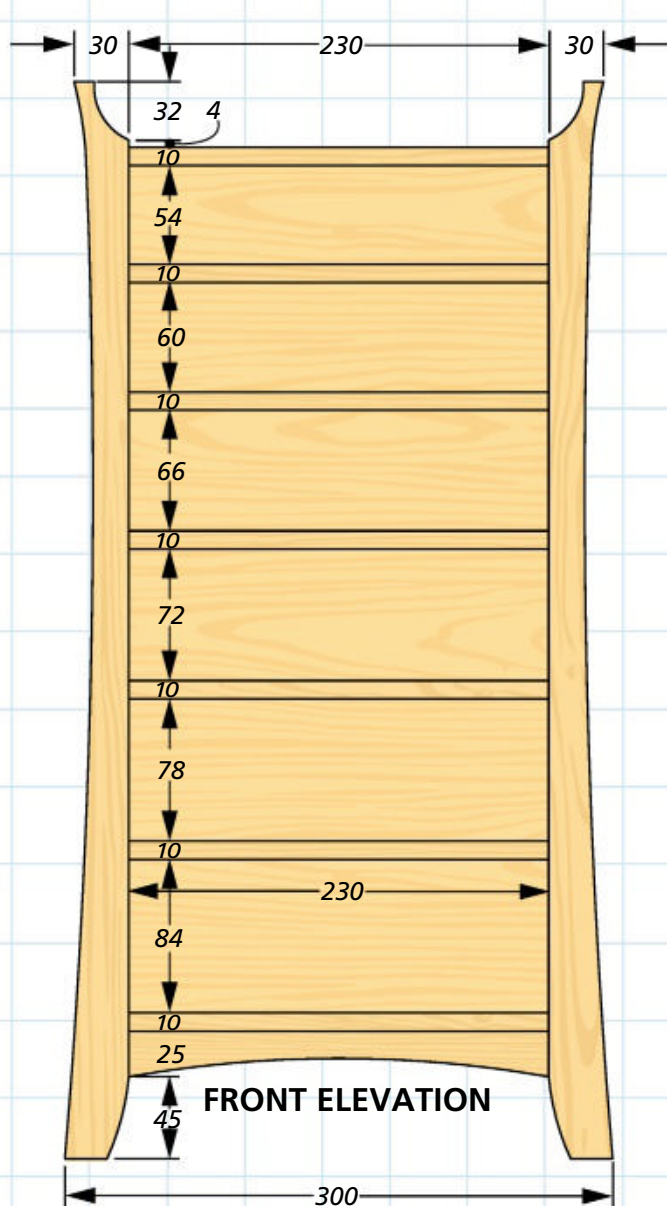


▲ After playing around with scale sketches, a full-size working drawing was produced.



A large plank of quartersawn chestnut with some nice ripple.



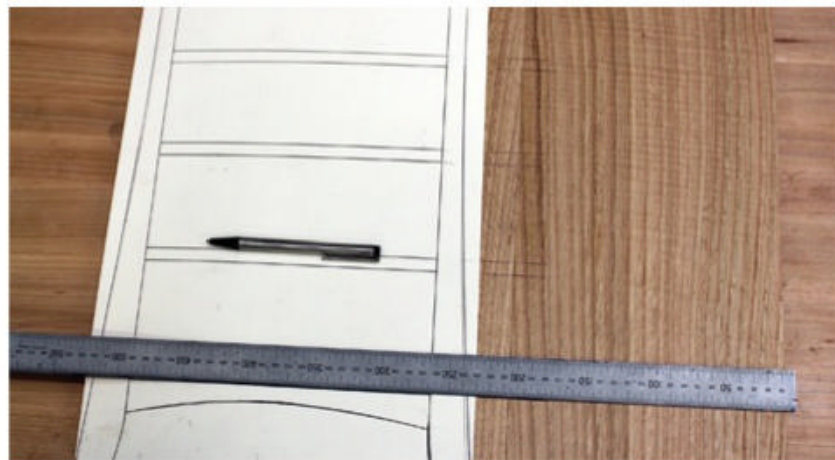


Construction Overview

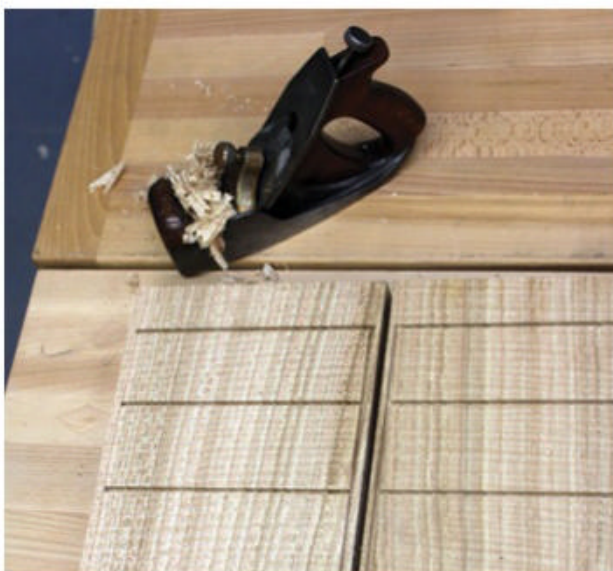
OVERALL DIMENSIONS:
590mm H x 300mm W x 200mm D



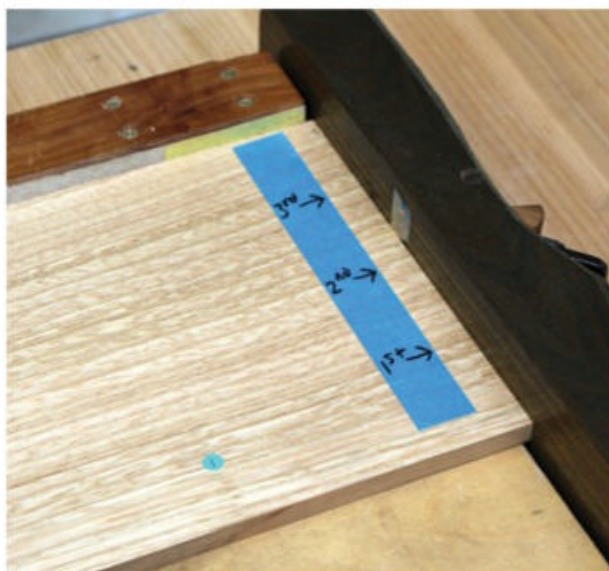
▲ Parts cut on the bandsaw and being allowed to settle.



▲ Using the drawing to mark off the position of the dividers.



▲ Cleaning up the internal surfaces after routing the grooves for the dividers and back panel.



▲ Using stopped cuts on the shooting board to induce a front to back taper to the openings.



▲ Checking the taper against stops with a feeler gauge.



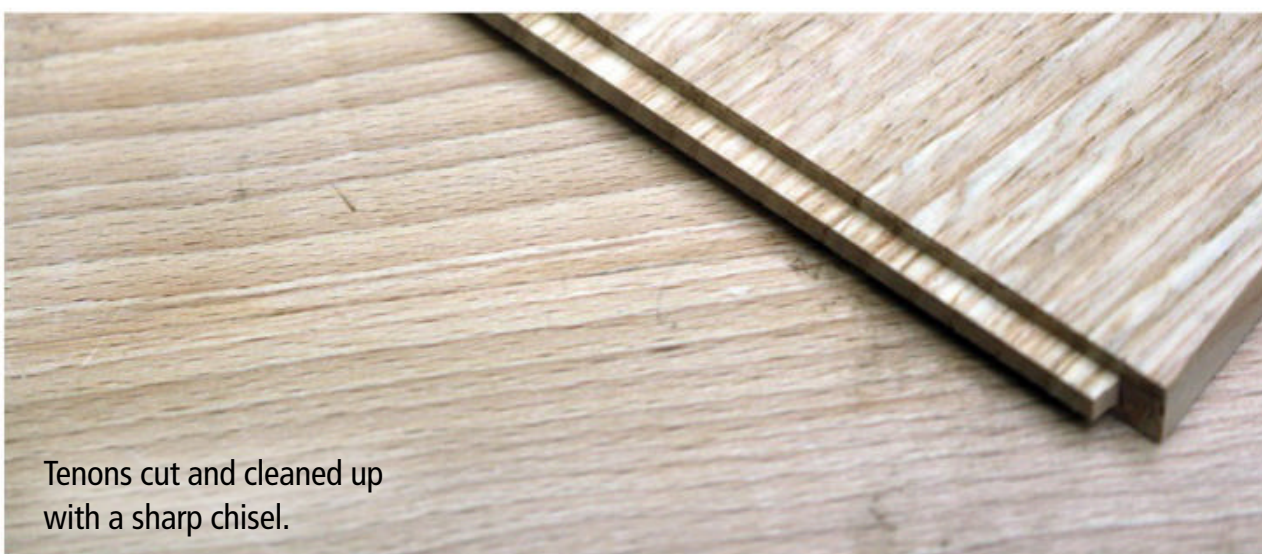
▲ Smoothing the curves to allow finger access to the drawers.

Cutting and marking

Having worked out all the dimensions required, I bandsawed the parts 20% oversize and allowed them to settle for a few days. The air-dried timber held no tension so there was very little movement; this was helped by the fact it was quartersawn. With the sides planed to size and cut square, I marked all the positions from the template and cut all the grooves for the dividers and back panel on the router table. All the dividers were then cut to identical size and squared before I created a slight taper on the shooting board. I took three progressive stopped shavings and then finished with one through shaving. This was done on both sides of each divider, making sure of course that the shavings were started at the front to create a taper that widened towards the rear. The taper was then checked with two stops set to the rear edge and this confirmed a taper of 0.26mm (0.13mm on each side), this would be very difficult to achieve with a tablesaw.

With all the dividers gently tapered I marked the baselines for the tenons with a wheel marker. The tenons were then cut on the router table just shy of the scribeline and cleaned back with a (sharp) chisel. I have found this gives a much cleaner finish than just relying on the router and I like to undercut the shoulders a fraction to make sure they are pulled up perfectly tight with no gaps. All this takes a little extra time but it makes sure that tapers are maintained in the glued-up carcass.

I then cut the finger access for the dividers on the bandsaw and cleaned up with a flat-soled spokeshave, which is ideal for smoothing out a gentle concave. I also cut a shallower curve on the back to allow air to escape when the drawers were closed.



Tenons cut and cleaned up with a sharp chisel.



▲ A dry fit to check everything.



▲ Cutting curves on the bandsaw.

Shaping and gluing

After doing a dry fit, to confirm the fit of all parts, it was time to shape the sides. To aid stability on the bandsaw I stuck both sides together with a small amount of double-sided tape (the small inside curves were cut individually before sticking together). The more accurately these cuts are made the closer the two parts will be to each other and the less cleaning up will be necessary. Even with care it still took quite some time, with both curved and flat-soled spokeshaves, to create nice, even and identical curves.

Prior to gluing up I re-attached both the offcuts with a small amount of double-sided tape which meant that the clamps were square to the work, applying even pressure. I took the precaution of rough sanding the bandsawn offcuts so that the smooth sides of the cabinet weren't damaged. I also took

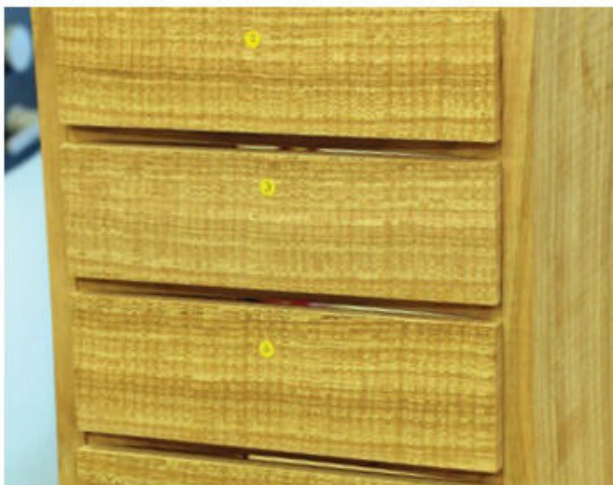
a few progressive shavings from the underside of each divider to create a slight taper in the height increasing from front to back. This is not essential but I've found it aids with fitting the drawer sides.



▲ Smoothing and cleaning up the sides.



▲ Gluing up the carcass using the offcuts to keep the clamps square.



▲ Fitting of the drawer fronts in their openings.



▲ Scribing the rear pieces from the fronts.

Fitting the drawers

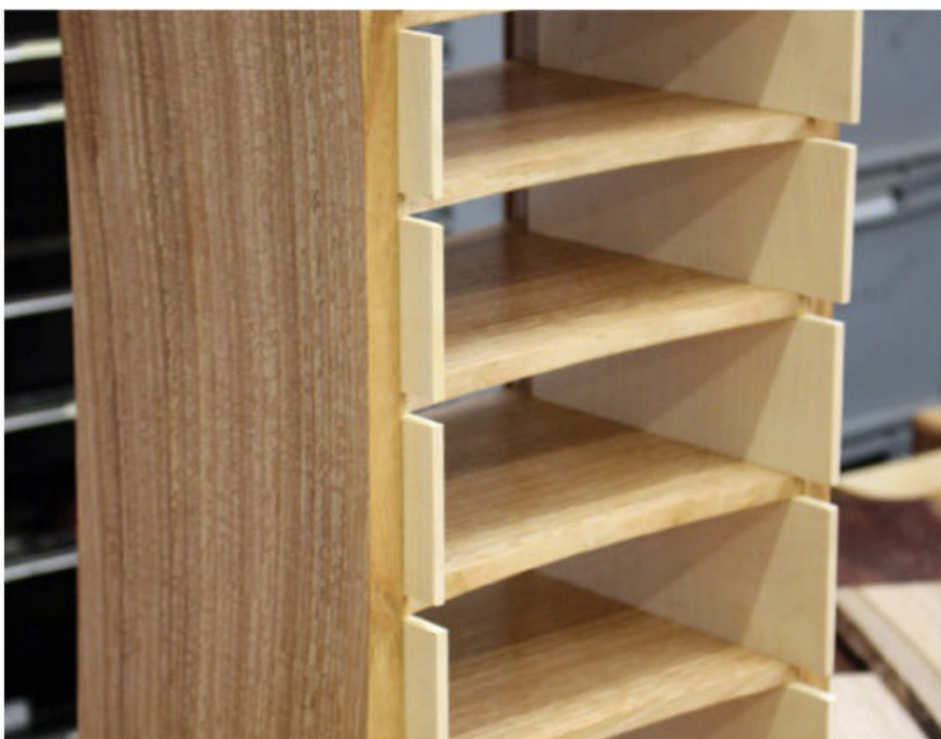
With the carcass glued up I could start fitting the drawers. First the fronts were shot to a very tight fit in the front openings. With this done, the tapers in both height and width could be checked at the back of the cabinet – all was well. The rear of each drawer is knifed from the front and trimmed back to the knife lines on the shooting board. Each of the sides was marked with its position and orientation with coloured dots before being shot to a tight but smooth running fit.

With all the drawer parts fitted it was time to cut the grooves on the router table. The back of each drawer had to be cut level with the top of the groove to allow the drawer bottom to slide in. By using the top edge of all parts against the router table fence the rear

pieces could be grooved on both sides before being cut off and cleaned up to a perfect fit.

Now it was time to cut the dovetails, all 96 of them! Clean, accurate square tails are the key to a good fit and this type of close accurate work is my favourite part. I had decided on half-blind dovetails, something I don't cut very often and the pins proved quite a challenge in this coarse timber, especially with a thin lap. Tradition has it that the lap should be $\frac{1}{3}$ to $\frac{1}{4}$ of the timber thickness but on finer work I prefer to work to $\frac{1}{5}$, which in this case was just 2.5mm thick.

I cut the through dovetails on the rear with a 3mm protrusion and used this later to adjust the drawer position.



▲ Fitting each of the sides in its opening.



▲ Routed grooves in the drawer parts, note the narrower rear piece.

WOOD MOVEMENT

A tree is effectively a very efficient water pump. The leaves transpire, creating a vacuum that sucks water and dissolved minerals all the way up the xylem to the canopy of the tree. This is an amazing feat!

When the tree is felled and processed

the water in the log has to be removed. Seasoning in a kiln is the first step. The second is to let the timber acclimatise in the workshop for a week before it is worked on. One challenge that a colleague had with a commission for a large wooden sculpture

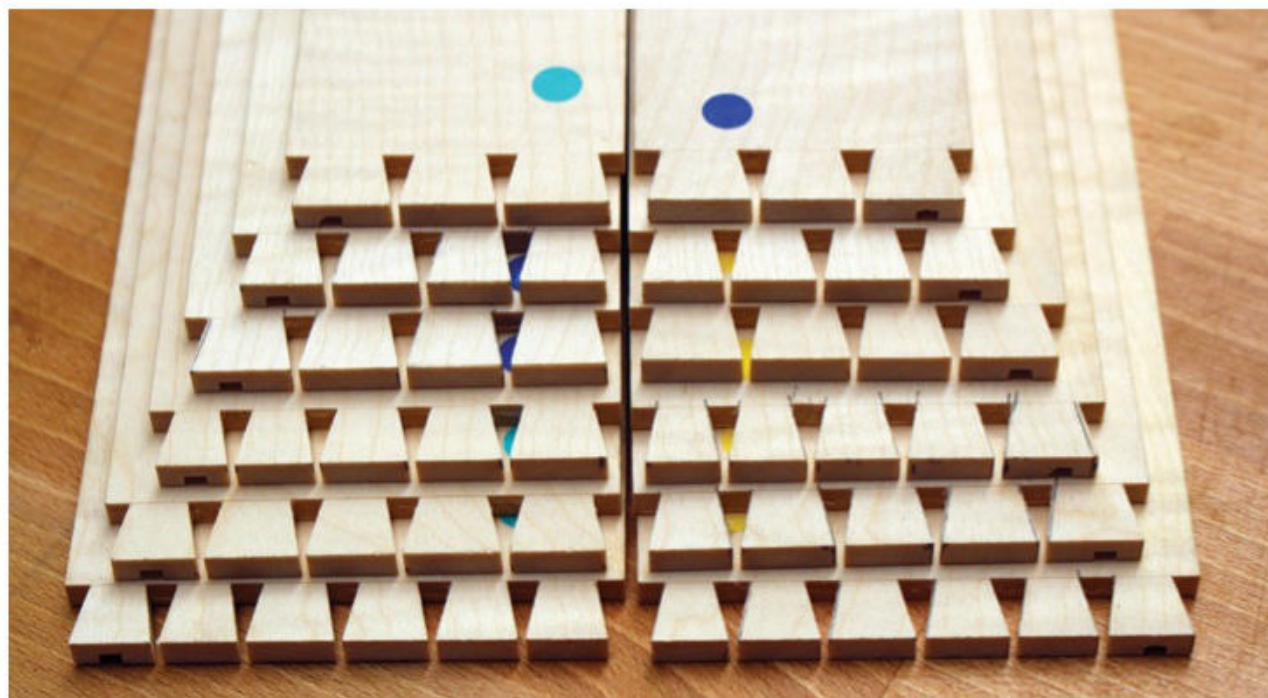
was it acclimatised in the workshop but cracked after a month when installed in the air-conditioned foyer of an office block. If possible, you should build your projects in the room that they will furnish, otherwise expect wood movement!

While it is usual to make the stops against the drawer front, the amount of movement in the sides of this small piece was going to be minimal and not worth allowing for.

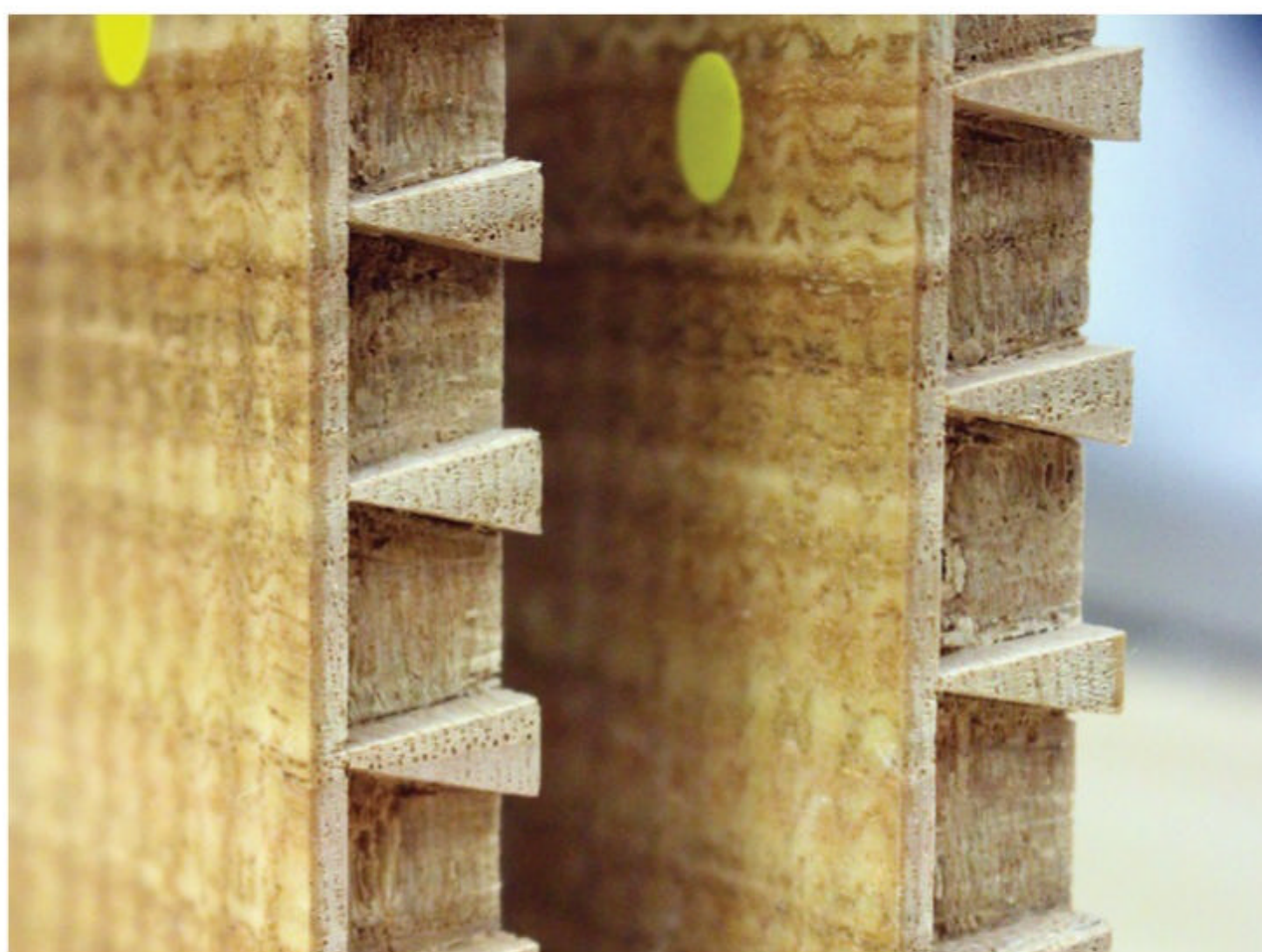
The final fitting of the drawers needs to be done carefully to ensure a smooth running piston fit, which is aided by the tiny tapers that were built into the carcass. Each drawer is fitted into its opening from the back and the wood is carefully planed until the fit is running smoother but without wobble. Waxing the sides and running them in and out helps identify the high spots which show up as shiny. Alan Peters gave an excellent and detailed description of this in an article he wrote for *Fine Woodworking* many years ago.

With each drawer fitted, the cedar of Lebanon base could be slid into place and re-checked before being secured with a slotted screw to the rear. The rear panel was fitted in a similar fashion and again secured with a single central screw to allow for wood movement.

I had experimented with various finishes on scrap pieces and decided against an oil finish as it accentuated the colour differences in the wood. I wanted something that gave a mild finish that didn't clash visually with the shape of the chest and so settled on three coats of heavy cut shellac, cut back with 600 grit and gently waxed. **W**



▲ Tail boards - search "David Barron Furniture Half Blind Dovetails Made Easy" on YouTube.



▲ The corresponding delicate pins. Notice that each drawer is colour coded.



▲ Carefully fitting the drawers.



▲ The drawers being fitted from the rear to ensure a smooth piston fit.

Singapore Ball

Richard Findley takes on the challenge of turning this fascinating puzzle.



My challenge this month is to make a Singapore ball. I have been aware of these for many years but have never even considered making one. It's an interesting puzzle where small points protrude from a ball, but the points have enough space to move around and hide within their holes, so, despite its potentially prickly appearance, it will always be safe to touch. Even before researching it more closely, I can tell it's going to be a fiddle to make.

The place to start my research is David Springett's excellent book *Woodturning Wizardry*. Amazingly, the Singapore ball is one of the simpler projects in the book – but don't let that put you off. If you enjoy making intricate items that will have other woodturners and non-turners alike scratching their heads, then this is for you.

I don't want to simply lift David's article straight from the book, but it will be

an invaluable companion as I go about this challenge.

As with any new project or challenge, I look at the project and mentally break it down into stages; this is undoubtedly the best way to tackle such an apparently complex job. The simple parts for me are going to be turning a ball and turning the little spikes – the challenge will be marking out the holes and holding the ball to drill them out.

PHOTOS: RICHARD FINDLEY

Making a start

Initially, I have a lovely piece of walnut lined up for this project, but when I realise that I need to show the marking-out for the holes, drawn clearly on the ball in the photos for the article, I discount it as walnut and pencil marks are a tricky combination. I root through my timber pile again and find a suitable board of steamed beech which will do the job perfectly.

The original idea of the puzzle is that it all appears to be made from a solid piece of timber, so the spikes are made from carefully selected wood from the

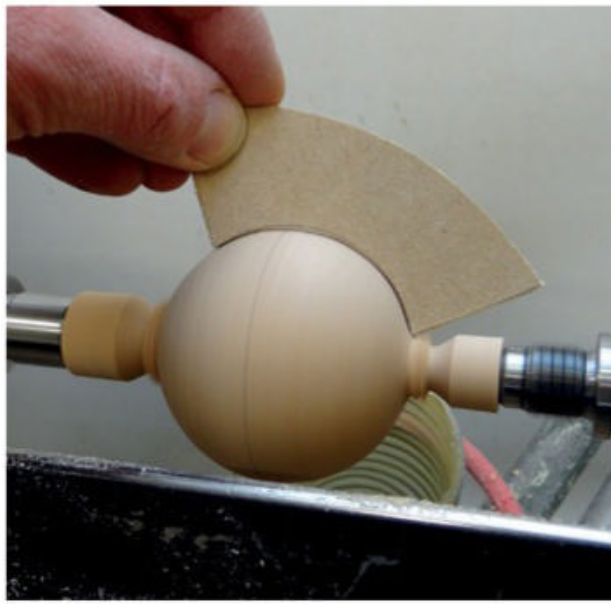
same board. I have, however, seen them made with contrasting-coloured spikes, which has quite a striking look, so I contemplate making the spikes from walnut, but decide to stick with it all being beech for this first attempt.

The project is based on using a 62mm diameter ball, so I cut a blank from the 75mm-thick beech around 100mm long and mount it between centres. This can be turned by hand. I used a spindle gouge and regularly checked it against an MDF template. The alternative would be to use a jig of some sort. I have the

Paul Howard sphere jig, which I use for a regular production job of hemispherical boxes, but ironically, I've never actually used it to turn a complete sphere. I turn the sphere by hand to a little over size and set up the jig on the bed of the lathe and centred the cutter, which makes producing a perfect sphere an absolute breeze. This jig uses a little carbide cup cutter and leaves a surface that is easily perfected with abrasive. In David's book, he describes how to make a homemade version of a sphere jig, which is fun for those who enjoy jig making.



▲ Turning a ball freehand.



▲ Checking progress against a template.



▲ Using a sphere jig.

Usually, when making a sphere, the majority of it is turned between centres and then the little stubs at each end need to be turned away by rotating the sphere between wooden cup centres. But, planning ahead, I realise that the Singapore

ball has a hole drilled in the top and bottom, so as long as the remaining saw marks are no bigger than the 9mm holes I will be drilling, there will be no need for the secondary mounting. The sphere jig does leave fairly large waste sections

on each end, but using the template and a sharp spindle gouge, I am easily able to continue the cut around the curve of the ball down to a small nib. 9mm is plenty of wood to safely hold a 62mm ball, especially in close-grained wood such as beech.



▲ The sphere jig can't get right round the ball.



▲ Extending the curve by hand.



▲ The finished sphere showing the cut-off area.

Marking out

The marking out is part of this process that makes me slightly nervous, because it can be quite mathematical. I read David's instructions for setting out, then read them again. Despite his clear, practical directions, I have always found that as soon as mathematical terms are used together in a sentence my brain starts to shut down. After reading a few more times and trying my best to visualise it all, I decide I need to just crack on and have a go.

The first advantage I have with my method so far is that I can clearly identify the ends, or 'poles', of my sphere. I find visualising the sphere as a globe, with poles and equator, is a great way to keep track of things.

The finished ball will have 32 holes drilled in it, but I need to start with 12 equally-spaced points around my sphere and a compass is the best tool to do this.

The first bit of maths I need is to find the setting on my compass, which is the diameter of my ball, 62mm, multiplied by 0.526, which is 32.612 – I think we can call it 32.5mm between friends.



▲ There are triangles in the pattern and the centre of each needs finding.

With my compass set to 32.5mm, I place the point on one of the poles and draw a circle, then repeat with the other pole. This gives me two rings around my sphere, a bit like the tropics on a globe, a little above and below the equator.

Next, I pick a random point on one of those lines and draw another circle using the same compass setting. Where this circle crosses the line I am using, I need to

place the point of my compass and draw another circle and repeat until I get back to the start. This gives me five circles. I then move to a point where one of these circles crosses the other 'tropic' line and repeat, which gives me another five circles. If every point has been used, geometric patterns that resemble a flower will cover the ball and there should be 12 equally-spaced points.

WHERE DOES 0.526 COME FROM?

David simply says the 'vertex separation is 0.526' but I literally have no idea what that means. I guess it doesn't really matter because using this number achieves the required result, but I like to at least try to understand these things. Luckily, my best mate is a professor of physics, so I give him a call, as I always do when something about maths or science puzzles me.

Because I need 12 equally-spaced points around the sphere I need to imagine a shape inside the sphere with 12 points. Imagine a cube within a sphere and you have 8 points (the points of a 3D shape are called vertices), but I need 12, so the shape trapped in the sphere is called a regular (as in, all sides are the same size) icosahedron which has 20 faces! To work out the straight-line length (vertex separation) between these points (vertices), I need to multiply the diameter of the sphere by 0.526.



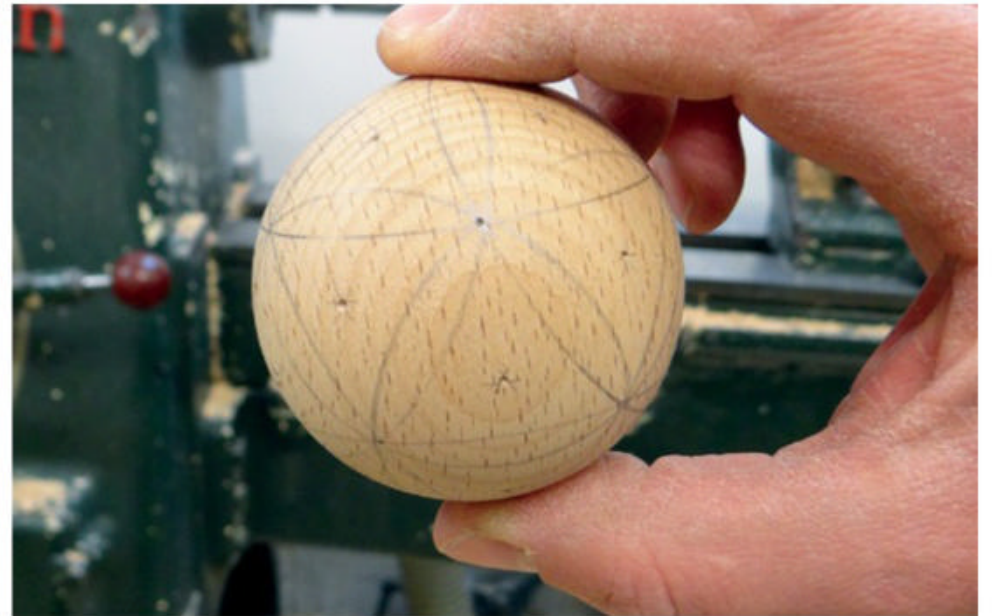
▲ Marking the first 'tropics' line.



▲ With the 'tropics' marked, I pick a point and draw another series of circles.



▲ Using my compass to find the centres of the triangles.



▲ Marking out complete.

With all circles drawn a flower pattern emerges, giving 12 equally-spaced points.

The Singapore ball needs 32 points though, so more points are needed. This time, I need to find the centre of each of the triangular shapes that have appeared in the pattern. By guessing this size, I set the compass and, from each of

the three points that form the triangle, I make a light mark in the centre. If the guess is correct I get a cross, if it's a little out, I get a smaller triangle, of which it is easy to find the exact centre. With the compass adjusted to be the correct size (I make it 20mm), I work my way around the sphere, drawing little crosses in the

centre of each triangle. I confirm these little crosses with the tip of my awl.

The marking out is now done for 32 evenly-spaced holes. No matter how many times I read and re-write this, it sounds terribly complicated, but in fact, with compass and sphere in hand, it is remarkably simple.

Jig

With my 32 points marked on the sphere, I next need to drill them and then slightly enlarge them to allow the spikes to move around freely inside. In David's book, there are very clear instructions for making the jig, which is essentially a hollowed-out block to house the sphere, and a securing ring, which holds the ball in place while presenting a face of it to work on. I have made a similar jig before for hollowing the spherical boxes I mentioned earlier.

I use a cube of 100mm pine, along with a piece of 100mm-long '4 x 1', as it would have been in the old days, for the ring and some M6 threaded inserts and 30mm-long M6 countersunk screws. I

roughly round the cube on the bandsaw and mount it on a screw chuck. Once it is turned to a cylinder I move to the face and begin hollowing to hold the ball. I realise there is no need for the full 100mm of depth so reduce it to around 70mm, which makes it feel much more solid. I make another MDF template of the 62mm ball to allow me to monitor my progress as I hollow.

Satisfied with the fit of the ball, I mark, drill and fit the inserts into the edge of the jig. Next, I need to add the ring, so

mark the positions of the holes on the thinner piece of pine and drill them with an 8mm drill. They line up well so I screw the two parts together. I turn a hole through the thinner part to form the ring, open the hole out to around 45mm, then use my spindle gouge, as if I were undercutting the rim of a box, to hollow the inside of the ring. After a few test fits and a little adjustment, everything fits together well and the ring firmly holds the ball in place, while presenting a portion of the ball for me to work on.



▲ Components for the sphere holding jig.



▲ Hollowing the pine block to hold the sphere.



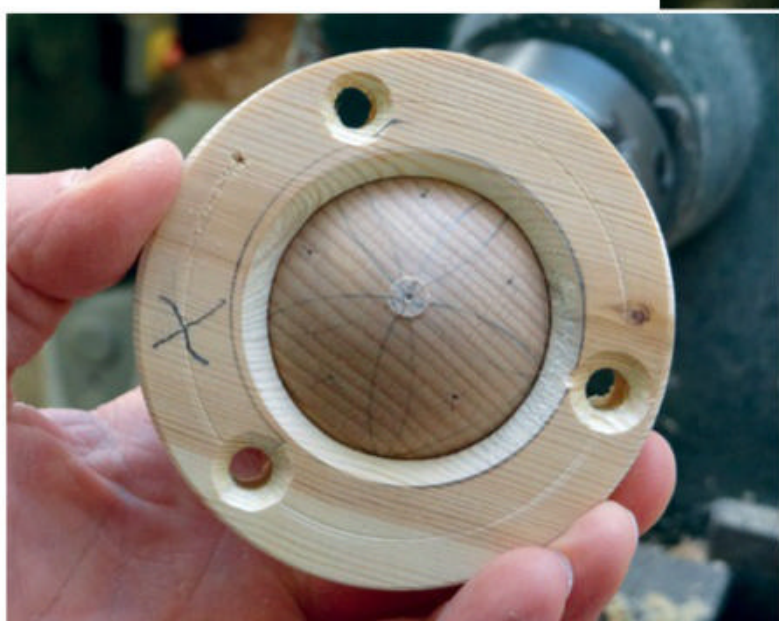
▲ Fitting the threaded inserts.



▲ Beginning to hollow the securing ring.



▲ Relieving the underside of the ring to hold the sphere in place.



▲ Testing the fit of the securing ring. ►



Drilling and hollowing

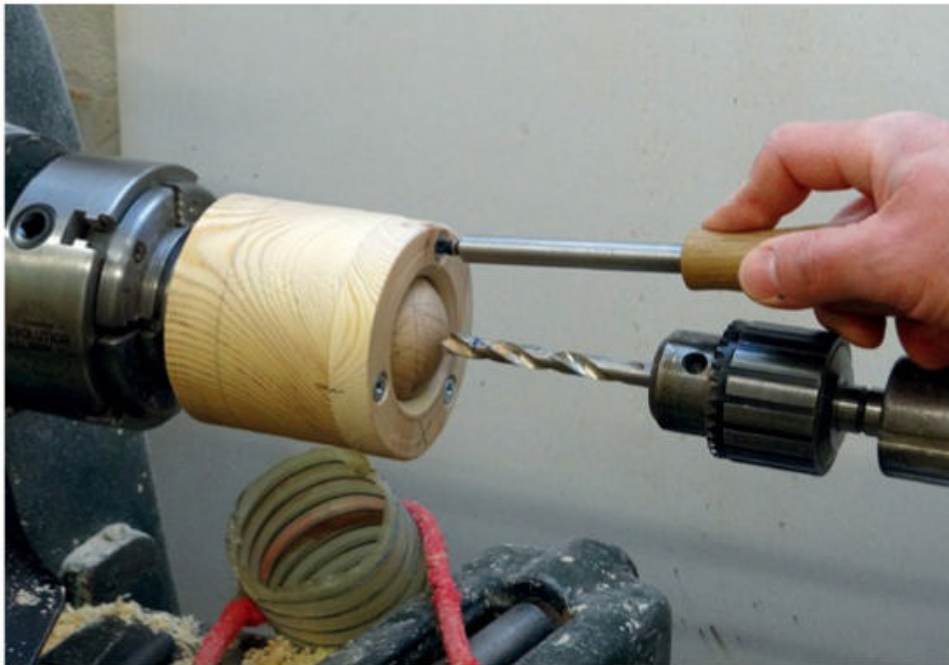
I place the ball inside the jig and fit the locking ring with the three M6 screws. It's a bit of a fiddle this first time, but I find that once a hole has been dealt with, I don't have to completely remove the ring to adjust it, just loosen the screws, move the ball and tighten again, so the process is actually quite easy.

I use a 9mm lip and spur drill, which gives me a lovely clean hole. I mark 15mm from the tip of the drill with a marker pen to give me a regular depth mark and line up the first mark on the ball with the tip of the drill. Light pressure from the drill bit holds the ball in

place while I tighten the screws. I start the lathe and drill to the depth and slide the tailstock down the lathe bed and out of the way.

Each hole needs a little hollowing to allow the spike to move around freely. In David's book, he grinds up a special little scraper to do the job, but having given it some thought, I can't see the need. I opt to use a 6mm spindle gouge and enlarge the inside of the hole as if hollowing a box or tiny hollow form, through a small hole. It is important

not to touch the actual opening of the hole, this should remain 9mm at all times, but behind the visible hole needs to be a rounded pouch to house the spike. I cut the first a little cautiously, but having done one, I am certain this method will work just fine. I lightly sand around the hole with 320 grit and a red abrasive pad and stop the lathe. I loosen the three screws and roll the ball to the next position, lining it up with the tip of the drill as before and repeat.



▲ Securing the sphere in the jig.



▲ Drilling the hole.

SEA CREATURES

While turning the Singapore Ball I realised it looked a lot like a sea urchin. That observation left me to ponder the design of the workshop and how fundamental the rectangle and straight line is in modern society. We live in a man-made rectilinear world of mass-produced rectangular windows and doors, bricks and tiles. Being surrounded by straight lines can become a cage for thinking and designing.

Straight lines and rectangles are hard to find in nature. Communities that live closer to nature build dwellings that reflect the materials at hand and are often based on curves.

Sea urchins and other creatures have evolved to survive and thrive in a very different environment, their colours and symmetrical shapes are a delight to the eye. Potters and woodturners create round shapes that can lift our spirits, I think because the shapes are tactile and reflect the curves we see in nature. Taking inspiration from an urchin may well have been the origin of the Singapore Ball.



▲ Enlarging the hole with my 6mm spindle gouge.

Some time later...

I get into quite a rhythm, drilling each hole and hollowing out behind it with my little spindle gouge. It takes around 80 minutes to do all 32 holes. In a few areas, I have accidentally cut through at the lower side of the hollowing and can see a little daylight between the pouches, but David points out in his book that this isn't a problem as the spikes make it impossible to see this once in place.

I give the ball a rub over with a red abrasive pad to ensure all pencil marks and fluffy shavings are removed and the ball is done.



▲ The finished ball, with 32 holes.

WHAT IS AVAXHOME?

AVAXHOME-

the biggest Internet portal,
providing you various content:
brand new books, trending movies,
fresh magazines, hot games,
recent software, latest music releases.

Unlimited satisfaction one low price

Cheap constant access to piping hot media

Protect your downloadings from Big brother

Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

All languages

Brand new content

One site



AVXLIVE:ICU

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We have everything for all of your needs. Just open <https://avxlive.icu>

Spikes

The spikes are another slightly repetitive job, but as a production turner, a little repetitive work doesn't bother me. I cut some lengths of the same beech and hold one end in the smallest jaws I have for my chuck, the Axminster 'F' jaws. These grip an 18mm tenon, so I rip the blanks at 18mm square and around 100mm long. The spikes are a perfect job for a little skew practice, so using my preferred skew (which is, in fact, a 10mm beading and parting tool) I turn the wood to a dowel with a planing cut and with my Vernier callipers

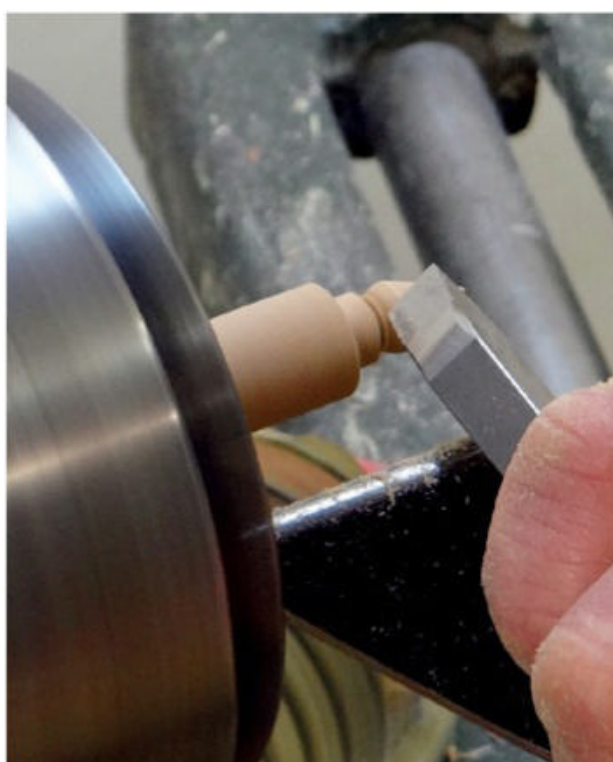
set to around 9.3mm I make a series of sizing cuts. I mark 15mm along the spindle and turn the end of the dowel to a point. I then round the base forming the little teardrop shape that I'm after. Before it gets too thin, I sand with 320 grit and my red abrasive pad and part it from the rest of the dowel.

The rounded part of the teardrop is a little untidy, as parted work often is, but this will never be seen once in place in the ball, so I'm not too worried. Very gently, I test this first spike in a few of the holes. In most it is tight, in a couple

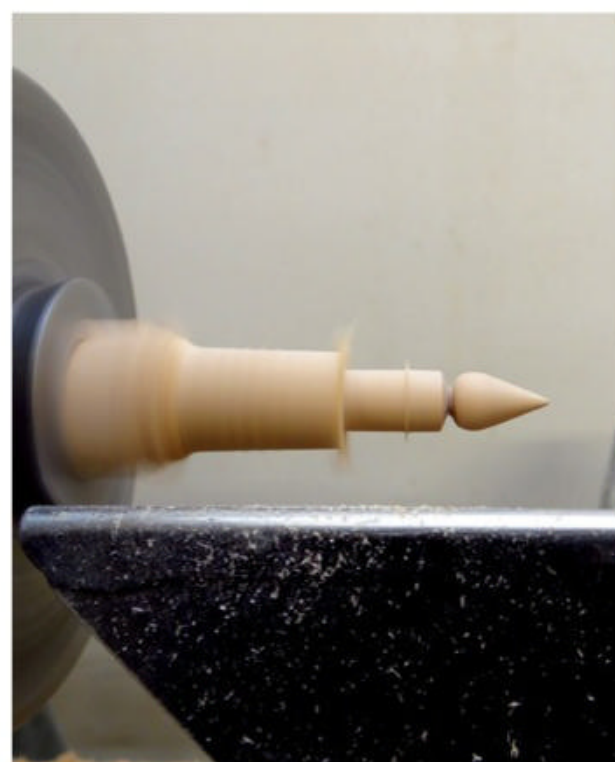
it is a little loose. It is a fine balance between too tight and too loose with these spikes, so I decide to turn too many and make a few slight size variations. As this seemed to be a minimum size I turn most to 9.4mm, with a few going as big as 9.7mm. I'm certain that natural variation will occur with my turning technique and the sanding, but it means I should have enough spikes of enough variations that all of the holes will be filled with a suitable spike. From each dowel, I can turn three spikes before getting too close to the chuck.



▲ Turning the point of the spike.



▲ Rounding the back of the spike.



▲ The teardrop-shaped spike before parting off.

Later still...

A little short of an hour later I have 40 little spikes in a jar, which look a little like nuts or large seeds when gathered together.

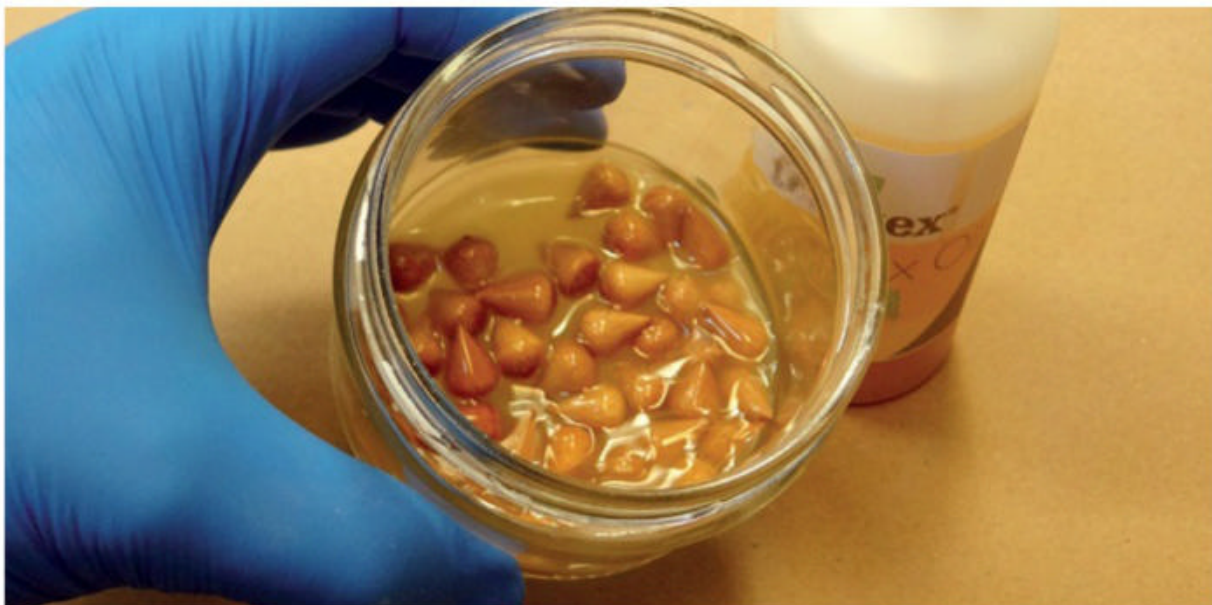
During the turning process, I have been mulling over how exactly I will apply some finish to the components. I could leave it unfinished, but the very nature of the Singapore ball encourages it to be picked up and examined, almost played with, and it will soon get grubby from finger marks without some form of finish. Generally, I will either oil or lacquer my work. Spray lacquer seems like a good option for the ball as I can mount it on a long spike or screw into the base of one of the holes and spray it, which would be

very simple and effective. But spraying or, more to the point, holding 32 little spikes, would be a real task. Oil-ing will be easiest for the spikes as they can just be dropped into a pool of oil, thoroughly coated and then laid out to dry. The ball would be fiddlier because of oil pooling in the holes, but with care, I think I should be able to deal with this, so oil is my decision. I always keep old (clean) mayo and sauce jars as they are incredibly handy for mixing stains and finishes and cleaning brushes etc.

I put all 40 of the spikes in one such jar and cover them in oil, mixing them well with a gloved finger and leaving to soak while I sort the ball. This is just

a case of wiping the surface with oil as I normally would. Initially, I try to avoid getting oil into the holes but realise that when the spikes are sitting back in their holes, I will be able to see somewhat into them, so apply the oil a little less carefully and, using a cotton bud, wiggle it around in each hole to make sure the oil is evenly spread without pooling.

Satisfied with the ball, I wipe off the excess and set it aside to dry. I tip the spikes out onto a piece of paper towel and dab them dry, swapping the towel a couple of times before leaving them to dry next to the ball. I apply four coats of hardwax oil in this way before assembling the Singapore ball.



▲ Oiling the spikes.



▲ Oiling the ball.

Assembly

Once the oil is dry, I give the ball a buff on the lathe with my buffing brush to even the satin sheen all over and make it silky smooth to touch. I wipe each spike with a cotton cloth before picking a hole to fit it into. Most go straight into the hole I choose, the odd one is

a touch loose or tight and gets tried in another hole, before being rejected if it's not suitable. Amazingly, of the 40 I made, exactly eight are rejects and 32 fit in place with a firm push with my thumb and finger, each making a kind of pop as it goes into the hole.



Conclusions

I am really pleased with how this came out. A Singapore ball is something I've been curious about for years, although would never have tried to make one without a push, so I am pleased to have been challenged. I can see how some would find the repetitive nature of making this a bit tedious, but others will rise to the challenge and thoroughly enjoy all of the stages of making it, and I can confirm that the end result is well worth the time invested. Beech was a good choice of wood, anything softer may bruise around the holes as the spikes are pushed in. I've seen them made from a dark wood with light coloured spikes, perhaps a walnut and sycamore combination, which looked striking and I'm almost tempted to make another. Almost. **W**



The finished Singapore ball.

Cabinetry Shortcuts

Designing cabinetry is fundamentally related to drawer size, the tools at hand and your dovetail jig.

David Barron's small chest of drawers on page 62 inspired me to make the most of a piece of aromatic rosewood I had squirrelled away in the workshop.

The curved sides and scalloped top are both eye catching and sensuous. The organic design is so delightful I just had to have a go at morphing the chest just a little so I could incorporate some joinery shortcuts that readers might find useful.

FULL SCALE DRAWING

The first step was to make a rod 595mm long by 35mm wide, sketch the profile of the sides onto it and then cut to the line.

The dressed plank of rosewood (also known as rose mahogany) I had was 920 x 260 x 90mm. I realised that it would be a waste not to make the cabinet slightly wider and deeper in order to make the most of the rosewood.

As you can see to the right, I based the drawer sizes on what could be achieved with the Gifkins dovetail jig. With these sizes in mind, I went about drawing a full-sized front view of the cabinet. The best fit for the drawer sizes ended up being one 46mm-deep drawer, three 66mm-deep drawers and two 86mm-deep drawers. After I had drawn the full-scale front view, I then transferred the drawer support and top positions onto the rod.



▲ The 10mm Gifkins dovetail example helped determine drawer size and cabinet height.

RIPPING STOCK

I docked the plank so that I had a 595mm-long section that I could rip and reassemble for the cabinet sides. After marking the face with a "V" and the back with a "VI" I ripped the plank into two 86mm and one 66mm sections. These sections were then ripped to 36mm thickness. A pass through the thicknesser had them 35mm thick.

The method in the madness behind ripping the 260mm plank into sections, only to later glue them back together again was to make cutting the trenches and the curves easier, as well as yielding the 10mm stock for the drawer fronts.



▲ The profiled rod sets the datum for the first cut, the spacer lines up the second.



▲ Cleaning up each trench with a hand router removed inconsistencies.



▲ After the trenches were dressed, it was time to trace and then cut the profiles on the bandsaw.

MACHINING THE TRENCHES

As you can see above, I used the rod to set the datum for the bottom cut of the trench and then slid the spacer in place in order to cut the top of the trench. The 10mm-wide trenches required the spacer to be 6.8mm thick (blade thickness plus spacer = 10mm). With the top and the bottom lines cut I then used the cross slide to nibble away the waste in between the two cut lines. This process was repeated until I had all the trenches cut.

The next step was to use a hand router to plane away the ridges left by the standard rip blade.

CUTTING THE PROFILE

With the trenches cut it was time to trace the profile onto both sides of each section and then to cut away the waste with a

bandsaw. I used a bobbin sander to clean up the scalloped tops before machining domino joints into the mating surfaces. After a dry run it was time to apply the glue and lock the side pieces together again. At this stage I made the two 10mm-thick cover strips for the cabinet sides and glued them in place.

The top of the cabinet and the false drawer fronts were then ripped from the 310mm-long plank section. After I had made the drawer spacers and the top, it was time for a dry assembly, followed by a glue-up.

The Gifkins dovetail jig made short work of making the drawer bodies. These were then tweaked so they slid neatly in place.

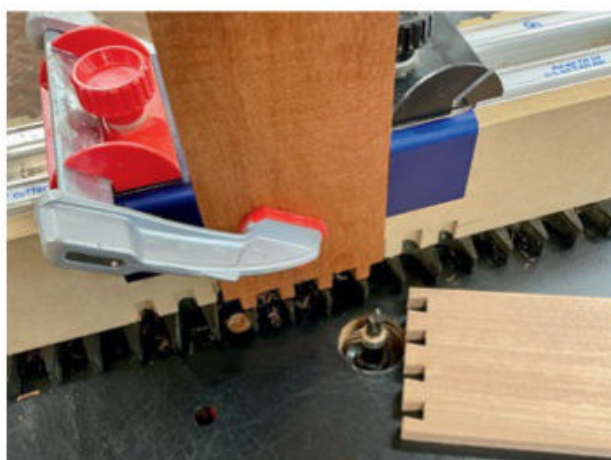
The next step was to make the 8mm-thick false fronts and glue them

in position. After sanding through the grit sizes from 80-220 grit I sealed the drawers and the cabinet with two coats of French polish and then applied two coats of Feast Watson Wipe-On-Poly.

The masking tape drawer pulls were replaced with satin ribbon. The cabinet speaks for itself. I am more than happy with the end result! [W](http://www.australianwoodsmith.com.au)



▲ Drawer supports and top installed, base curved and surgical tube at the ready for a test assembly.



▲ The drawers had rosewood fronts and coachwood sides and back.



▲ I used masking tape as drawer pulls while tweaking the faceless drawers so they slid neatly in place.

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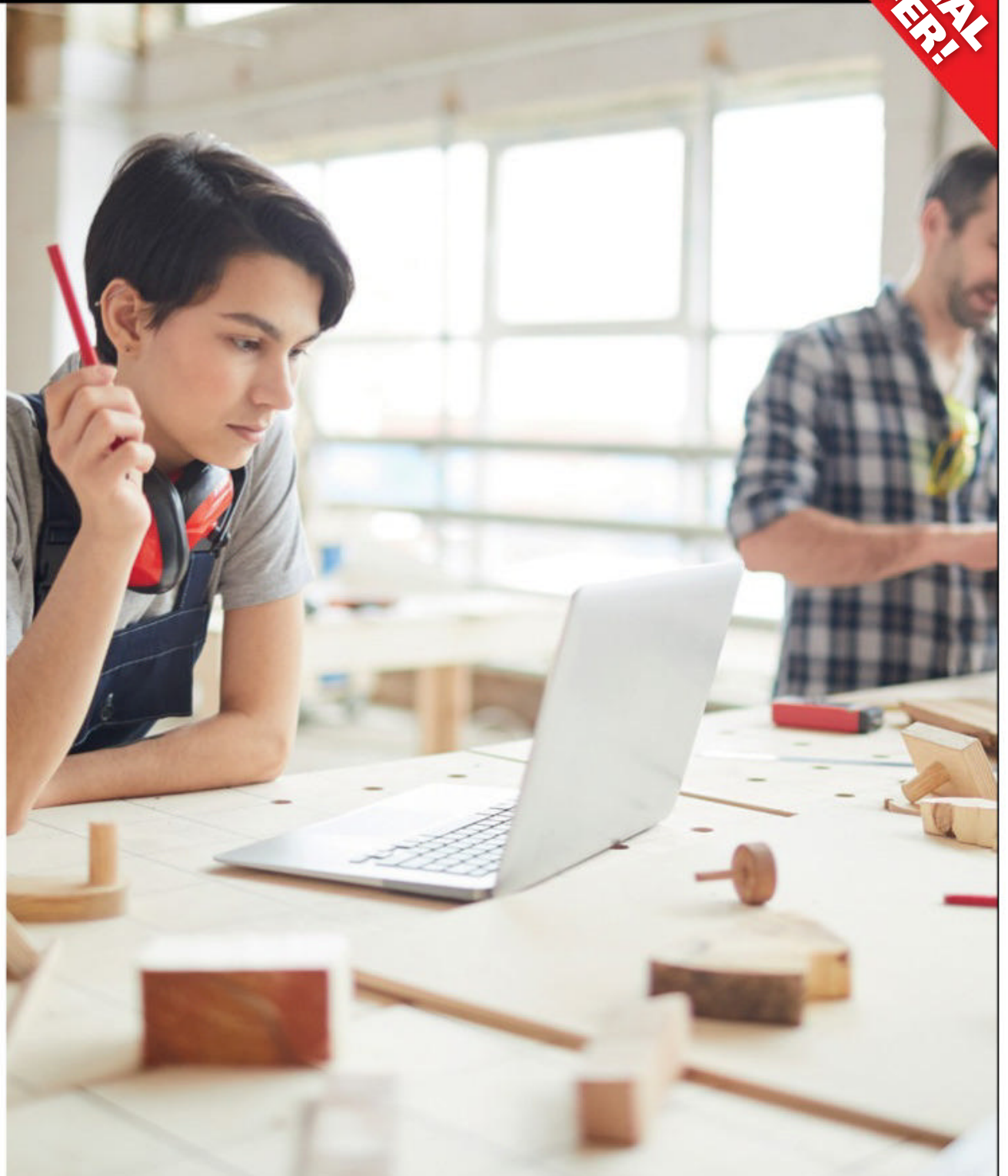
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Anti-rust Plane Socks

Anti-rust socks (made from silicon-impregnated cotton hose) can keep rust at bay in your plane drawer. Making your own socks is both economical and simple.

My favourite plane has to be my Veritas shooting plane. The PM-V11 blade keeps its edge for ages and it can be used free-hand as well as in a shooting board. Sadly, last time I went to use it, I noticed that all the planes in my plane drawer had started to rust (due to an amazingly wet summer).

That got me online looking for silicone-impregnated anti-rust plane socks for all of my cast iron planes. The prices seemed to range from \$20 to \$25, depending on whether you wanted a sock for

a No 7 trying plane or a sock for your smoothing plane. While online I noticed 1380mm-long anti-rust gun socks available for around \$15 each!

As you can see above, one gun sock can be transformed into four plane socks (or two No 7 plane socks). All you need is a sewing machine with a removable table so you can slide the hose in place and stretch it while hemming.

It was a pretty straightforward process making each plane sock. The first step

was to position the plane on the sock, allow 60mm for the 20mm hem and then cut the hose to length. The sock was then turned inside out and its base stretched and sewn closed. A hem was sewn on the top and nipped with scissors so a paper clip could be used as a shuttle to thread through a bootlace drawstring. The off-cuts of hose from the four gun socks I used ended up being just the right size to stretch over apron planes.

Not bad for just \$60! 



▲ Tourbon anti-rust gun socks are designed to slip over a rifle equipped with a scope; long enough to make several plane socks.



▲ Plane socks not only keep rust and dust at bay on planes, the hose can also be tailored to protect your dovetail saws.

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booktopia.com.au
Woodturning Wizardry

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Classic Hand Tools
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David Barron's dovetail guide

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SANDBAGS

Panelbeaters leather sandbags are an option worth looking at if you are in the market for sandbags (Hare & Forbes has them in stock). You can make your own out of heavy-duty cotton if you know your way around a sewing machine, however the leather-covered variety (favoured by jewellers) are also handy when it comes to netsuke carving. You will be surprised how often you will use sandbags in the workshop.

WASHI

Japanese Tools Australia is the place to go to check out washi. The texture of the handmade paper is not appreciated until you hold it. JTA stocks the Asa-No-Ha Kumiko jigs made by Wigwood. These are the same jigs that Jason Bennett used to create the awesome lampshade on page 20.

WOOD INSERT JOINERY

Dowel joinery with buttons and matching brad point drill bits is the cheapest and most accessible joinery system. Biscuit joinery has been around long enough for the original patent to expire, allowing several competitors into the field. The Festool Domino is a premium jointing system that is the most versatile of the lot. The German engineered and made machine is built to very high tolerance and is robust and reliable. The cutters wear out and need to be replaced more often if you are working with hardwoods. The best way forward in regards to a Festool Domino is to purchase the Dominos in a Systainer. The deal includes a new set of cutters.

TENONING WITH A ROUTER

The ¼" knobs and related hardware used in the jig are available from Carbatec. The most economical way forward is to buy the Carbatec Hardware Fitting Kit - ¼" Thread (OOH21-49).

KUMIKO LAMP SHADE

Brian's amazing lamp shade was made from merbau rescued from a pallet, rice glue he

made himself and a handful of skewers from the kitchen. The washi he used came from Japanese Tools Australia. He made the jigs himself. The most important components in the construction were planning, patience and a sense of humour!

WEEKEND WORKBENCH

The most important component of the workbench is the vice. Before you start your build, you need to purchase a 9" (228mm) quick action vice. The quick action allows you to adjust the vice quickly before you lock it down. One option could be the Pony Jorgensen Professional vice from Timbecon or a Groz vice from Carbatec. If you have deep pockets and want the best vice on the planet visit HNT Gordon online and admire the awesome all-aluminium non-racking works of modern art!

SMALL CHEST OF DRAWERS

It is obvious that David Barron is a master cabinetmaker. The lines of this cabinet are a delight to the eye. The best way to approach the project is to first purchase a 1:6 ratio David Barron dovetail guide (available from Classic Hand Tools) and have a go at making some practice dovetails. When you are confident that you have honed your skills, you can then set about crafting this marvel in wood.

SINGAPORE BALL

The Paul Howard Sphere Jig that Richard used to make the ball is available online from Olivers Woodturning (oliverswoodturning.co.uk). Otherwise you can follow David Springett's instructions in his book *Woodturning Wizardry* from Booktopia and make your own.

PLANE SOCKS

Silicon-impregnated gun socks are available online. I bought four and then realised I could make little pouches for my apron planes with the leftovers. I have since bought another two so I can finish pouching my apron planes and make socks for my dovetail saws.



▲ *Staircase.* Follow James Hatter's step-by-step guide to build you own set of stairs. All the instructions you need start on page 30.



▲ *Weekend Workbench.* A new bench that's heavy enough it can't be pushed around, has a lot of storage but doesn't cost a ton of money to build. All you need to know begins on page 55.



◀ *Singapore Ball.* Richard Findley takes on the challenge of turning this fascinating puzzle. Step-by step instructions start on page 68.

Final details



▲ *Kumiko Lampshade.* This beautiful timber and washi lamp would make a beautiful addition to your dining room. Step-by-step instructions start on page 48.

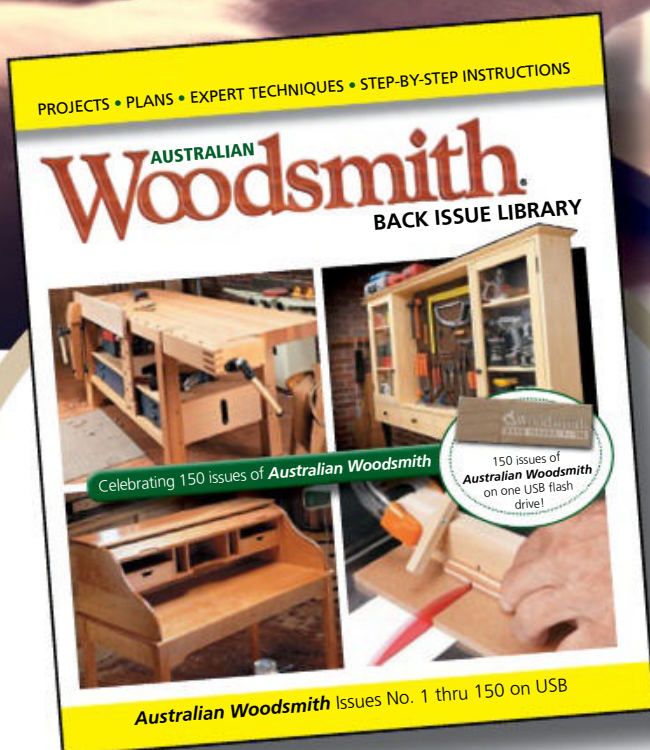


▲ *Small Chest of Drawers.* David Barron makes good use of a chestnut board with this small project. Turn to page 62 to learn more.

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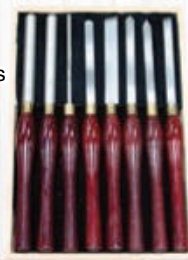
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