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THE **Shed**

WHERE DREAMS ARE MADE REAL

SEPTEMBER–OCTOBER 2017

ISSUE 74

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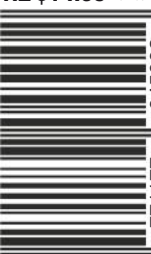
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Hey mate — why not “Cutshop it?!”



EVER HAD AN IDEA YOU JUST WANTED TO BRING TO LIFE? AS A READER OF THE SHED, YOU’VE PROBABLY HAD LOTS, BUT SOMETIMES THEY JUST STAY ON PAPER, OR IN YOUR HEAD, AND NEVER SEE THE LIGHT OF DAY



We’ve seen lots of examples of great ideas that we helped become real. We listen to people’s ideas, programme their designs, and then cut what’s needed, including: solid wood, composites such as MDF, plywood and particle board, as well as acrylics, aluminium, and polystyrene.

With our large flat-bed CNC machines, we provide a factory to anyone with a good idea — ‘our factory is your factory’ — so you can ‘Cutshop’ your project. It’s a factory in your back pocket!

“Cutshop” your office

Take handyman Paul Kiely who remembers messing about at his Dad’s tool bench, and later went on to renovate houses.

In his current home, he wanted to turn the dining room into an office — somewhere to keep things he had collected over the years.

He had an idea, designed it using

the Cutshop software and, “the whole thing actually cost about half the other estimates and because I installed it myself, the labour was free!”

“At the end, I stood back, looked at it and thought ‘Wow! I did that!’”

“Cutshop” outdoors

John Mead came to us with a DIY project to brighten up his grandchildren’s

outdoor play — and to keep the plants safe from wayward balls and feet!

John had spotted the idea for a space-saving garden in a magazine and decided to make two garden walls.

He gave us his plan and we made sure every slat was 100% the same. “I wanted a thorough paint job and it was worth the effort. I’m very pleased with the end result — they’ll give great service for many years.”





TESTIMONIAL QUOTE

"Cutshop offers very good service — it's a professional, cost-effective business."

"No problem was too big or too small. It was an exciting thing to do — a real creative outlet. Cutshop allows home handyman to go out and tackle bigger projects themselves and get a great result."

Paul Kiely, Handyman

Rocking with Cutshop

'Think it, Make it' is our thing at Cutshop. Nigel Binks took us up on this offer when he set out to create a brand new line of rocking horses with a difference.

From paper, to prototype, to factory, to dinorocker, a combination of two favourites from Nigel's childhood —rocking horses and dinosaurs.

He heard a Cutshop radio advert, got in touch, and hasn't looked back since. After Nigel brought us his drawn designs and a prototype, the project got rocking!

We listened to his idea, programmed it and cut the templates out of plywood. He's now got a thriving business.

"Cutshop Waikato were really brilliant - they were enthusiastic and keen to make my idea work. It was the first time I had done anything like this. They have helped me to turn a creative idea into something that's commercially viable."

Nigel Binks, Dinorocker

"Cutshop" your home

We've built lots of interiors for homes, shops and offices.

Kiwi fashion boutique, Augustine, is a great example — using decorative panels, it's head-office now has lots of character.

While this is a great example of an office, you could use any of our many decorative panel designs to create privacy and beautiful spaces in your home, either inside or out, all made using our CNC machines.



If you have a project you want to get off paper, why not "Cutshop It"? Subscribe to our newsletter on our website for ongoing ideas.

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That's the attitude

I don't know about you but I *avoid clichés like the plague*. Darn. See how hard it is? You have got to be on your toes constantly. Can't let your guard down.

One cliché that has been bandied about with New Zealand's fantastic America's Cup success is how we won that cup with the No. 8-wire Kiwi approach.

There's no denying that we had a miniscule budget compared with what one of the richest men in the world had at his disposal, but to say the team was running on bread and jam for tea might be a wee bit of a stretch. However, it is how they did, and how we like to think our team triumphed, over the cheque-book sailing team of Oracle that is inspirational.

So that No. 8-wire approach must have been our secret weapon as much as the mighty cyclors were, and deep down it's what we all think is as Kiwi as. Solving issues and thinking of a way to do things smarter, easier, and cheaper. Well, they do say that *necessity is the mother of invention* (darn!)

Chatting to our Back O' *The Shed* columnist Jim Hopkins recently, he told me about once meeting Weta Workshop's creative director Richard Taylor. Richard told Jim that, when recruiting for his world-leading special-effects team, he actively seeks out rural candidates. He believes that candidates with a farming and rural background have what it takes to think outside the square given a gnarly problem. They have the wherewithal to look at an issue and then hunt for that simple solution. It's what you have to do when you are way out the back of Winton and only you can fix the problem that confronts you — no one is coming to help.

So feel good about that and feel good about being a sheddie too; figuring stuff out and sorting the best way to build, create, and fix things. The only difference with those others is that you have *The Shed* to help you.

Over the past weeks I have got a bit tired of hearing about the No. 8-wire Kiwi approach cliché but *at the end of the day* (I give up!) it is our cliché and ours alone. A bit like the America's Cup.

Greg Vincent
Publishing Editor
editor@shedmag.co.nz

The Shed Back Issues

Just a brief note to let you know that all the issues of The Shed going back to Issue No. 1 are now online and for sale in our online store, magstore.nz.

Some issues we have hundreds of and others just a handful, so if there is an issue you have been meaning to purchase, now is the time. We can't store these magazines forever so when we run out of room, the older ones will have to go. Not all issues have a full contents listing on magstore.nz but we are working on loading those as fast as we can.

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THE WHERE DREAMS ARE MADE REAL
Shed

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EDITOR

Greg Vincent, editor@theshedmag.co.nz

SUB EDITOR

Sarah Beresford

TECHNICAL EDITOR

Jude Woodside

PROOFREADERS

Odelia Schaare, Helen Adams-Blackburn

DESIGN

Mark Tate

STAFF PHOTOGRAPHER

Adam Croy

CLIENT SERVICES MANAGER

Rebecca Frogley

ADVERTISING COORDINATOR

Renae Fisher

CONTRIBUTORS

Sue Allison, Mark Beckett, Ray Cleaver, Jim Hopkins, Geoff Merryweather, Coen Smit, Jude Woodside, Bob Hulme, Raf Nathan, Juliet Nicholas, Rob Tucker

SUBSCRIBE

ONLINE: magstore.nz

PHONE: 0800 PARKSIDE (727 574)

POST: Freepost Parkside Media Subs

PO Box 46020, Herne Bay, Auckland 1147

EMAIL: subs@parkside.co.nz

CONTACT US
parkside media
magazines television internet events

PHONE: 09 360 1480

FAX: 09 360 1470

POST: PO Box 46020, Herne Bay, Auckland 1147

EMAIL: info@parkside.co.nz

PUBLISHER

Greg Vincent, gvincent@parkside.co.nz

GENERAL MANAGER, BUSINESS DEVELOPMENT

Michael White, mwhite@parkside.co.nz

GENERAL MANAGER, OPERATIONS

Simon Holloway, sholloway@parkside.co.nz

PRINTING

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DISTRIBUTION

Gordon & Gotch

PHONE: 09 928 4200

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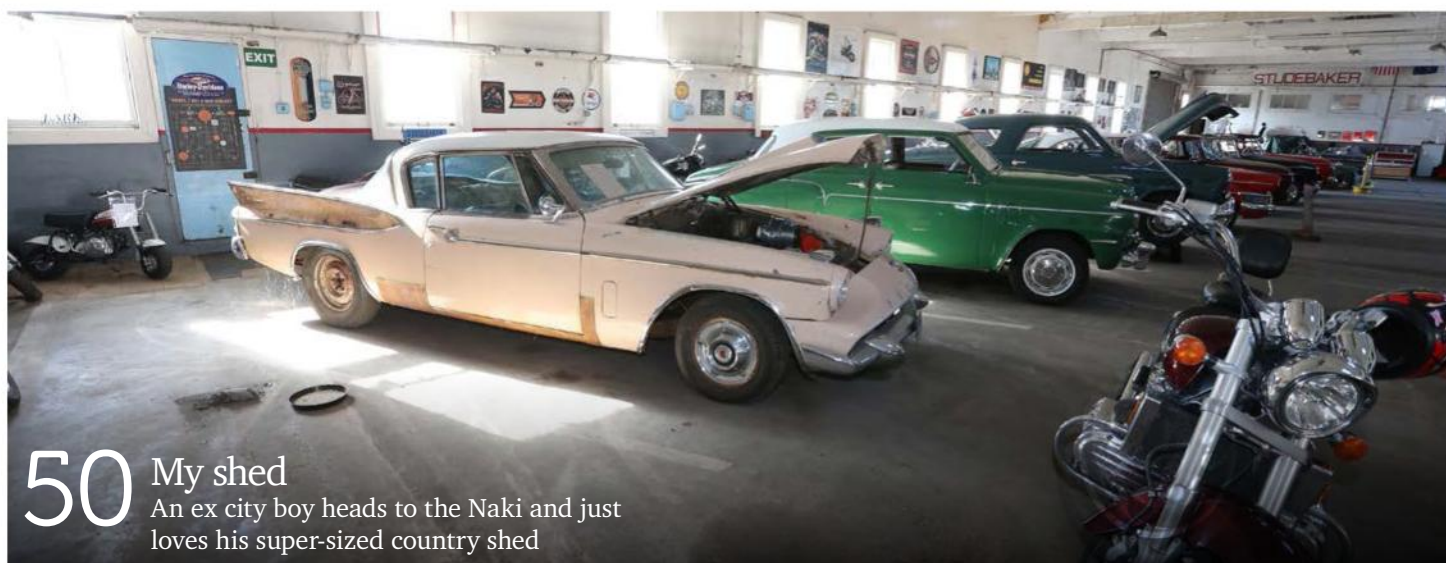
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ONE FOR THE BIRDS

A PASSION FOR BUILDING BIRD HOUSES
HAS LED TO THE OPPORTUNITY TO HELP
A GOOD CAUSE

By Sue Allison

Photographs: Juliet Nicholas



“He always encouraged us as children. I’m surprised we still have all our fingers”

Megan Collings’ birdhouses tick a lot of boxes. Her quirky shelters are not only well-constructed and aesthetically pleasing, but they are indirectly providing food and shelter for more than her feathered friends. The money from every birdhouse Megan sells helps children orphaned by the 2015 Nepal earthquake.

“The earthquake hit me hard after our own quakes in Christchurch,” says Megan. “There were so many thousands affected, schools damaged, homes destroyed, children homeless. I wanted to go over and help but felt I was a nobody. I’m not a nurse, I’m not a doctor. But I love making my birdhouses and thought it was a way I could both be creative and raise money to help children in Nepal, especially with their education.”



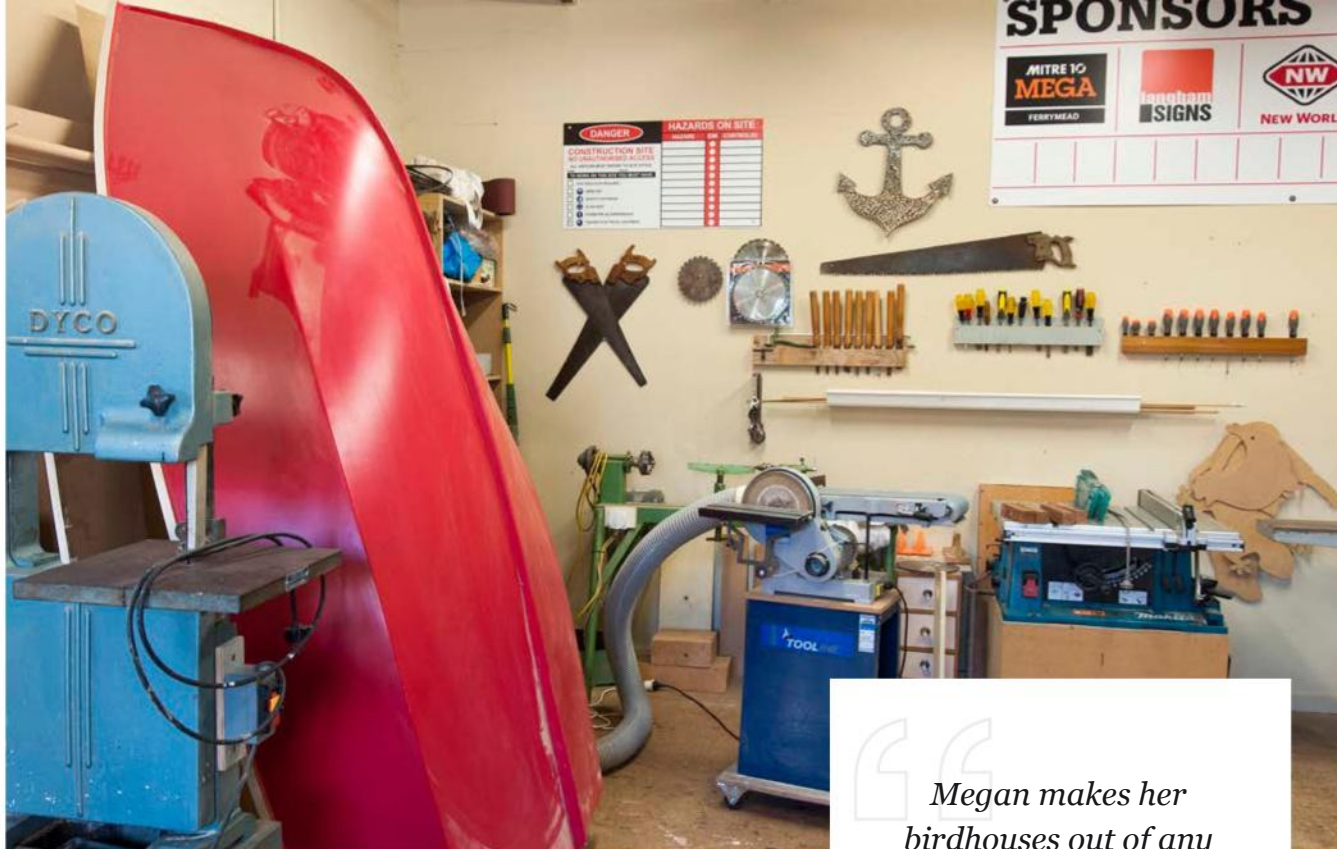


Megan uses the Dewalt drop saw to cut her mitred roof angles
Below: Plenty of tools on hand in this community shed

Megan makes her birdhouses down at the Redcliffs Community Shed. She needed a piece of wood cut on a bandsaw and happened to spot the Shed while out driving. When she approached them, they bent their rules and cut it for her. Before long she and her husband Tim Clemence had signed up as two ardent new members. Tim is now on the Shed's committee and the couple go down to the Shed whenever they can and always together on Wednesday nights. "It's our date night. We're so happy here. It's our home away from home."

The plan had been to build a shed in their own backyard in the neighbouring suburb of Sumner, but by the time they had added a loft and some elaborate design features, it had morphed into a sleep-out rather than a simple workshop. Besides, they soon realized it





Above: This dingy was built as a fund raising project for the Redcliffs Shed, by a group of members

Below: Aligning angles is crucial to the construction of her quirky houses



Megan makes her birdhouses out of any recycled materials she can lay her hands on

was going to cost a fortune to fit it out with equipment. “We can come down here where there are great tools and machinery for just \$50 a year for the two of us.” Not to mention the experienced woodworkers on hand to offer advice.

Megan studied interior design and still does some consulting as a kitchen designer. She is also a proficient mosaic artist, with her work commissioned for Christchurch installations in the late 1990s.

She is no stranger to sheds, having spent much of her childhood pottering in her father’s workshop. “He was a roofer by trade, but loved his woodwork. He always encouraged and helped us make things as kids, and when he wasn’t home we would still sneak in and plan. I’m surprised we still have all our fingers.” Now 92, he sometimes comes down to watch his daughter at work in the Redcliffs workshop. “He’s green with envy at all the equipment we have access to down here.”

Megan’s first major woodworking project was a true labour of love and one from which many would have recoiled. When her mother, only in her 50s, was dying from cancer, Megan and her two young brothers made her coffin. “It felt like the right thing to do. It didn’t

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“Word got around
and women in the
community wanted to
come along too”

feel right to buy one off the shelf,” she says. They constructed the casket from recycled rimu, using old door handles from a second-hand shop as carry handles. All three were pall-bearers. “It was way too big and really heavy, but it was very special. I’m going to make my own, too, but it might be more like a birdhouse,” she smiles.

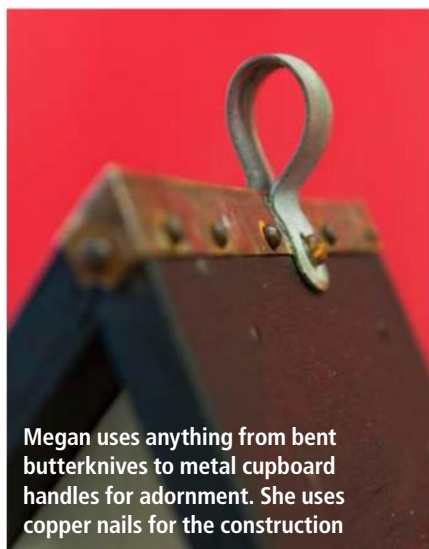
Recycled materials

Megan makes her birdhouses out of any recycled materials she can lay her hands on. Old floorboards are ideal for the walls of the tall, elegant structures

and several have been fashioned from a pink plank she found washed up on the beach while walking from her house to the Shed. She prepares the surfaces with the Shed’s Makita bench saw and belt sander, leaving some imperfections to add to their charm.

“I try to make them as robust as possible so they will last,” says Megan, and the roofer’s daughter always tops them off with copper flashing. “It looks good and keeps them water-tight.” She fits a hinged door on one side for access, always using copper or galvanized nails with brass screws for decorative detail.





Megan uses anything from bent butterknives to metal cupboard handles for adornment. She uses copper nails for the construction

The hanging hooks and perches are made from an array of materials, mostly bits and pieces found in her husband's hoard of "things that might come in handy". Tim, a creative up-cycler who makes one-off lights and lamps, is a collector from way back. He has boxes of bolts and brass fittings, hinges, strips of copper, and paraphernalia perfect for perches. Some of Megan's latest bijou dwellings have bent silver butter knives as roosts.

One of the most useful discoveries in Tim's trove was a rusty set of picture framing braces for holding mitred corners. He cleaned them up, painted them with rust-killer, and Megan uses them to hold right-angled joints while the glue sets. She uses exterior adhesives, including a mystery mix in a bottle she was given by pioneer Christchurch surfboard maker Denis Quane, who used to make his boards in the Shed in the days before it was a community venture.

Megan's favourite tool in the Redcliffs Shed is the DeWalt mitre drop saw. "It's brilliant. I just set the angle (usually 60°) for the roof and the saw does the rest."

The Warrior hole saw comes a close second in terms of making the job easy. She simply selects a circular attachment for the birdhouse entrance and fits the "cookie cutter" to the drill press.

Megan likes her houses to have a natural, worn look, leaving most partially painted or with a raw finish, but she paints the roofs with semi-gloss enamel for weather-protection and coats the rest with linseed oil.



Megan marks the screw holes carefully before drilling

Below: The pink house was made from a plank she found on the beach

Silver lining

Redcliffs and its neighbouring seaside suburbs took a hammering in the February 2011 earthquake. Images flashed around national and international screens of houses precariously hanging

from clifftops, and the local school miraculously still standing in front of piles of red rubble from the crumbled cliffs behind.

With many properties red-zoned and handymen having no access to their gear, a couple of locals hit on the idea of starting a men's shed. With funding and a building available, they soon had one up and running. But before long, word got around and women in the community wanted to come along too, particularly arts and crafts groups needing woodworking tools. And so came a name change and the gender-neutral "Community Shed" was born.

Since 2015, the Redcliffs Community Shed has been run by a management committee as a charitable trust. Lotteries' money pays the rent, the Community Organisation Grants Scheme (COGS) covers administration, power and insurance, and quake recovery funding helped set up a lot of the machinery. "Everyone loves a community project," says treasurer Cam Holdaway.







All the houses have copper roof cappings to keep them water-tight

The shed's 60–70 members pay an annual sub of just \$25. "We don't need much money to operate. We're almost self-funding," he says.

Local sponsors help out too, including Spark, who installed the internet, Mitre 10, and the New World supermarket across the road, which sends over food for Shed get-togethers and the annual working bee.

The community shed is open on Mondays, Wednesdays and Fridays from 10am–2pm, and Wednesday nights until about 9pm. "It's become a local meeting place," says Cam. "We've got a structure in place to ensure there are people able to look after the machinery and the building so people like Megan can come and learn and enjoy making things."

Friday tends to be arts and crafts day, with Redcliffs School parents coming along in the morning to make things for the annual school fair. A lot of elderly people who live alone come down, too. "They not only have a lot to offer in terms of skills, but quite a few have donated their gear."

And, of course, the common room area includes a shelf packed with folders of well-thumbed Shed magazines. "They're brilliant," says Cam.



Every birdhouse is different.
Megan also made the mosaic plant pot

Snack shacks for birds



Rob and Sue Allison have spent the last 20 years planting hundreds of native trees on their 12ha lifestyle block in North Canterbury, appropriately named Otemanu (Place of Birds). In winter, they supplement the birds' intake with hanging feeders. This is the design Rob has found the simplest to make and most popular with all feathered visitors, especially wax-eyes and sparrows. Home handyman Rob Allison originally made his first birdfeeders as Mothers' Day presents for his mother, mother-in-law, and wife. Popular demand has seen his feeders, with a few modifications, hanging on trees in the gardens of friends and family around Christchurch. "It's a very simple design," says Rob. "An ideal first project for a youngster interested in woodwork, and they will have the added pleasure of watching the birds enjoy their handiwork." The construction, designed to hold

either a fat-and-seed ball moulded in a standard plastic dripping container or an apple, is made from three pieces of wood, three lengths of dowelling, and a handful of nails and screws. The central piece is 20mm dressed pine (thick enough for a hole for the skewer to be drilled in the side without splitting). Cut a rectangle 280mm x 180mm. Mark with a pencil, then cut 45° angles from the centre top to create a 90° pitch for the roof. Cut a 100mm-diameter circular hole with its highest point 120mm from the peak. Rob started this with a drill then cut the hole using a handheld jigsaw (while time-consuming, it could be made by drilling a ring of holes then punching out the circle). File the hole to finish. Drill holes (of greater diameter than skewer) through each side at the widest point of the circle, using a ruler to align them. Treated pine was used for the roof to





give some weather protection. Take two pieces of 10mm x 150mm x 180mm wood. Using a handsaw, cut 45° angles on the top edges to create a 90° mitre joint. Centre each side over the peak of the central board and nail, then screw, them into place (they can be braced front and back with triangular pieces of wood to ensure the joint doesn't open). Cut three 200mm lengths of dowelling (either 10mm or 12mm) for the perches, drilling the holes 2mm smaller and hammering through to wedge them in place.





Bird tucker



Melt a pottle of supermarket dripping in the microwave.

Meanwhile, mix in a large bowl: wild birdseed (available from the pet section of supermarkets), cereals such as rolled oats or rice bubbles, dried fruit, raw sugar, breadcrumbs, nuts, bacon rind, pet biscuits ... anything birds might like. Pour melted fat over and mix. Spoon back into containers and freeze until needed. One pottle of fat will stretch to fill two empty containers.



Centre the top perch about 15mm above the central hole and the bottom ones about 15mm below and 40mm in from each side. Rob's Mark I model had a flat base for the birds to stand on beneath the ball, but they tended to slip on it. A more elaborate version could include both a feeding tray base and dowel perches. Coat with boiled linseed oil for protection. Fit a hook or ring to the top, hang it from a tree and wait for the birds to find it. Use a rigid rod to secure the block of bird food so it's easy to guide it through the opposing hole. A kebab skewer was used here.



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Letter
of the
MONTH



Outside the shed

I was inspired by Michael Wolfe of New Plymouth (May–June, Issue No. 72) to show my matched shed to my 117-year-old cottage.

Some sheddies work inside their

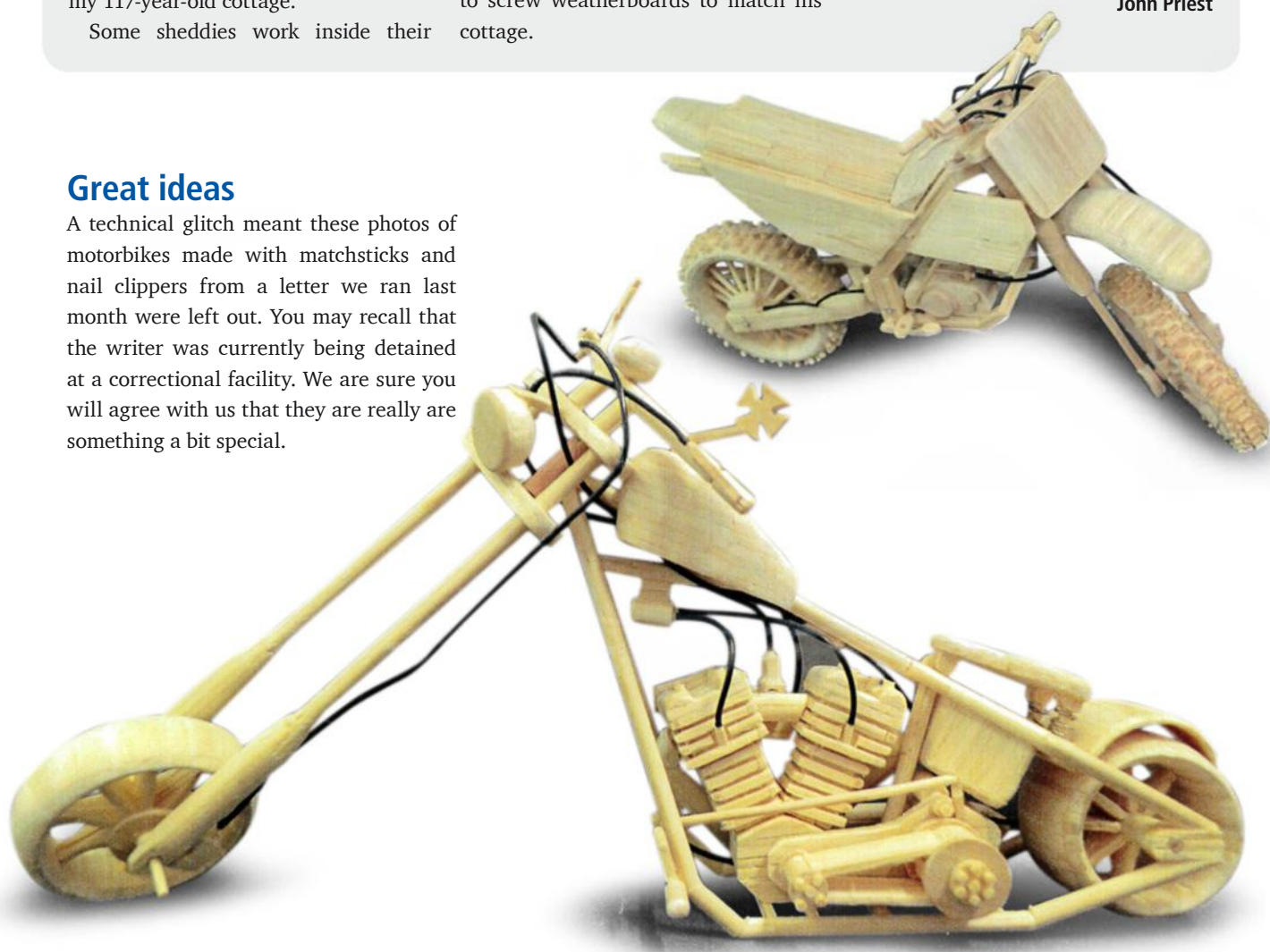
sheds. Some sheddies work outside their sheds. This sheddie worked inside his shed, on the outside of his shed, to screw weatherboards to match his cottage.

Love your magazine. Keep up the great work of disseminating ingenuity and creativity.

John Priest

Great ideas

A technical glitch meant these photos of motorbikes made with matchsticks and nail clippers from a letter we ran last month were left out. You may recall that the writer was currently being detained at a correctional facility. We are sure you will agree with us that they are really are something a bit special.



Triumph Super 7s, very rare indeed

We read with interest *The Shed* article (Issue No. 73) about Noel Sim's vehicle collection and to see that he has two Triumph Super 7s. This was of interest to us as there are very few Triumph Super 7s in New Zealand. We own two of them!

We have a 1930 Super 7 Roadster — running and used regularly on VCC [Vintage Car Club] events and trips to town, and another 1929 Super 7 awaiting restoration. Additionally we have an Austin 7 Special. We thought Noel might appreciate knowing about our two Triumph Super 7s and may or may not like to contact us (if you are able to pass our contact details to him, thanks) to share our experiences of owning and restoring them.

S & C Payne



Letter of the month

The writer of the Letter of the Month this issue receives a Coast Utility Fixed Beam Headlamp. Whether you want to put it on your hard hat or simply on your head, the HL5 Headlamp is a great all-round headlamp for day-to-day use. Using utility-beam optics this headlamp produces a beam best suited for up-close work. The headlamp also features a hinged tilting head to let you adjust the direction of the light beam. It includes three AAA batteries and has a run time of three hours, 15 minutes. The beam distance on high can reach 65m.

This issue's winner is John Priest.



Letters should be emailed to editor@theshedmag.co.nz, or posted to Editor The Shed magazine, PO Box 46,020, Herne Bay, Auckland 1147.

Good things take time

I finally built a pair of wheel ramps as per *The Shed* Vol. 5, No. 4 (Dec. 2009/ Jan. 2010).

A great little project that I am sure will be used by my family for many years.

I added another top cross rail and some wheels for handling and storage. I also cut some hand holes in the recycled 16mm plywood.

The original article could be run again.

Regarding future articles, could someone do a write up on the art of drill

sharpening? The good sharpening jigs, and the cheap method on a bench grinder?

Also using a MIG welder with bronze wire on thin steel panels and tubing.

Is there a man shed in South Auckland? As a retired engineer, I miss access to the company maintenance shop. Best regards for a great magazine.

Andy Wilson

Thanks Andy, we will put all those on our editorial wish list. To find your nearest men's shed see the list on page 118 of this issue. ▶





Harare Shed fan

► I first received *The Shed* magazine from my son in Australia. It was the May 2014 issue.

I decided this was the magazine I wanted for all the interesting and diverse subjects in its contents, many of interest to me.

I first ordered the hard copy but after a few issues, the mail we have here started slow delivery and they lost two issues.

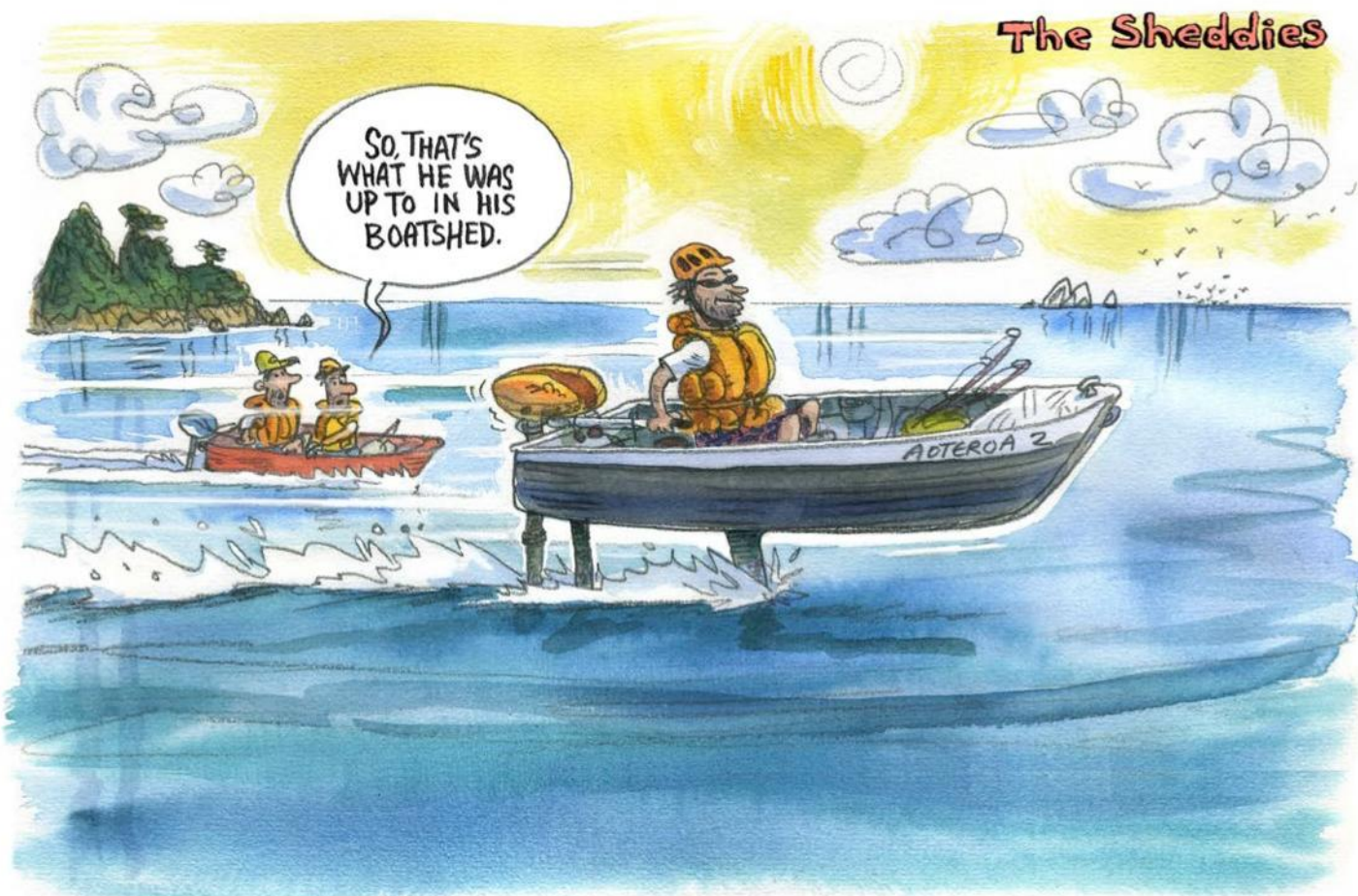
These were kindly re-sent but I decided to go onto a digital subscription instead.

Once you changed to Zinio, at first I could not download but this has now been

resolved so I hope all other issues will be coming through OK from now on.

Here are some photos showing my vintage circular saw and jointer/planer, etc., and a pic of us running on the train track at home. Hope this is of interest.

Mike Thomas, Zimbabwe



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Good on you, Burt

By Janette Gellatly

Photographs: Janette Gellatly

CLUB ORGANIZES 50-YEAR SPEED RECORD ANNIVERSARY TRIBUTE TO BURT MUNRO

Motorcycle legend Burt Munro's epic Bonneville world land-speed record will be celebrated 50 years to the day at his beloved Oreti Beach, near Invercargill.

On August 26, 1967, Munro, aged 68 and riding a 47-year-old Indian motorcycle, set an under-1000cc land-speed record at the Bonneville Salt Flats, in Utah, America, which has not been beaten.

Southland Motorcycle Club vice-president Stephen Winteringham said the club decided racing at the beach would be a fitting tribute to mark the milestone. For the past 11 years, the club has hosted the Burt Munro Challenge in late November. However, due to consistent bad weather, the next date for the annual event has been moved to February 2018.

Mr Winteringham said members of the club didn't want to miss the opportunity to celebrate Munro's 50-year record this year

just because the date of the challenge had been moved, so Burt's Bash Out At The Beach is planned for Saturday, August 26. "The club wanted to pay tribute to Munro, and what better way than to pay homage at his old stomping ground on Oreti Beach?" Burt's Bash will also double as the national beach-racing championships, for which the club holds the annual hosting rights. In addition, the day will also include a have-a-go component for the public to ride their motorcycles on the beach.

"It's going to be a full-on day," says Mr Winteringham, who is hoping about 70 riders from around the country will join in the once-in-a-lifetime event.

The day will kick off at Oreti Beach between 9am–10am, depending on the tide. As well as the traditional 50-lap race, there will be a one lap-one mile down, and one mile return race — the way it used to be, according to Mr Winteringham.

"Because the event is to honour Burt's record, we are planning to have a Le Mans start, where the riders have to run to their bikes and start them for the race, as it was done years ago. The winner of the 50-lapper will have a special badge commemorating the anniversary added to Burt's 50-lapper trophy."

Also, as part of the 50th celebrations a charity auction organized by E Hayes & Sons managing director, Neville Hayes, will be held with an Indian Scout motorcycle among an impressive line-up of items to go under the hammer. Mr Hayes said the store and name had long been considered home to the legacy of Burt Munro, with Munro's original bikes and memorabilia on display in store. He said he was proud to be celebrating Munro's record in this way.

Burt Munro's World Speed Record 50th Anniversary Charity Auction will be held





E Hayes & Sons owner Neville Hayes (right) and Burt's Bash Out At The Beach race organiser Stephen Winteringham



at Ascot Park Hotel on Saturday, August 26, between 5pm–7pm, with proceeds to Hospice Southland. Tickets to the charity auction, which are available from E Hayes & Sons, are \$10, and items to be auctioned included a 2017 Indian Scout 1000hp, 1133cc, V-twin motorcycle with a customized anniversary tank, which was on display at E Hayes & Sons.

A customized commemorative anniversary helmet, boxing gloves personally autographed by Joseph Parker and Kevin Barry, and a host of other items will also feature.

* Burt's Bash Out At The Beach race registrations are open. For more details and to purchase tickets, go to www.southlandmotorcycleclub.org.nz.



Star of Field Days

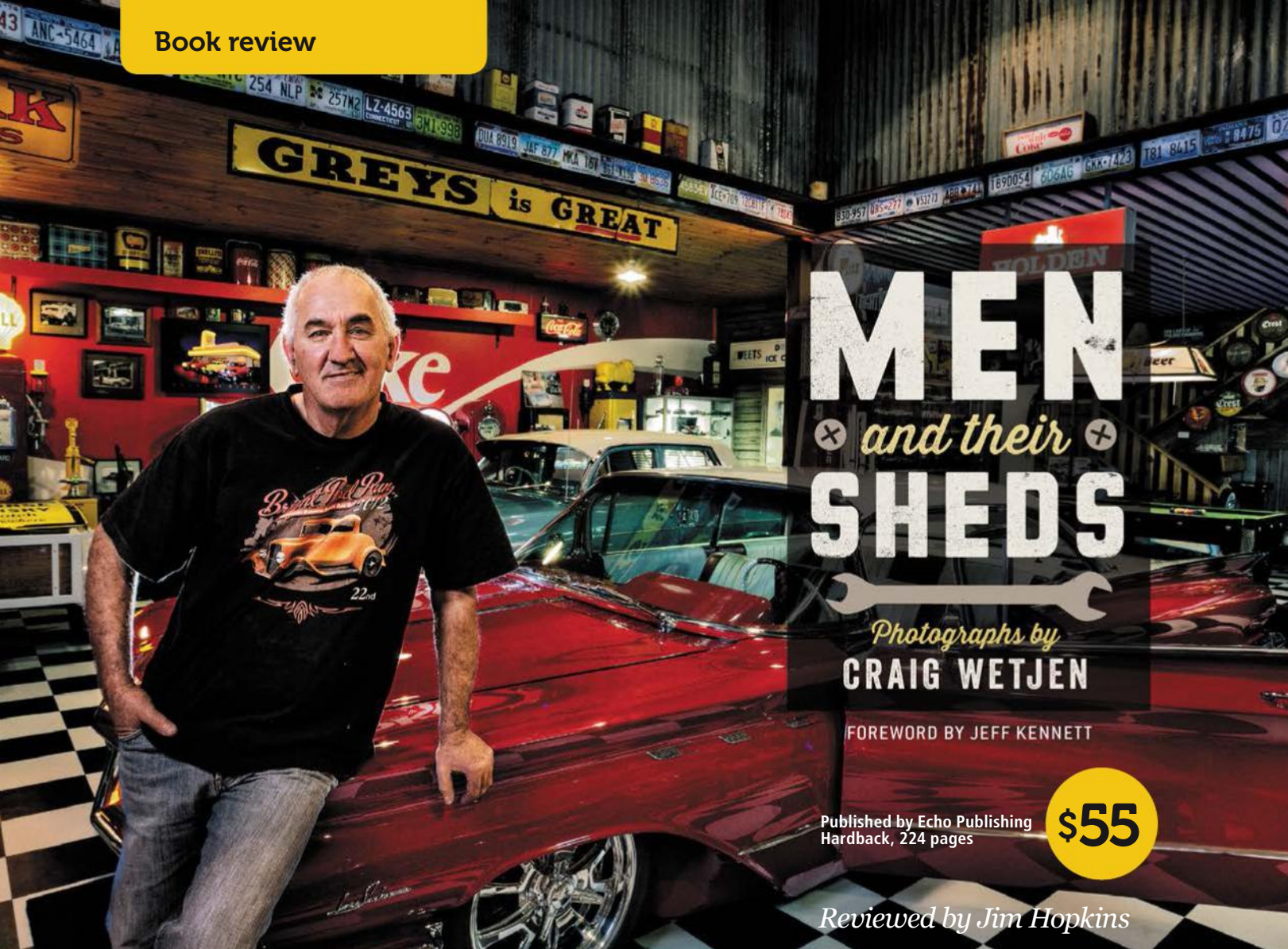
A group of students from Westmount School in Timaru were something of a hit at the 2017 Field Days recently. The group are participating in the Young Enterprise Scheme, which is a nationwide competition where students team up to create their own businesses.

This team's business, Eliminar, created an innovative boot remover that makes taking your muddy boots off much easier. The product entirely sold out at their stand in the Innovations Section.

The boot remover is 100% New Zealand made, with the choice of a silver or gold zinc finish. It's made of a 4mm mild steel base, a 3mm top, and weighs just over 4.5kg. The cost is \$74.99 each, with a generous discount for large orders of 10 or more.

The Shed says well done Westmount School, and good luck with your business venture. To purchase or discover more, head to www.eliminar.co.nz.





Published by Echo Publishing
Hardback, 224 pages

\$55

Reviewed by Jim Hopkins

Some things you never forget. Like the day, late last century, when I came across a slim little book on the shelves at Whitcoulls in Christchurch. It featured about 50 black-and-white photos, each filling a right-hand page, with a just single line of text on the left.

It was published by HarperCollins, created by Australian Mark Thomson and called *Blokes and Sheds*. The instant I saw that title, I knew that it was the most brilliant idea for a book I'd ever seen. And someone else had thought of it! So it was off limits. Unable to be copied. But I bought a copy anyway, and every time I thumbed through it, that famous word from the Toyota ad tormented me.

Then, a few months later, the phone rang. It was a HarperCollins editor in Auckland. He said they'd been talking about a quirky little book that had been a surprise hit across the ditch. And since the company owned the title — you guessed it, *Blokes and Sheds* — they'd decided to do a Kiwi version. Would I like to write it?

Would I what? When do we start? HarperCollins New Zealand's decision to publish its own edition made the impossible possible. In the end, after talking with our editor, photographer Julie Riley and I delivered a book that



was bigger than the original, with more photos, more sheds, and 300–400 words about each and its owner.

Blokes and Sheds New Zealand was a bestseller. We did three more books: *Inventions from the Shed*, *Back in the Shed*, and *Mates*, our take on the importance of friendship. Much has happened in the shed world since. The Mensheds movement started in Australia and now supports about 1000 communal sheds. We've got Menzshed here too, plus this great mag, of course. James May has made a series celebrating sheds and we've seen *Amazing Spaces* presenter, architect George Clarke, hosting Shed of the Year shows — just Brit sheds, alas, although a Godzone Shed of the Year would go gangbusters too, I reckon.

Suddenly, sheds are chic, finally getting the respect they deserve. No surprise, then, two decades after *Blokes and Sheds*, that a sequel has appeared. *Men and their Sheds*, by photographer Craig Wetjen, is the biggest, most ambitious shed book yet and,



for that reason alone, arguably the best.

This coffee-table classic profiles 102 sheds and sheddies with striking images, all in colour, adding a new dimension and richness. Otherwise, the format's similar — but that's no bad thing. It doesn't really matter that it's Australian, either. You could find any of these sheds and sheddies over the fence or down the road. Each shed gets its own two-page spread, dominated by a sumptuous main photograph, supported by smaller photographs, and each sheddie tells his own story, in his own words. Obviously these are extracts from recorded interviews. There's some great lines, like this:

"I will never retire. I'm just too busy being alive."

"My job is how I feed my family. My shed is where I feed my soul."

"It's kind of like a zen retreat."

"... the shed is the first place to be unlocked in the morning and the last to be locked up at the end of the day."

"Who needs therapy when you have a shed?"

"I believe if you keep your hands busy, your mind will probably look after itself."

"This is my way of expressing things ... I love the classic automobile, and in my shed I get the chance to restore and adore them."

"This is my history, in my shed."

"Everyone should have a shed."

There are sheds here for every purpose.

Sheds for pals; sheds for parties; sheds to share with grandchildren; sheds for woodworkers, stone carvers, blacksmiths, model makers, drone builders, bird breeders, inventors, pinball wizards, and solid-gold good guys, like the bloke who repairs bikes for needy children. There's plenty of restorers too, preserving classic cars, muscle cars, motorbikes, trains, trucks, stationary engines, and paddle steamers.

Something for everyone, in other words, beautifully presented in a 21-gun salute to that unique place in which things are fixed and friendships formed, where invention begins and the amazing history of things is kept alive. Some contributors stress

the benefit of sheds as a therapeutic tool, warding off loneliness and depression. But, for me, that's a side effect. Their greatest gift is that they're gyms for body and mind, incubators of dreams — not antidotes to despair — fostering creativity, skill, satisfaction, achievement, and pride. Plus, they keep you young. And those things will keep the blues at bay, 24/7. This book's 224 pages show how that happens. It's the perfect present for any sheddie. 📖

The Shed magazine has copies of this book for sale for \$55. To order, see Bookcase on page 116 of this issue.



FATHER'S DAY PRODUCTS FOR DAD



HEAVY-DUTY HAND PROTECTION

When you work a lot with your hands, you need to protect them from a range of hazards that could cause discomfort or injury. The Titan XT Kevlar-Lined gloves are impact resistant, cut resistant, anti-vibration, and high-visibility. These high-tech gloves feature TPR smash protection on the top of the hand, and EVA foam to dampen shock and vibration on the palm. Kevlar lining throughout means that the glove has a Level 4 ANSI cut-resistance rating. Despite being laden with features, the gloves remain flexible and allow for precise work. Priced at \$60.00

To purchase and for more info visit www.youngstown.co.nz.

HEARTH WARMING

Everybody loves a warm house. Designed and made in New Zealand for our unique conditions, Wagener offer a range of stoves that will make your home nice and cosy. From the very popular little Wagener Sparky to the big and beautiful Wagener Fairburn Cooker, every stove is crafted to last and reflects the company's commitment to quality and design.

Wagener Stoves have been warming Kiwi homes for over 35 years. As a third-generation family business, they have accrued a wealth of knowledge and experience, but are still small enough to care.



Check out their range at www.wagenerstoves.co.nz.

STICKY SOLUTIONS

Save yourself the hassle of sourcing the appropriate material and tools for repairs of cracks, corrosion, and holes. Weicon Repair Sticks provide a simple solution: cut off a piece to match the job, knead it, and place it into the hole to be repaired.

The extensive range is suitable for a variety of repairs, including copper, steel, ceramic, concrete, aluminum, as well as for underwater jobs. After application, the material can be drilled, tapped, painted or shaped with a grinder. \$14.29 (plus P&P and GST).



Industrial Technologies are the New Zealand distributor of Weicon products.

Contact them on 04 569 3465 or sales@industrialtechnologies.co.nz, visit them at Bldg A, 59 Marsden Street, Lower Hutt or check out their range at www.industrialtechnologies.co.nz

QUALITY FROM THE CONTINENT

From your hammer to your soldering iron, Fribesco is a company that understands that your tools should never let you down. With a focus on exceptional quality, Fribesco seeks out the very best European hand tools, machines, and work wear, and introduces them into the New Zealand market. Their range includes tools for plastering, roofing, sheet-metal working, and forestry. They also have a keen eye on developments in the industry and offer cutting-edge technology. Whether you're a professional or a DIYer, a good quality tool is something you should only have to buy once.

Check out their website for the full range:

www.fribesco.co.nz, or contact them on info@fribesco.com or 09 622 0107.



CUE UP

What kind of games room is complete without a pool table?! PotBlack manufacture the latest Tournament Edition 7' slate pool tables here in New Zealand. These tables have set a new standard in tournament quality, and are now the preferred choice for players seeking fast, reliable and accurate play. You can also personalize them to match your interior; PotBlack has a range of cloth colours and laminates to work with.

Priced from \$4475 including GST plus quality accessory kit, and if you want to save some cash, PotBlack often have ex-tournament lease tables available from \$3900 — these are in near-new condition, with a full 12-month warranty.

Visit www.potblack.co.nz, or contact 0800 476 825 or sales@potblack.co.nz.



SHIFTING SHEDS

No matter how organized you are, or how neatly you put away your tools, there isn't really a substitute for extra shed space. The Borderland Shed from Outpost Buildings can be delivered to your door, ready for assembly. The spacious 5.8 x 3.0m x 2.5m-high shed is strong and durable with a weather deflecting design. Even better — you can move it. Featuring a 4x6" skid-mounted base, it can be dragged short distances with a 4x4 or lifted with a hiab truck. Keep your stuff safe with the strong wooden doors that come pre-assembled and ready to hang. Priced from \$5153 incl GST, add \$997 for a plywood floor kit.

For more information, contact Outpost Buildings on 0800 688 767 or visit www.outpostbuildings.co.nz.

MULTI-VEST A WINNER

A highly functional, multi-purpose safety vest ideal for tradespeople, warehouse staff, builders, construction workers, and forestry workers. The Skillers Multi-Vest has 14 various-sized pockets that allow a multitude of different items to be carried in separate compartments. The shoulders are padded for comfort, and the vests have adjustable side straps to suit all sizes. They are made of a tough polyester fabric, with a breathable mesh fabric for the back panel.

The materials comply with AS/NZS 1906.4:1997, and the garment design complies with AS/NZS 4602:1999 for day and night use.

Four Velcro tabs allow the full range of the Skillers Workwear Flexi-System pouches and accessories to be attached to the vest. One size fits all.



Ask for *The Shed* readers' discount from Jaedon Enterprises Ltd; call 09 263 4566, or visit www.jaedon.co.nz.

TRADITION MEETS NEW TECHNOLOGY

Advances in technology mean that synthetic materials carry many advantages. But there's also a lot to be said for the look, feel, and functionality of time-honoured leather. There's no need to compromise with Youngstown's Hybrid Plus glove. Featuring a high-quality leather palm and synthetic materials for superior performance, the Hybrid Plus provides dexterity and durability. It also features internal knuckle protection, heavy duty fourchettes, a reinforced saddle between thumb and index finger, as well as a three-dimensional design pattern, so you'll have a comfortable fit throughout your workday. Priced at \$24.00

To purchase and for more info visit www.youngstown.co.nz.



FATHER'S DAY
PRODUCTS FOR DAD



Need to coat a wood stove, flue, heater or barbecue? Now you can with Resene High Temp Black Enamel, a flat, high heat coating formulation using heat resistant pigments in a silicone polymer resin that provides excellent colour retention, film integrity and rust resistance at working temperatures up to 538°C. This coating is designed for use on both ferrous and non-ferrous metal surfaces that are exposed to high temperatures. Do not use in areas with direct flame exposure.

Available from Resene ColorShops,
www.resene.co.nz/colorshops 0800 RESENE (737 363)

GLOVES FOR DEXTEROUS DIGITS

Bulky gloves make for imprecise work. With a focus on dexterity, the form-fitting Master Craftsman XT glove is ideal for auto and electrical work, carpentry, framing, construction, fishing, and woodwork. The shortened thumb, index, and middle fingers allow your fingertips optimal movement. These gloves are ideal for handling nails, screws, wires, and other small items. Precision doesn't come at the cost of durability, with Youngstown's heavy duty non-slip saddle reinforcement and double stitched bonded nylon thread. Priced at \$39.00.

To purchase and for more info visit www.youngstown.co.nz.

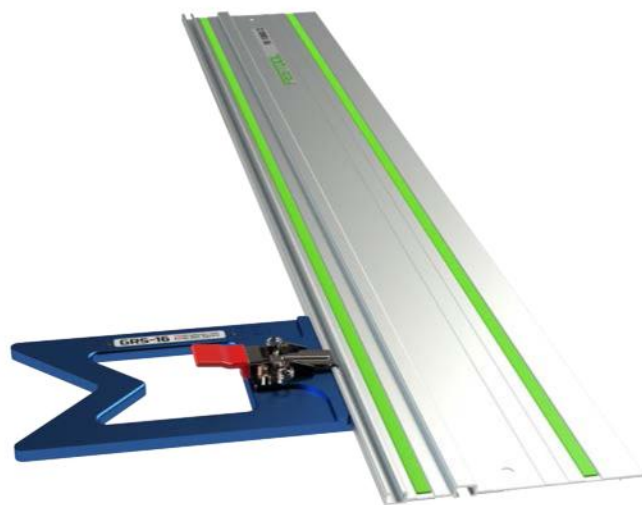


TOUGH JOBS MADE EASIER

The Slammer tool is an innovative New Zealand-made multi-tool combining a sledgehammer, digging bar and axe. It uses the downward force of the inner bar to slam the cutting blade through difficult roots and hard ground, rock and even concrete, without putting strain on your back. Ideal for tight spaces, dividing and transplanting flax and other plants, fencing and jobs where where machinery cannot easily reach. The Slammer is ideal for professional landscapers, fencers, construction workers, tradesmen and farmers.

The company also stocks a range of blade heads for added versatility. The Slammer has an RRP of \$275, including delivery.

For more information visit www.theslammertool.com, or contact info@theslammertool.com or 03 443 9297.



FIVE SECONDS TO SQUARE

Your days of relying on a handful of loose parts to square up your track-saw guide rail are over. The patent-pending GRS-16 PE Parallel Edge Guide Rail Square is completely self-contained and self-aligning. Where other accessories rely on the loose-tolerance T-slot found on just about every guide rail — requiring additional T-bars, hex bolts, and knobs to ensure accuracy — the GRS-16 PE has a high-strength draw latch mechanism.

You just slide it on to your guide rail, lock the draw latch, and verify that it's square via the zero-clearance attachment — it takes five seconds.

The GRS-16 PE Parallel Edge Guide Rail Square is priced at \$369 incl GST (guide rail not included). Visit www.carbatec.co.nz or phone 0800 444 329

CLEAN LINES FOR A DESIGNER BATHROOM

While it's a very functional fixture, Caroma's newly released Luna Cleanflush isn't your average toilet suite.

Awarded the 2016 Good Design Award for Best in Category, Product Design: Hardware and Building, Cleanflush has a range of impressive features. There's no space for bacteria to hide with its rimless design, and its innovative flow splitter and flow contours ensure that there's optimal wash coverage.

Cleanflush has a unique adaptable waste connector allowing the toilet set to extend out to any position up to a 50mm radius, meaning it can connect easily to existing pipework and allowing for a wider range of set-outs.

The Scandinavian inspired Luna range also includes baths, basins and tapware, fitting in effortlessly with any contemporary bathroom.

See the full range at www.caroma.co.nz



YOU LEGEND

These super useful pants really are legends. The Yakka Legends Pants feature heaps of handy pockets for all your bits and pieces, extra reinforcement in areas likely to be affected by high abrasion, and are extremely durable with triple stitching in leg, front, and back crotch seams to prevent tearing.

The Codura-reinforced knees takes the pressure off when kneeling — and if you do a lot of it, there's even space to add knee pads. They're also comfy; designed with a relaxed fit and articulated shape, they move with you and fit the shape of your body.



Usually \$84.95, but readers of The Shed can take advantage of 25% off. Enter the code **PROMO25** at www.yakkashop.co.nz/legends-pant

CUTSHOP YOUR IDEAS INTO REALITY

Have you got great ideas sitting in a notebook? Cutshop are experts in helping people bring their ideas to life through their specialist software and machinery. From kitchen benches to dinosaur rocking-horses, Cutshop will hear out your idea, program your design, and cut it into reality. They use a range of materials including solid wood, MDF, plywood, particle board, acrylics, aluminium, and polystyrene, all cut in their state-of-the-art, robotic CNC machines. Don't let your good ideas sit there for want of the right machinery.

Find out more at www.cutshop.com.



TURNING HEADS

A great option for the home machinist and with real-world industrial capacity, the Cammac Geared-head Engineer's Lathe (CO636N/1000) might be the machine that you've been waiting for. Its 8 speed settings — from 70 to 2000rpm — are driven by its 2hp single-phase motor, meaning it can be used for a variety of tasks, and the massive 52mm spindle bore furthers this machine's scope. It also features a 2-axis digital readout, foot brake, coolant system, quick-change tool post, stand, and a light. \$7400+GST and freight.

Find out more at www.coastalmachinery.co.nz



TOUGH GLOVE

Protecting your hands is pretty fundamental, and Youngstown's Pro XT glove have got you covered. Designed for heavy-duty work such as landscaping, logging, demolition, roofing, or farming, the Pro XT has a number of well thought-out features making your job safer and easier. Youngstown's unique 'one-piece saddle' reinforces the palm, fingers, and thumb, ensuring lasting durability and grip. The knuckles are double reinforced, and a Velcro cuff supporting your wrist provides extra protection. The gloves also feature moisture-wicking fabrics and a terry cloth thumb wipe. Priced at \$38.00.



For more info or to purchase visit www.youngstown.co.nz.

Raising the bar

By Jude Woodside

Photographs: Adam Croy

MAKING A BAR STOOL IS A LEARNING CURVE FOR A TIG WELDING NOVICE

I have wanted to make an elevating bar stool for some time. They are a relatively simple design — four legs attached to a nut through which an acme thread runs, raising and lowering the seat.

However, attaching the legs to the nut is problematic. The nut is usually a fairly large piece of steel, in this case

it's 38mm diameter, and even with the hole and threads cut it still has a wall thickness of nearly 10mm. The legs on the other hand have a wall thickness of only 1.6mm. That size differential makes using MIG welding difficult. It can be done of course, but it isn't quite as straightforward as usual.

I felt it was ideally suited to TIG

welding, and as I hadn't tried TIG before I thought this might be a good opportunity to get some experience.

TIG welding uses a tungsten electrode to create an arc that melts the metal. A filler wire is used to add metal to the weld as in the old-school gas welding. TIG requires pure argon, so it meant getting a new gas bottle and a TIG torch.



Bending 22.2mm tube can be a challenge, even with the Bramley Tube Bender

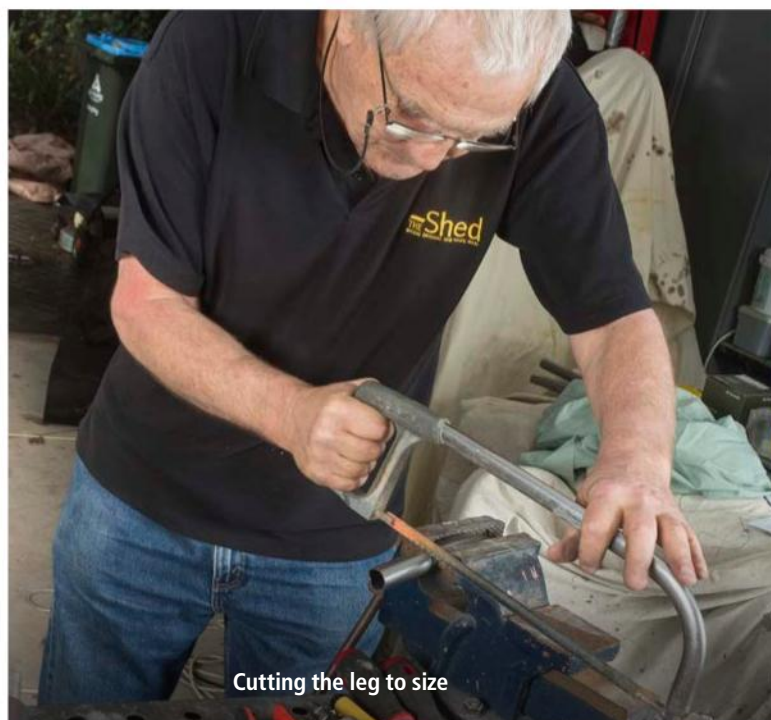
“The Bramley Tube Bender ... This venerable piece of equipment is made in New Zealand so it's not cheap, but it is the best”



The finished stool



Checking the tube against the template



Cutting the leg to size

Sourcing the parts

The screw is usually either an acme pattern or the metric equivalent, or a trapezoidal thread as in a lead screw. I could have cut one on the lathe and it occurred to me to do so, but as always I was constrained by time and these screws and nuts are readily available. In my case I sourced one from Nuweld in Papakura which manufactures G-type welding clamps. It's about the ideal size at 300mm long and 20mm diameter and came with a 38mm round nut.

I decided the legs needed to be 22mm tube, and I managed to source some off-cut pieces of 22.2mm furniture tube from a manufacturer. This tube, as noted, has a 1.6mm wall thickness and that introduced the next issue.

There are many tube benders on the market, mostly used by plumbers for light copper tube, and I briefly flirted with the idea of buying a cheap Chinese one. However, I was warned that it probably wouldn't cope with the 22x1.6mm wall tube and the formers might shatter. That left just one option — the Bramley Tube Bender. This venerable piece of equipment is made in New Zealand so it's not cheap, but it is the best and most cost-effective means of bending this grade of furniture tube. In fact, it will do two larger sizes of tube and comes with five formers for different-diameter tube.



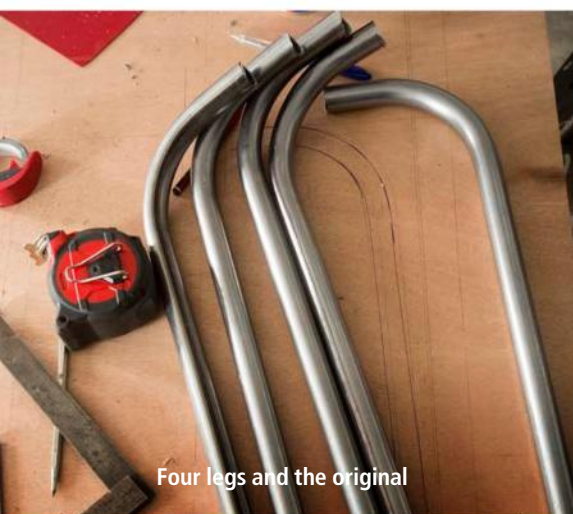
Setting up the BOC Smootharc Elite for TIG is simply a matter of selecting the job (127 for TIG)



Showing the amperage reading, controlled by the large knob on the left



Notching the end of the leg to fit the 38mm acme nut



Four legs and the original



The bender certainly gives you some confidence that it will do the job — it's very solid and clearly engineered to last.

The tube bender can be used after fitting it in a vice or you can purchase a floor-standing unit to anchor it to the floor. In my case, I used the vice on my heavy welding bench, but I was still forced to create an extension handle because the bender caused my bench to slide all around the floor. It requires two people to lift usually. The extension for the handle allowed me to apply more force to the bender so it didn't just move the bench across the floor.

Issue solving

I bent the first one for practise and to work out the size and angles for the legs. I wanted a certain amount of splay in

the legs to prevent the stool from easily toppling. The legs would be held together at the base with a tube bent into a circle.

The ring was the next issue I needed to solve. The Bramley bender won't bend tube into a circle, especially a 400mm diameter one. I couldn't really see how to do this and I did look for a roller, but the only person I know with one has no formers for round tube.

The alternative was to get one from a workshop that possesses a proper tube former. With the right machine, it's possible to have a length of 22.2mm tube turned into several rings in a spiral shape and then cut them out one by one. However, a machine like that was beyond my budget and I certainly don't have the space for it.



Set-up for welding the leg to the nut



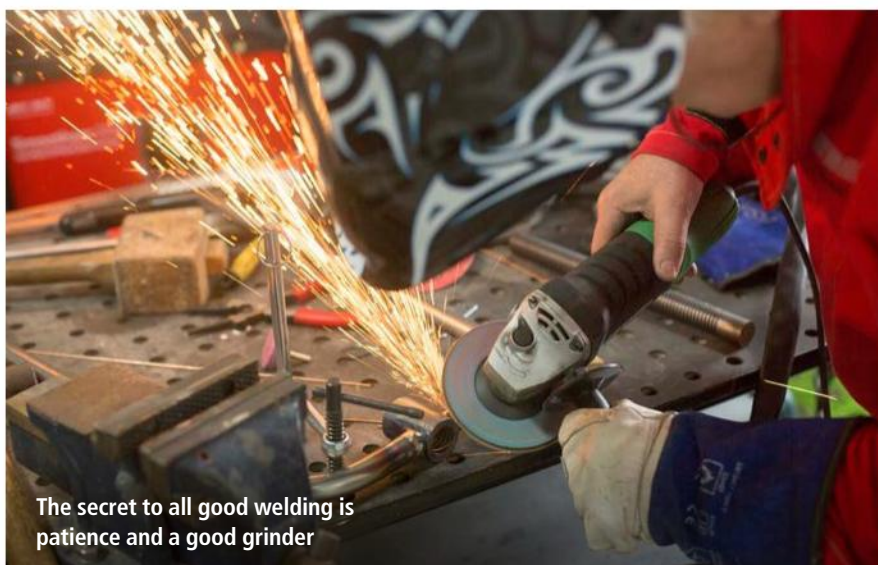
Keeping the heat on the nut until the weld pool develops

My luck was clearly in as I managed to secure a freshly bent ring when I went to enquire if my friends at Special Wire and Tube in Onehunga could bend the tube into a ring. They couldn't but they did know someone who could, and it happened that they had just had some bent into the ideal size for me — 400mm diameter. I would recommend that unless you are planning to go into production, you too should look to find a

company that has a proper tube bender and pay to get the ring bent.

Having the ring and knowing its inside diameter, I could work out the ideal angle for the legs — about 92 degrees. I had marked out the legs on a template using the original leg and allowing for the diameter of the ring at a certain point above the floor. I then bent each leg, being careful not to over-bend them, and tested each leg against the template.

The beauty of TIG is you can be very precise with the placement of the arc as long as your electrode is sharp



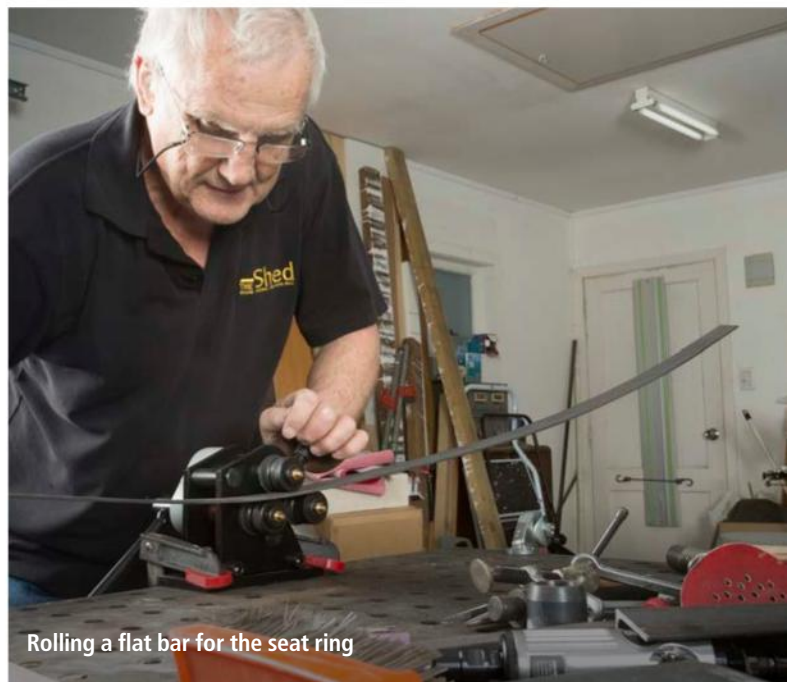
The secret to all good welding is patience and a good grinder



Welding the second leg. Note where the arc is directed on the nut



Tacking the footrest ring



Rolling a flat bar for the seat ring

Plan B

To notch the ends to fit against the nut, I bought a bi-metal hole saw and fitted it to the drill press. The teeth were far too coarse, and after one or two test cuts, I found it had lost a tooth. This tended to make the drill press vibrate to the point that things became loose and the saw simply wouldn't cut. So plan B involved finding a 38mm grinding stone for my die grinder.

The only shape I could find in 38mm was a thin disc shape, when what I really wanted was a barrel shape. I did have a barrel-shaped stone but in 32mm, so I found I could use this to cut the bulk of the notch and finish it with the 38mm disc. Surprisingly, that worked quite well but a notch cutter is now on the wish list.

The next stage was to decide on the length of the legs. This has been a vexing issue for me of late, having made a bit of blue when cutting legs for an outdoor bench a bit too long. This time I looked up similar stools on the internet and found one with dimensions, so I followed those. In some ways, it doesn't matter too much



Getting the hoop tighter



The seat parts with a coat of contact cement on the seat base and foam

as the seat is designed to raise and lower. I settled on a leg height of 560mm.

Getting welding

Then came crunch time — I needed to weld the legs to the nut. I hadn't had much time to practise my TIG welding technique and I wasn't able to practise on the real thing. I knew that I would need at least 70 amps to melt the nut metal, but this would quickly burn a hole in the tube. The beauty of TIG is you can be very precise with the placement of the arc as long as your electrode is sharp.



Fitting the foam to the seat. The seat ring made a good guide to get it centred



Setting the footrest ring

The ends of the electrode are sharpened on a grindstone that should be reserved for this purpose. The end of the electrode is sharpened to a point holding the electrode perpendicular, not laterally, to the grindstone. The reason that the grind should be longitudinal is so that the grind marks run to the point. That helps to direct the electrons from the arc in that direction. If you grind horizontally, the arc will become erratic. With a sharp electrode you can direct the heat to the nut until it begins to melt and then move the heat to include the tube. At this point you can introduce the filler metal to the weld pool.

I have seen various experts welding in TIG and laying perfect 'stack-of-coins' welds that require almost no clean up, but I am not in that league. Plus the added difficulty to heat up and melt the nut metal before the metal of the leg made it more of a challenge. I tried first to tack the legs in place, and that was reasonably simple if somewhat lacking in elegance. Then I went back over trying to

lay down a stack of coins ... not a chance, unfortunately, although to be fair, I was getting better by leg number four. So my first attempt at using TIG was not that lovely — grinder to the rescue. I did manage to burn the odd hole in the tube too, but was able to fill the holes with the filler wire. TIG is quite flexible.

It's not a good idea for the electrode to contact the weld or the filler wire, and I managed to do both with regularity so the grinding stone now has a groove in it and my electrodes are that much shorter. But it did teach me the importance of keeping that electrode sharp. Once the electrode tip gets bulbous, the arc will wander. It gets bulbous when a bulb grows on the business end from heat and impurities caused by touching the work.

So, it wasn't perfect but the legs were welded and cleaned up.

The next job was to weld the hoop that would hold the legs together and become a footrest. For this I reduced the amperage to 40 and clamped the hoop to close up the gap.

Everything you need for TIG Welding

BOC

Gas & Gear

- Quality Welding Machines
- TIG Torches and Accessories
- Range of Tungsten Electrodes
- BOC Gas Saver Kits
- BOC Shielding Gases
- And more!



Tungsten Rare Earth Electrodes (3 pack)

BOC's Rare Earth tungsten electrodes are designed for AC or DC applications and contain rare earth, instead of radioactive materials.

They maintain a sharpened tip configuration for steel and stainless steel welding and will form a balled end during AC welding of Aluminium.

Description	Part No.
Tungsten Rare Earth 1.6mm	BOC60116
Tungsten Rare Earth 2.4mm	BOC60124
Tungsten Rare Earth 3.2mm	BOC60132



Gas Saver Kits (for BOC17, BOC18, BOC26 Torches)

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Welding the ring in place. Working from below means the welds can't be seen from above



Just a note on electrodes — I used the new rare-earth electrodes from BOC Gas, which have a turquoise colour on the ends. They have the advantage that they can be used for both DC and AC TIG welding. Thoriated electrodes are most commonly used, but there is increasing concern at the risk of radioactive dust from the two-per-cent Thorium they contain. BOC has an electrode grinder that includes a vacuum to contain the dust, although it's probably more suited to professional welders than amateur dabblers like me.

This demonstrates what any rank amateur can achieve with a bit of patience and a handy grinder

Hidden joins

To attach the hoop to the legs, I clamped it to each leg in turn, checking for level and distance off the base. With the stool upside down, I welded each leg to the hoop. Welding two pipes together with TIG isn't straightforward unless at least one of the tubes has been notched to make a good fit. In my case, this wasn't possible so I just had to make do.

I found that I needed to increase the amperage to 70 again and increased the stick-out a bit to make sure the arc could penetrate to the intersection of the two tubes. 'Stick-out' is the distance the electrode projects from the gas cup. With both tubes equally hot and beginning to create a weld pool, I added filler to the pool and moved the arc around the pool, gradually increasing the weld pool. It worked quite well, and as I had performed

the weld on the underside of the hoop, it wouldn't be visible from above.

The seat I cut from 19mm ply and added a 20mm piece of closed-cell foam. I also had a piece of vinyl to cover the seat. A 25x3mm strip of mild steel binds the seat itself. To get the circular shape, I employed yet another machine especially for the task. I purchased the little metal roller from Machinery House in East Tamaki for around \$140. They are bit limited in that they can only handle mild steel up to 4mm, and 5mm solid round bar, but they do the job. I bent the strip and cut it to size and fitted it to the seat.

With the seat and band fitted, I drilled holes through the strip for pan-head screws that would hold the strip to the seat.

Final seat fitting

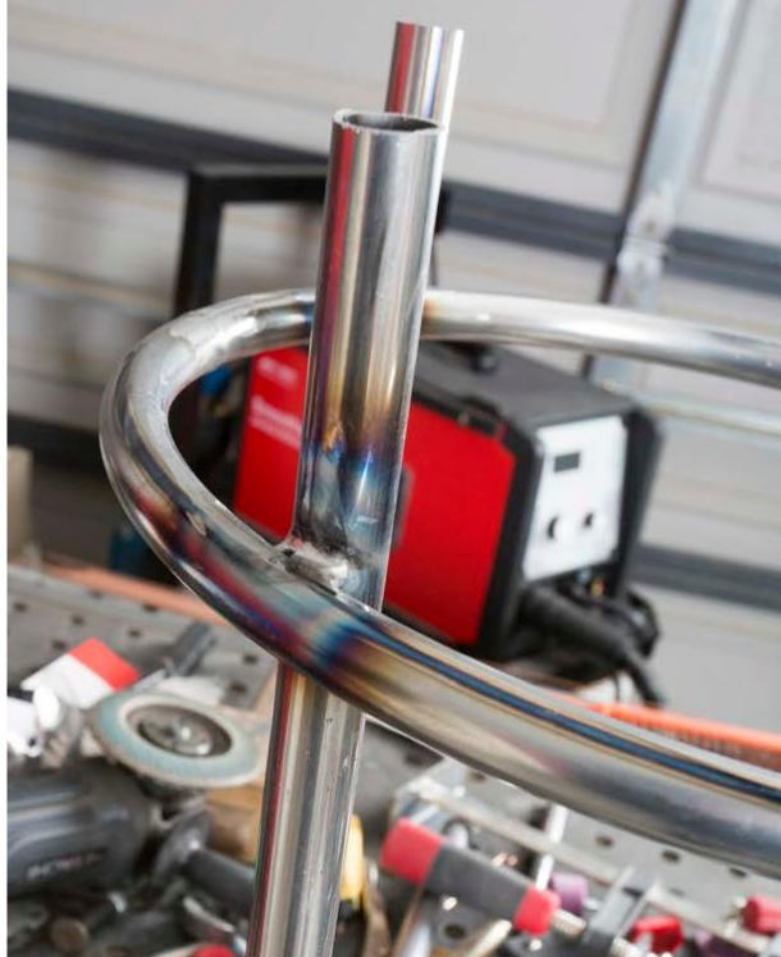
The next process was of course to attach the screw to the seat. For this I had obtained a piece of 3mm mild steel and cut a bit to 100mm square. I drilled holes in each corner for the fixing screws. I happened to have a piece of round bar that had been drilled for an earlier lathe project demonstrating the boring bar, and it happened to fit the screw very well.

I could have welded the screw to the sheet, but I thought it better to attach the ready-made socket. It gave me some experience in welding a heavy piece to a lighter piece of steel. In fact, I used this piece as a practice before I tackled the attachment of the legs to the nut. With the socket attached, I drilled a ▶

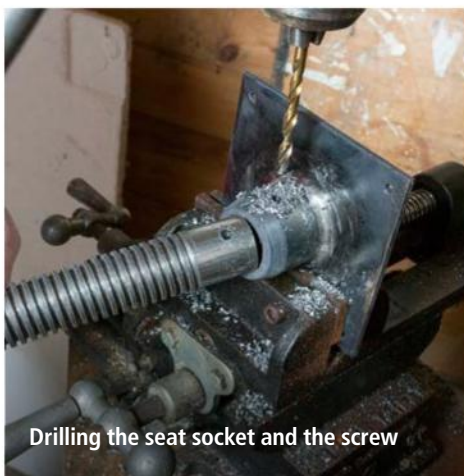




Tidying up the welds



I think I'm getting better



Drilling the seat socket and the screw



Drilling the seat ring for the screws



Tapping the socket and the acme screw



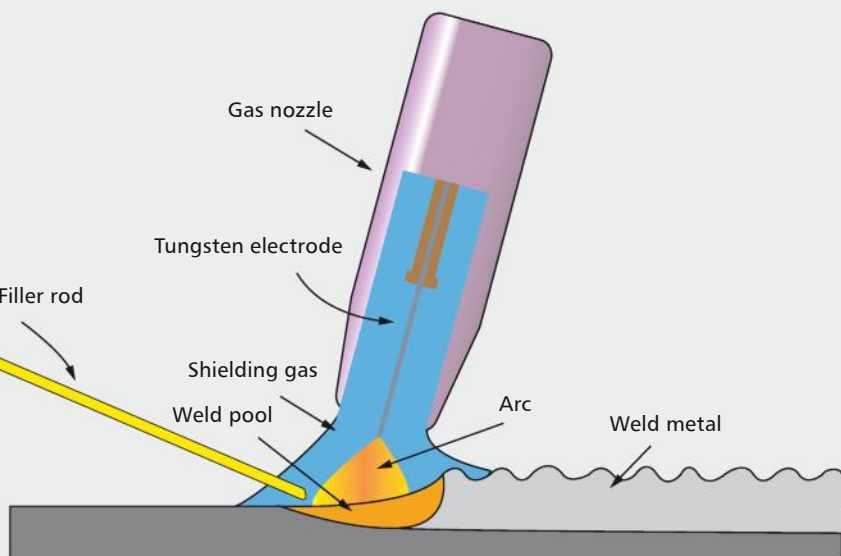
Upholstering the seat with vinyl — another skill I haven't mastered

TIG welding tips

TIG welding can be most frustrating yet the most satisfying welding process. Here are some guidelines to help make it satisfying rather than frustrating.

Getting started

1. Cleanliness, cleanliness cleanliness ... This includes materials, gloves, tungsten, torch — everything in the area of the welding. Unlike with other welding processes, where you may be able to burn out a bit of rust or paint, cleanliness is key with TIG to avoid contamination of the weld or tungsten.
2. Ceramic (or, as sometimes referred to, the 'pink thingy') size: this is determined by the area to cover with gas — the higher the amperage or travel speed, the bigger the outlet hole.
3. Tungsten diameter: again, the higher the amperage, the larger the diameter should be to avoid either overheating the tungsten if too small or arc instability if too large.
4. Tungsten stick-out: you should be able to see about two to three times the diameter of the tungsten. If you want to increase the stick-out to make it easier to see, you might need to increase the gas flow.
5. Tungsten choice: for DC welding you could use thoriated* but ceriated, lanthiated, or rare-earth tungsten can also be used. For AC welding you could use zirconiated or rare-earth tungsten.
*Note: Thoriated tungsten has been identified as a potential carcinogen so extra precaution should be taken when using and grinding.
6. Gas flow: a good starting point is seven to 10 litres per minute, but it is really determined by the size of the ceramic and your welding amperage. If you get discolouration of the weld, you may be lacking gas or in fact be using too much gas, wasting you money.
7. Gas: to TIG weld you need an inert gas so the preferred option is pure



argon. Specialty gases are available for TIG welding that will improve the cleanliness of the finished weld and improve welding speed. You can't use the argon mixtures used for MIG welding, as they will contaminate the tungsten and weld. There are plenty of guides available from the web to get you started.

Techniques

1. Setting up: as in all welding, the first step is to get in a position where you can see the weld, the tungsten, and the arc. Get comfortable and if possible be able to rest your hand on the material to 'slide' along parallel to the weld.
2. Have patience: TIG is a process that can be as slow as you want. Start out



Start off using two hands and no filler. Watch and work the weld pool.

at a low amperage to hold the torch steady until you form a pool, *then* start moving — don't start welding until you have a molten weld pool and don't go faster than the pool will let you. If you want to weld faster, you can stop and increase your amperage.

3. Torch position: once the arc is started, the tungsten should be maintained at about 3–6mm from the weld pool with the torch angled at about 70 degrees from the joint, similar to an oxy-fuel torch. In fact, the technique is very similar to oxy-fuel welding but uses the heat of an electric arc instead of a flame to melt the materials.

4. Contamination: if the tungsten touches the weld pool, you should stop welding and grind it clean again. Once you have mastered welding on a couple of pieces of scrap, you can introduce some filler wire to add material to the weld. Sometimes a very smooth weld can be achieved without a filler wire — for example, outside fillets.

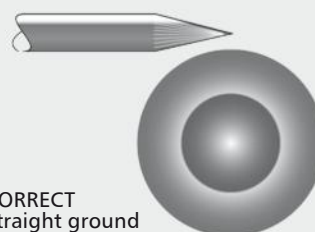
5. Using filler wire: choose a wire that matches the materials you are welding. The diameter of the filler is determined by the size of the finished weld that you want to achieve, the material thickness, and the welding amperage. Angle the filler wire at 15 degrees to the weld plane and bring close to the arc. Add the filler

directly to the weld pool by dabbing it in. This may 'shrink' the weld pool as it cools a little so you can move the filler a little bit away from the arc until the weld pool re-establishes ... Repeat. Once you master this technique, you will be a step closer to getting the stack of coins people look for ... and that sense of satisfaction in your welding.

Sharpening your tungsten

To produce a good, clean weld you require good, clean tungsten. This means learning the dark art of tungsten grinding. Always grind so that the grinding marks are in line with the tungsten instead of going around. Grind almost to a point at a length of between 1.5 and 2.5 times the diameter of the tungsten. The higher the amperage you are welding with,

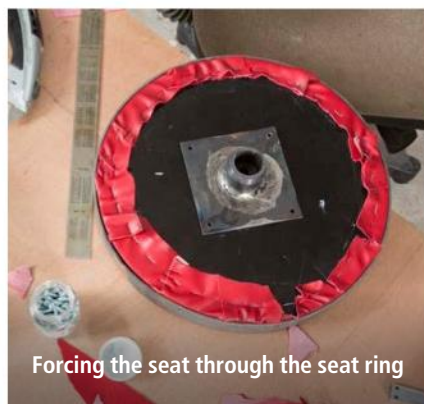
the flatter the angle on the tungsten. Leave a very small flat on the end of the tip that that will round off when welding to help stability. Use a 200-grit or finer wheel and, if you can, only use it for grinding tungsten. If you get any contamination or the weld becomes unstable, head to the grinder. BOC Gas has a machine especially designed for sharpening tungsten electrodes: the Turbo Sharp X Port Tungsten Electrode Grinder. It includes a vacuum to contain the dust, which can be radioactive if you are using thoriated electrodes.



TIG torch and electrode



Grinding a point on the electrode



► 5.5mm hole through it and the screw, and tapped both to fit a 16mm socket-head screw. The idea is that I can remove the seat if I wish at some later date.

One problem I discovered trying to refit the screw to the nut after having spent some time welding the legs was that the heat had obviously caused the nut to distort a bit, and it took some considerable winding of the screw back and forth to free it up again. In future I will weld the legs to the nut with the screw in place to help dissipate the heat.

I glued the foam to the seat blank with contact cement and used the iron ring to help locate the foam precisely. I removed the ring again and covered the seat with marine-grade vinyl. I am not that experienced at upholstery, so my efforts must look a bit amateur and more than a little clumsy.

To finish the ring, I cleaned it up with a brass brush in the angle grinder and after careful masking I painted it black.



the colouration from the legs around the welds. This tended to give the whole thing a satin look, so I proceeded to run it over all the exposed steel to give it a homogenous look. I added the plastic feet that I got from Hi-Q Components in Albany and it was finished.

The results

Overall, I am very pleased with the stool. I am especially pleased with the way the welding turned out. Remember, I have had only minimal practise with TIG, and this demonstrates what any rank amateur can achieve with a bit of patience and a handy grinder. My welding did actually get better by the end of the project, and

I am sure that if I make a few more of these, which I intend to do, I will be far more accomplished by the end. In future I will use a shorter screw — 200–250mm should be plenty — and I want to alter the composition of the ring around the seat; maybe something lighter and shinier next time — thin stainless perhaps. TIG is well suited to welding stainless.

It has been a project that exposed me to all the practical uses of TIG welding, and TIG is addictive. Not flash and dash like MIG but quiet, methodical, and precise. It pays to have some ventilation available though. TIG produces a lot of ozone and you can smell it. Ozone is not really that good for your lung function. 

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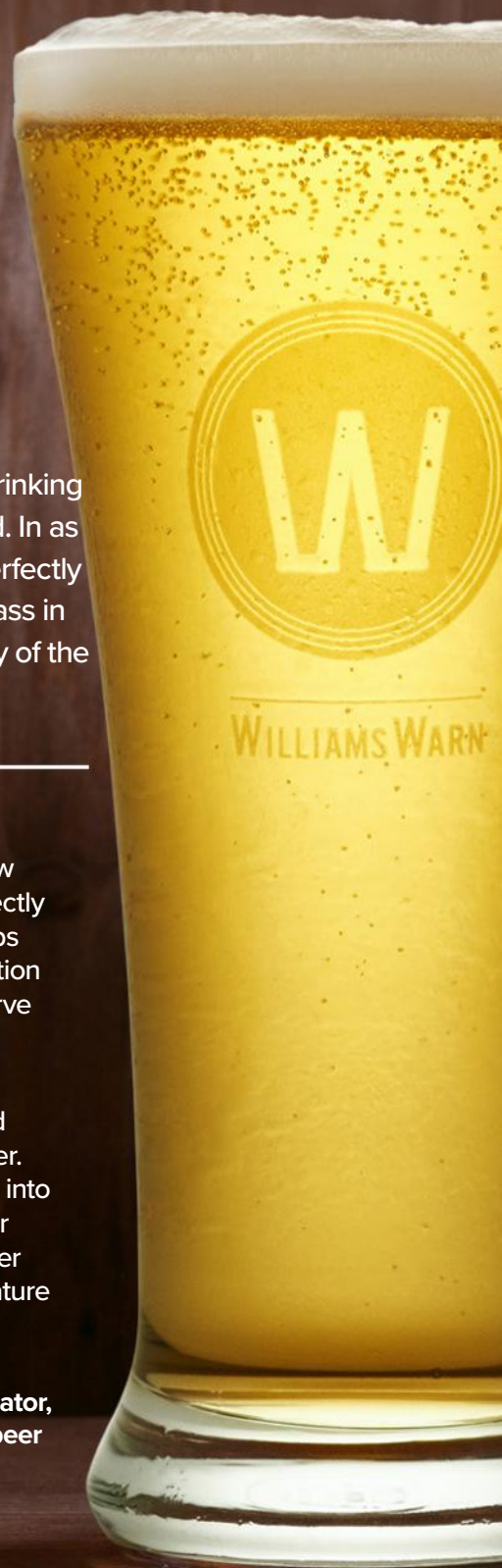
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Phil Kindberg and his massive shed



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THERE'S PLENTY OF ROOM IN PHIL'S SHED

By Ray Cleaver

Photographs: Rob Tucker



Phil's dairy factory — room to spare

When Phil Kindberg decided to escape the Auckland rat race and retire to rural Taranaki with his precious collection of old Studebaker cars, he didn't dream of the massive shed that was waiting for him.

Two years ago, he made the shift south and purchased the 100-year-old Riverdale dairy factory, not far west of Hawera.

The big factory, which in its heyday specialized in cheese production, already had a bit of a past with motor vehicles, having been a panel-beating shop for a while and also once housing a huge collection of old Citroën cars.

Now on display in the factory are Phil's seven Studebakers from 1947 to 1962, a 1958 Packard, a mate's collection of

40 motorbikes, including some classics and home-made bikes, and other weird and wonderful machines.

The 600m² factory building had a staff of 18 in its days of cheese-making. Now Phil has made his living quarters in the office space. The old factory building is bigger than his Auckland house and section combined.

"It sometimes takes people an hour and a half to get to work in Auckland. It was a nightmare and I'd had a gutsful. This is a dream shed for me and country people are a lot friendlier than [those in] the big smoke. I love it."

His daughter Huihana persuaded him to make the jump and his brother, Dave, already living in South Taranaki, put in an offer of \$150K on the factory. Phil

Below: Parked up in the factory is Phil's brother Dave's rail drag car. It is driven by a 5.4 litre Ford Falcon BA 330





Beer-crate banjo/guitar



Hanging on the wall at Phil's Garage is a rather unique instrument, a slide banjo/guitar made from a Studebaker hubcap attached to part of an ABC beer crate. There's a Heineken bottle for a bridge and the string nuts are Heineken bottle caps. It even has an electric pickup. The banjo/guitar has travelled to the US and been played in public performances.



Rare '58 Hawk in foreground — awaiting restoration



ended up with one-and-a-quarter acres (0.5ha) of land with the big factory and four outbuildings on it.

He moved south with five Studebakers, his Harley bike, and a Mazda.

Studebaker fan

Phil's love of old Studebakers goes back to his childhood when his father drove the family around in a 1947 four-door Studebaker Champion. He has that model in his collection.

His first car was a 1956 Studebaker he purchased from his father in the early 1970s. The next one was a 1963 Studebaker Lark Cruiser, which he drove for nine years before selling it to finance a big celebration for his wife's 21st.

He's owned about 40 Studebakers over the years but has cut this down to seven, plus an old Packard. Packard merged with Studebaker in 1954. Studebakers and Packards are a bit special. The merged company ceased production in 1966.

Phil's 1958 Studebaker Commander coupé, fully restored

"This is a dream shed for me and country people are a lot friendlier than [those in] the big smoke. I love it"





The history of Studebaker



Studebaker (1852–1967) was an American wagon and automobile manufacturer based in South Bend, Indiana. According to its online history, it was founded in 1852 and incorporated in 1868 under the name of the 'Studebaker Brothers Manufacturing Company'. The company was originally a producer of wagons for farmers, miners, and the military. Studebaker entered the

automotive business in 1902 with electric vehicles and in 1904 with gasoline vehicles, all sold under the name 'Studebaker Automobile Company'. Over the next 50 years, the company established a reputation for quality and reliability. After years of financial problems, in 1954 the company merged with luxury carmaker Packard to form the Studebaker-Packard Corporation.

However, Studebaker's financial problems were worse than the Packard executives thought. The Packard marque was phased out, and the company returned to the 'Studebaker Corporation' name in 1962. The US plant ceased production in 1963, and the last Studebaker automobile rolled off the Hamilton assembly line in Ontario, Canada, on March 16, 1966.





Nicknamed 'The Flying Flea'— a 125cc 1952 Royal Enfield



Early jet ski



Owned by Bob Seaver, this 1980 model from Suzuki was one of the first jet skis produced. Called the 'Wet Bike', it has a 1240cc engine and has a front ski it rides on when the jet ski gets up on the plane. The machine was given to Bob for display in the motorbike museum he is building.



Phil's Garage

He calls the factory 'Phil's Garage' and different clubs and groups, often car clubs, come and visit the collection of cars and bikes. Phil has a workshop area and a parts room.

The old factory office and smoko rooms are his living quarters, and on the factory floor is a 1950s/'60s themed area for visitors to relax in, complete with jukebox and second-hand Burger King seats and tables. This area he calls 'Phil's Diner'.

Phil spent 28 years in the luggage-making trade, fashioning bags, backpacks, and briefcases. For the past 16 years, he worked making spa and pool covers. Now, aged 61, he has plenty of time to work on his car collection. He does some mechanical work on the cars

Next project



One of the more unique and rare cars in Phil's collection is this 1958 Packard Hawk V8, one of only two in New Zealand. As well as classic sweeping lines, the car is powered by a supercharged 289-cubic-inch engine that puts out 275 horsepower. The car has power

steering and an auto transmission. Phil picked up the car in this original condition and it was complete except for the supercharger. A recent visitor to Phil's Garage looked at the car and said, "I've got one of those you can have." To Phil's delight, it fitted perfectly.

Below: A rare bike in Bob's collection is this World War II parachutist's motorbike. These fold-up bikes were dropped with parachutists in a crate with their own chute. The 100cc engine and bikes were made by Corgi, an English company





Bob Seaver and his six-cylinder Valkyrie. The 1998 US-made Honda has a 1530cc engine

“*The old factory building is bigger than his Auckland house and section combined*”

and, of course, all the upholstery and interior work.

The bike collection

With so much room in the building, he has space to share. He met a friend of his brother's, Bob Seaver, who has a large collection of motorbikes and is building a motorcycle museum in Hawera. Bob is a motorcycle mechanic who started life

as a sheet metal worker, and the factory is the perfect place to display some of his collection.

He moved 40 of his bikes into the factory, including some rare and very interesting machines, from 1942 World War II bikes to 2007 models.

Familiar classic models on show include those from AJS, Norton, Ducati, BSA, Ariel, and Jawa. 



Phil's pride and joy — a 2005 Harley-Davidson Springer Classic with full accessories



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out of the box

THE CHEST IS A TRADITIONAL PIECE OF FURNITURE WHICH CAN BE USED AS STORAGE, A SEAT, OR A TABLE SURFACE. HERE'S HOW TO MAKE A BASIC BOX CONSTRUCTION WITH AN INNER DRAWER

By Raf Nathan

Photographs: Raf Nathan

The modern incarnation of the chest is the blanket box which sometimes doubles as a seat, so it needs to be strong enough to support weight as well. This project is no more than a box with a lid and base. Dowels are the primary jointing method throughout, and the top and base use a floating panel within a frame. There is also a small sliding drawer that is also dowelled together.

Actually, I've made hundreds of blanket boxes. Years ago I used to make Baltic pine versions for a large retailer, and I had a pretty good system set up to make quality work. I had to give it away in the end though, because there started to be too many other

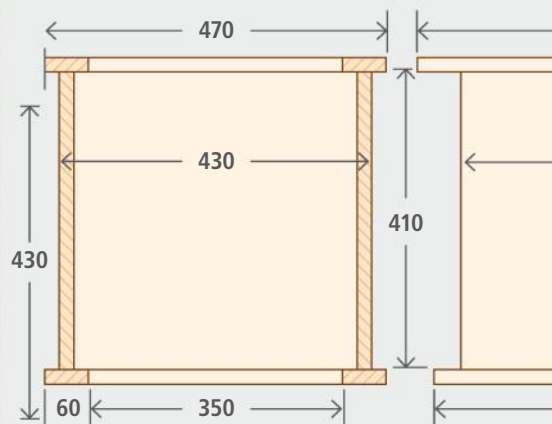
makers undercutting prices. The wholesale price kept dropping to the point where the only way to make them priced low enough would have been to nail the beasts together and forget any sanding. If it gets to that level you have to ask yourself, what's the point? Ironically, once we stopped making the boxes, the retailer came back and asked us to do their custom orders, at a top price.

Selecting and matching

Select the timber for the main box and try to match up grain and colour as best as possible. I used blackwood, which is a difficult wood to grain match as there is so much variation from board to board

Dimensions

Measurements in millimetres





Cutting list (mm)

SIDES (2x)

2390x410x20

2780x410x20

TOP FRAME (2x)

2900x60x20

2350x70x20

BASE FRAME (2x)

2854x60x20

2350x50x20

PANELS (2x)

2772x362x18

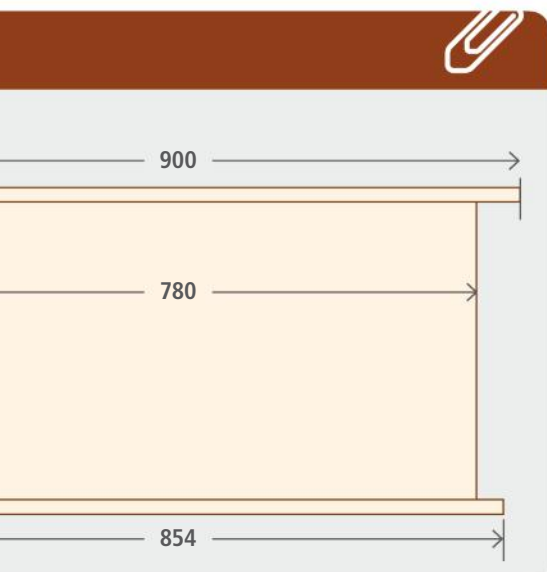
DRAWER (2x)

2450x90x12

2365x90x12

PLYWOOD BASE (APPROX.)

434x372x4



and also within each board. When possible, I used the same board for each panel. The front is made from one wide board cut in half and then glued up with the grain running in the same direction.

The box

1. Glue up the four box panels and then dimension the panels to size. I planed one edge, sawed it to width with the planed edge against the saw fence, and then planed the freshly sawn edge. The panel was then sawn to length.

2. The dowel locations were marked out on the end grain of the side panels. Here, I used 10mm diameter dowels, 50mm long.

3. Use a jig to drill the holes in the end grain. I drilled deep enough for the dowels to protrude around 15mm, as this is the amount of dowel that goes into the holes in the long panels. The masking tape on the drill bit was my depth stop.

4. Next, transfer the dowel positions to the mating panel. I used a drill press to drill the panel; however, you could use a dowel jig for this. Chamfering the dowel holes with a countersinking drill bit made inserting the dowels easier.

5. Now is the time to sand the inside faces of the panels – the outside is easy to sand later. Glue and tap the dowels into the short panels.

6. Do a dry test fit to ensure everything



aligns and if OK apply glue to the joint and tap everything home.

7. I used three clamps on each joint with sticks to spread the pressure. Make sure the box is square and none of the sides is bowed. I placed some spacers inside to keep everything parallel.

8. The frames use dowels: the top one has three dowels and the base uses two at each joint.

9. The panel sits within a groove in the frame made with a straight cutter in the router table. The groove is 10mm wide

and 8mm deep (the size of the cutter in the router table) and runs the length of the short pieces but is stopped on the longer pieces.

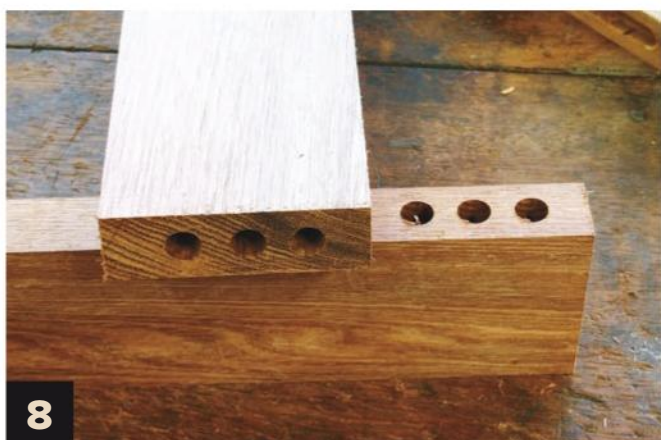
10. The top and base panels are 18mm thick and have a tongue machined in all edges. The final size of the panel depends on the depth of the groove in the frame and the size of the tongue. I used a 12mm rebating cutter on the panel and made the tongue to be a neat fit in the groove. This fit will be determined to an extent by the weather conditions at assembly

time. For instance, in very wet weather wood will swell giving a firmer fit.

11. Sand the panels before gluing the whole frame assembly. It's important to centre the panels with an even gap all around. Measuring and making line-up marks on the panel and short pieces will ensure this.

The panels need to be without twist when they are glued. The outside of the main box can be sanded now.

The top and lower frame are also final sanded. I used a belt sander and plane



As storage, a seat, or a table surface, the chest is a multi-function furniture item that's sure to find a purpose in every home

to flatten the frame. There will be some variation in alignment at the joint line.

12. Now glue and screw the base to the main box.

13/14. Two hinges are used to attach the lid to the box. Fit the hinge in the box first by laying it in position and using a knife to outline it. A small cutter in a laminate trimmer will remove most of the waste. The depth of routing should be equal to just under half of the thickness of the hinge knuckle.

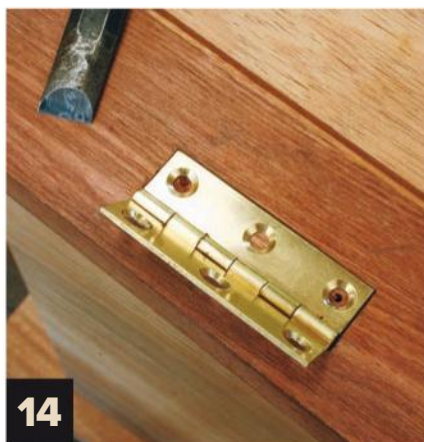
Insert the hinges and fit the screws neatly. Expect variations in individual hinge manufacture and mark each hinge

on the inside so that it always returns to its same position.

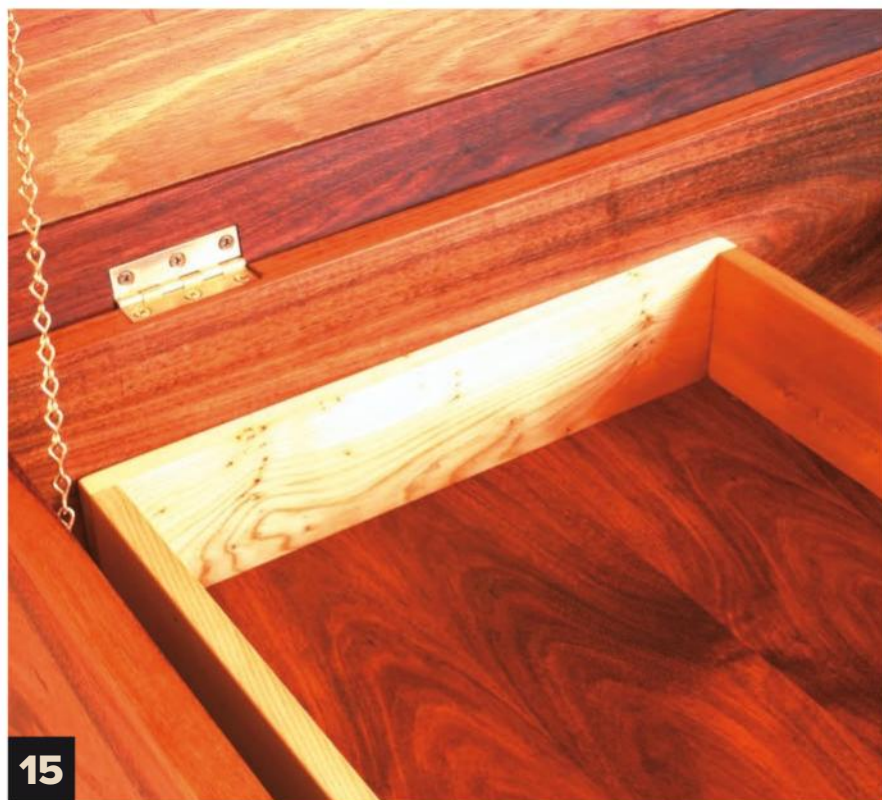
I then laid the top in position and used a knife to mark the hinge positions on it. I could not trace all the hinges with the top in the way, so each hinge was removed and laid in place on the top to get the location right. Once again, the laminate trimmer removed most of the waste with a chisel cleaning up. The hinge can then be dropped in place and the holes drilled.

15. Fit a small chain inside to prevent the top leaning back too far and ripping the hinges out.





14



15

Inner drawer

The drawer was made from pine and fits neatly within the sides. Once the box was made, I measured for the drawer and left a 1mm clearance so that the drawer was 480mm long by 389mm wide overall. The sides are 90mm high and 12mm thick. A veneered plywood panel sits in grooves that were sawn into the sides.

My drawer is dowelled together but you can use through dovetails at the corners if you want a more decorative touch.

The drawer slides from end to end on two 20x20mm cleats of pine, which are screwed along the sides about 120mm down from the top edge of the box.

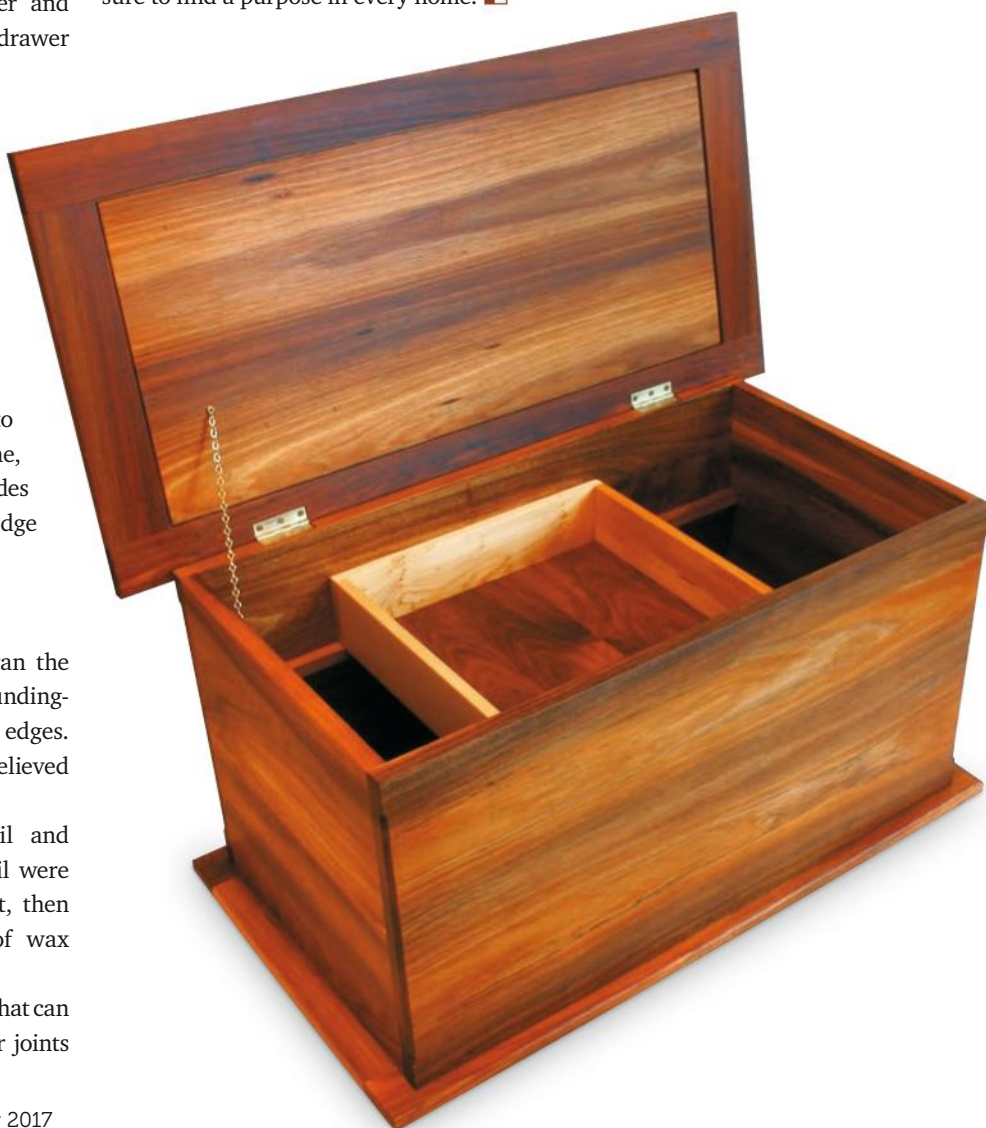
Finishing off

To soften all the sharp edges, I ran the laminate trimmer with a small rounding-over bit along all the top and base edges. The outside edge of the box was relieved with a small stopped chamfer.

The finish chosen was an oil and wax combination. Two coats of oil were liberally applied a few days apart, then the box was given two coats of wax and buffed.

This box is a simple construction that can be varied by using exposed corner joints

or by adding any number of details. As storage, a seat, or a table surface, the chest is a multi-function furniture item that's sure to find a purpose in every home. 🗳️

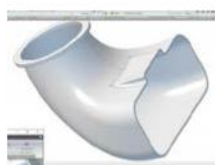




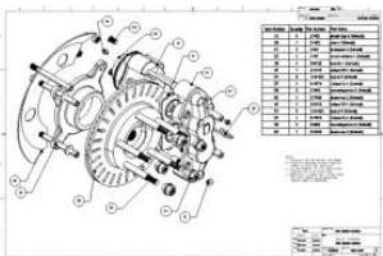
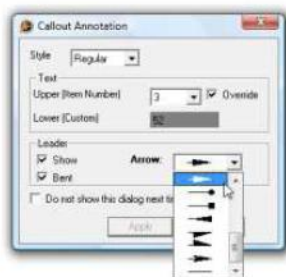
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Fire dance

A BLACKSMITH IS A MASTER
OF THE ANCIENT ART OF HEAT
AND HAMMER

By Sue Allison

Photographs: Juliet Nicholas



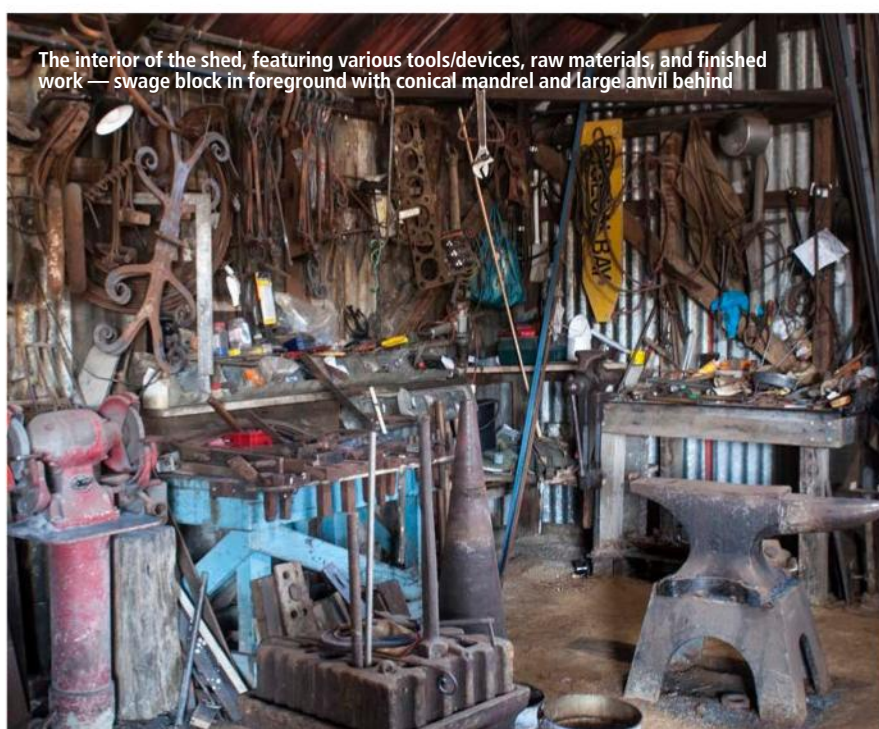
Les Schenkel heating metal in the forge



Les's largest mallet weighs 28lbs



The restored blacksmith's shed, Teddington, Banks Peninsula



The interior of the shed, featuring various tools/devices, raw materials, and finished work — swage block in foreground with conical mandrel and large anvil behind

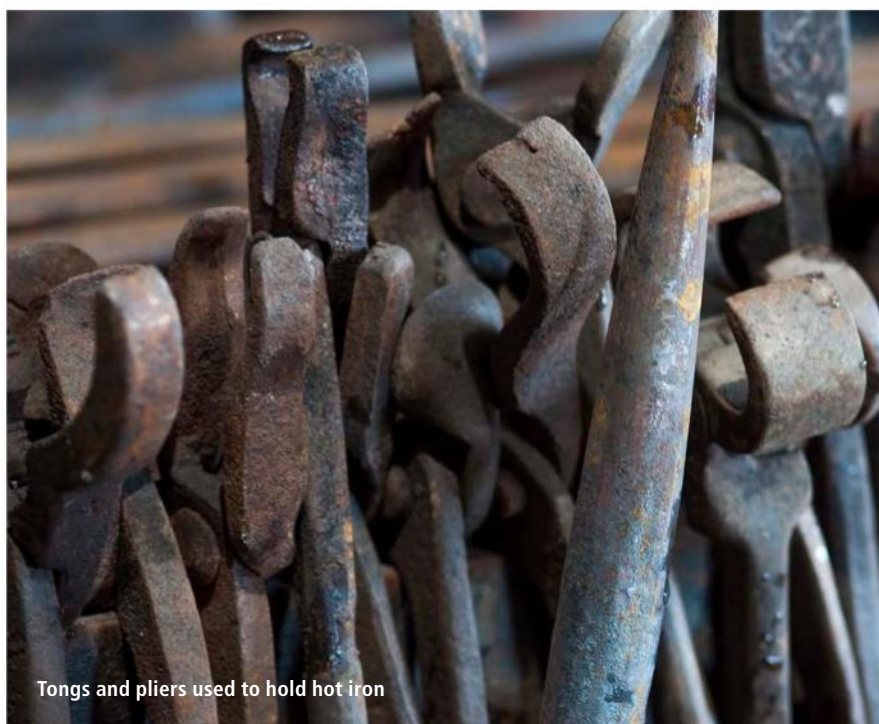
A yellow sign indicates a historic site ahead and soon an old corrugated shed with “Blacksmith 1889” emblazoned on its side comes into view. Not so unusual, but a driver might do a double-take when he spots the glow of the ancient forge and hears the ring of metal on metal as he passes. While the smithy in Teddington, on the road from Lyttelton to Port Levy on Banks Peninsula, is a relic from a bygone age, the man at work is a real live 21st-century blacksmith.

“This is what I’ve done all my life,” says Les Schenkel, who can be found at work down at the blacksmith shop on Mondays, Wednesdays, and Fridays. Horses, however, are not among his customers. Les, who spent his working life in Lyttelton as a blacksmith in the maritime industry, shied away from



shoeing horses early in his career. “When I was doing my apprenticeship there was an old bloke who was all bent over. I asked ‘What happened to you, Norm?’ and he said, ‘I got kicked by a Clydesdale.’”

Les uses the forge to make everything from gates to trivets, anchors to pizza knives, and is Mr Fix-it in between. He is in the process of restoring an old copper for storing firewood, while a curious bike rack is leaning against a bench. “I’ve made that for a fellow who wants to tow his wheelie-bins up a long drive,” he says. Other one-off orders include a clapper for a cowbell for a goat, and steel batons for a potato-picking conveyor for Maori gardens being established on the peninsula. He is also making a decorative gate for Ohinetahi Homestead, renowned for its garden, in Governors Bay.

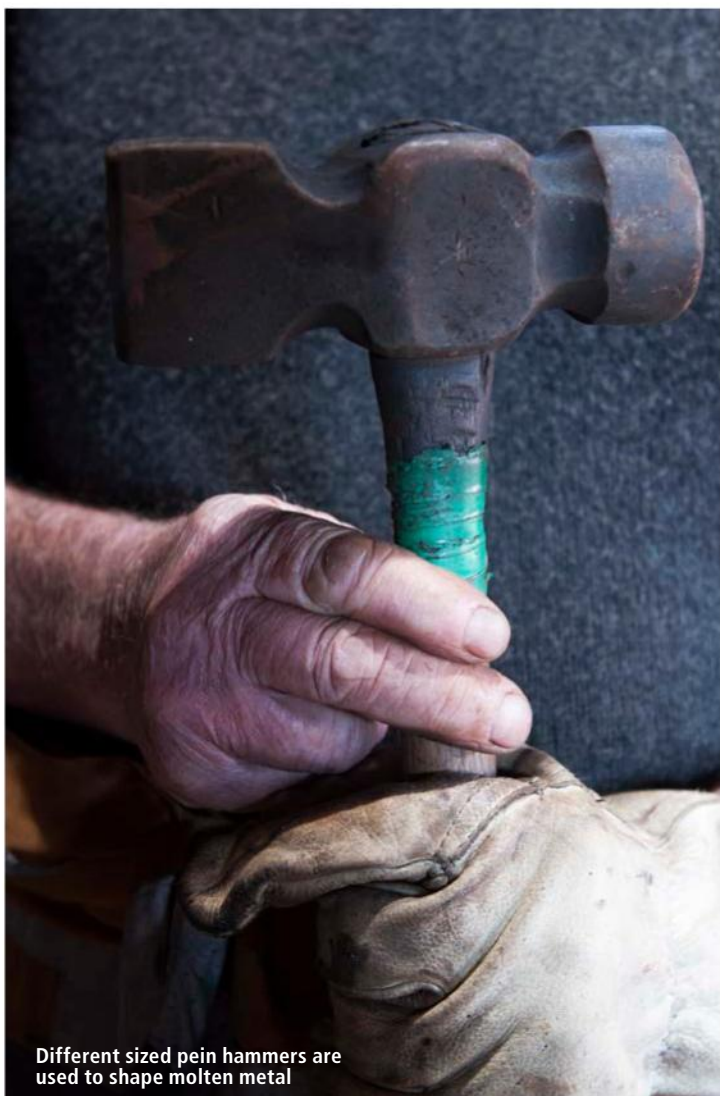


Tongs and pliers used to hold hot iron



Les holding on to the cow's horn that is attached to the bellows' lever

Les uses the forge to make everything from gates to trivets, anchors to pizza knives



Different sized peen hammers are used to shape molten metal

Perfect spot

Les has been forging his wares in the restored building since it opened two years ago, making the smithy, which is leased by the Governors Bay Heritage Trust, one of the few operating blacksmith forges in New Zealand. Positioned at the junction of Gebbies Pass, with the Teddington (now Wheatsheaf) Hotel across the road, it was a perfect spot for a blacksmith to ply his trade in the 1880s.

The hotel was equipped with stables and grazing paddocks, enabling farmers who were driving stock over to the Christchurch sales to take a break and see to their horses.



Metal being heated in the forge



Mini carver

Forged metal hinges



Les hammering molten metal on the anvil to form a taper

But as motor vehicles replaced horses on the farms and roads, the district couldn't sustain a full-time blacksmith. For a while, the forge was manned by a visiting blacksmith, then it was used by Blatchford's contracting business before being abandoned to the elements.

In 2015, local resident David Bundy spear-headed a project to restore the old smithy, which had completely collapsed. The building was rebuilt 1.2m above the original floor on new wooden piles. The roof was repaired with period iron and local recycled timber from the same era was used to rebuild the walls. ▶



The handle of the piece he is working on is dunked in the quenching trough to stop it over-heating. Dipping the molten end would stress the metal.

Hammering spears



Spears are an example of 'drawing out' metal, with Les stretching a 50mm rectangle of steel to an 80mm taper by hammering the hot metal to a point. Les heats the steel to white-hot, or 1500°C, then hammers it on his anvil with various peen hammers in his fuller set. (A 'fuller' is a tool with a round or parabolic 'nose' that is driven into the hot metal.) His hammers range from lightweight peens for finishing off to a 28-pound (12.7kg) sledgehammer. Les works quickly, changing hammers all the time and returning the spearhead to the fire as the glowing metal cools and dulls. It's a rhythmic fire dance — heat and hammer, heat and hammer, with sparks of fiery scale flying with each beat. "That's the most dangerous metal," he says of the flaky surface residue. "It tends to stick to your skin."

He dunks the handle in the quenching trough occasionally to cool it — but never the end he is working on. Ferrous metals such as steel must be cooled slowly to anneal. If plunged into cold water they can snap as the carbon crystallizes or at least a flaw might be created.

Once the spear has reached the required length (marked on his anvil with engineers chalk), Les hammers along the neck to make an indentation, which he later cuts through with a hacksaw. "If I was mass-producing them, I would make a form, but I just do these by eye."

He attaches the spearhead to a steel rod using his electric arc welder. Once that is done, he puts the whole piece back in the fire for normalizing. "Every ding represents a flaw," says Les. To get rid of the flaws, which create stress, you need to heat it up to 930°C, above its recrystallizing temperature. It must then be cooled slowly to allow the metal to anneal.

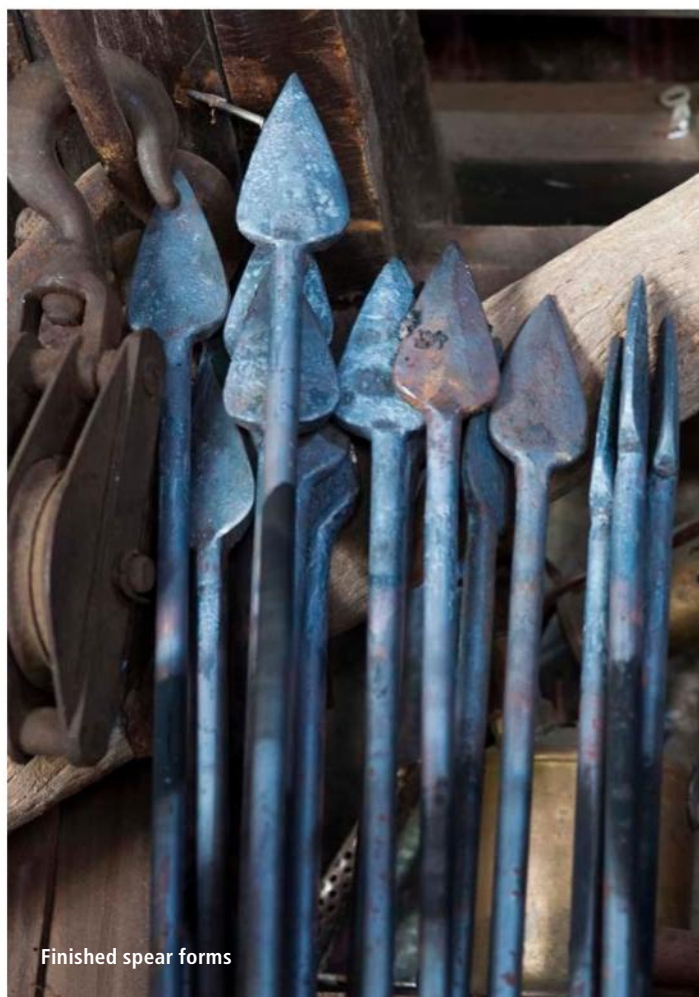




Hammering and shaping iron for spear forms for fences/gates, etc.



Process shots showing formation of pointed spike



Finished spear forms

The blacksmith's trade



A 'smith' is someone who works with metal. A 'blacksmith' works with iron and steel. A 'farrier' is a blacksmith who shoes horses.

Blacksmiths create objects from wrought iron or steel by heating the metal in a forge until it becomes soft enough to shape with hand tools, such as a hammer, anvil, and chisel. Unlike metal machinists, they don't remove

material. Instead, they hammer it into shape, manipulating the form while it is hot and malleable.

The first blacksmiths were Hittites, who started make tools with iron in around 1500BC. The ways tools are made by blacksmiths has changed very little since then. They involve these basic processes, or combinations of them:

Drawing is hammering on the sides of



The heritage bellows donated to the shed by a local farmer



The swage block consists of a honeycomb of different die shapes and forms for shaping iron

a piece of hot iron to make it longer and thinner. This can be achieved using an array of tools and methods but, typically, the hot metal is hammered either on the edge or flat face of the anvil using the cross peen of a hammer. If tapered in two dimensions, a point results. (To finish a blade, the cooled steel is sharpened with a grinder after the metal is cool.)

A quicker method for drawing is to use a fuller, or the round peen of the two-headed hammer.

Fullering consists of hammering a series of indentations across the long section of the piece being drawn, resulting in a series of waves along the



Beautiful old anvil

Humans, like forged metal, should cool down slowly, he maintains

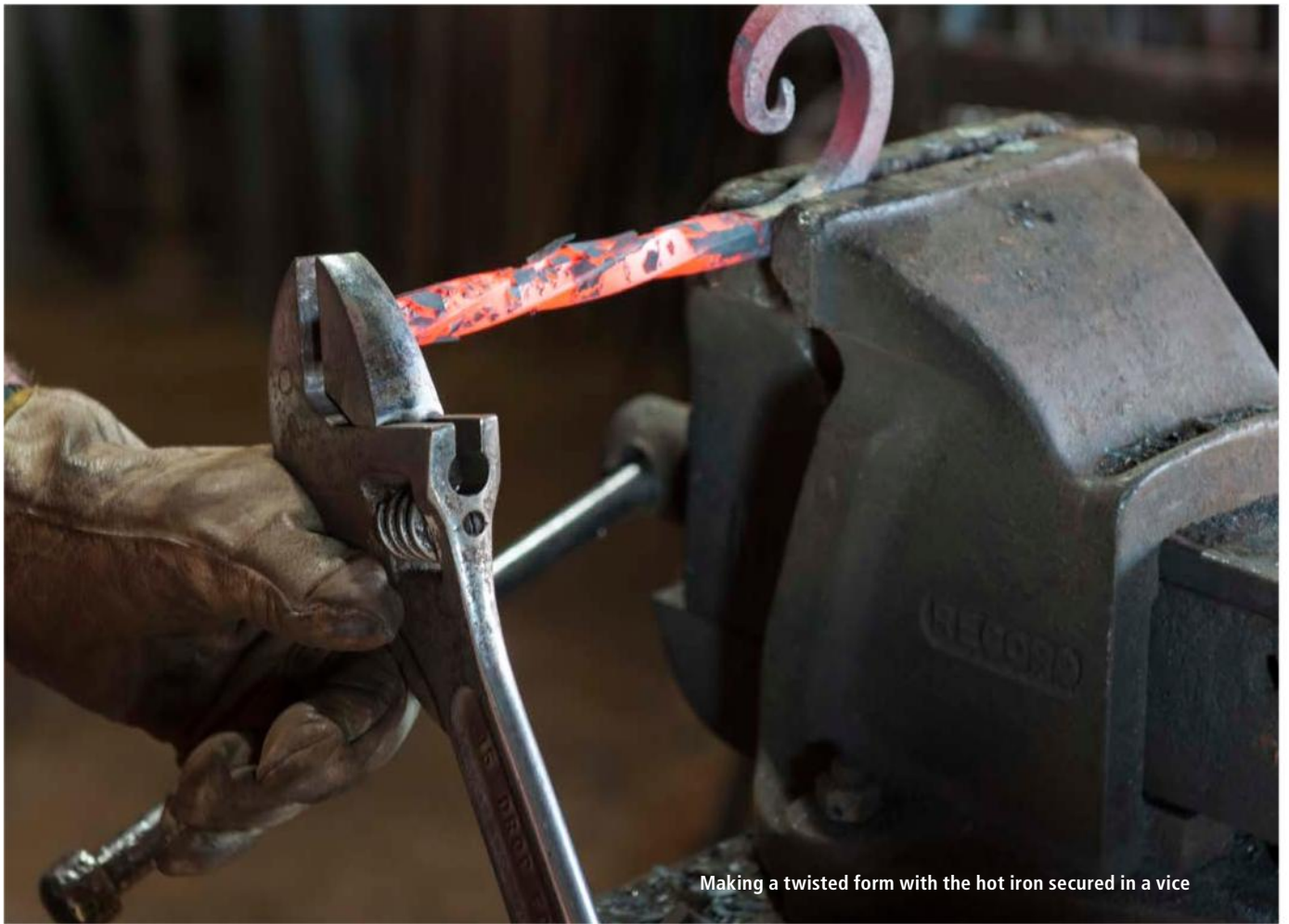
top. The smith then uses the flat face to hammer the ridges down. This forces the metal to grow in length (and width if left unchecked) much faster than just hammering with the flat face.

Bending is hammering a piece of hot iron to make it curve or form an angle. Bending can be done by hammering the metal over the horn of the anvil or by inserting a bending fork into the 'hardy hole' (square hole in the top of the anvil) and bending the pliable hot metal between the tines.

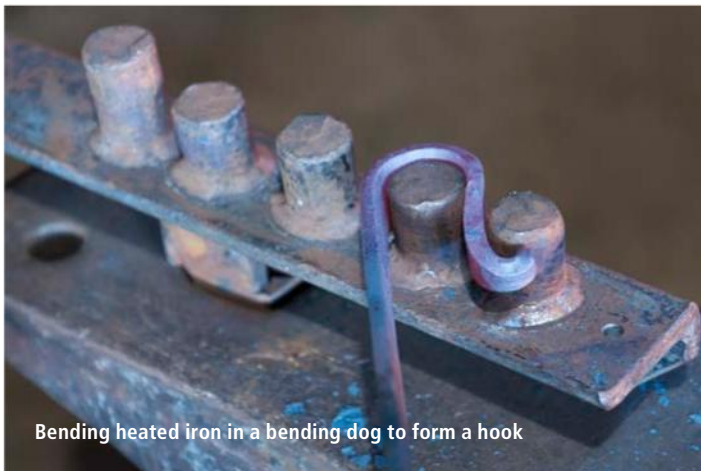
Upsetting is hammering on the end of a piece of hot iron to make it shorter and fatter. The rod is hammered as if driving in a nail, thereby widening the hot part and shortening the rod.



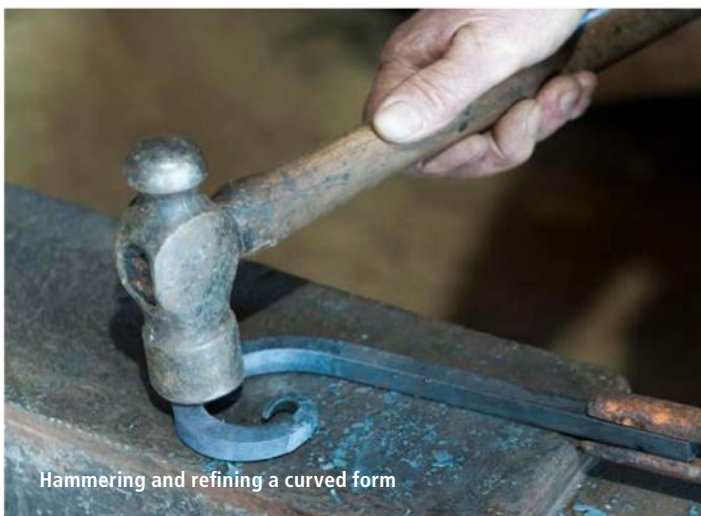
Les in his shed



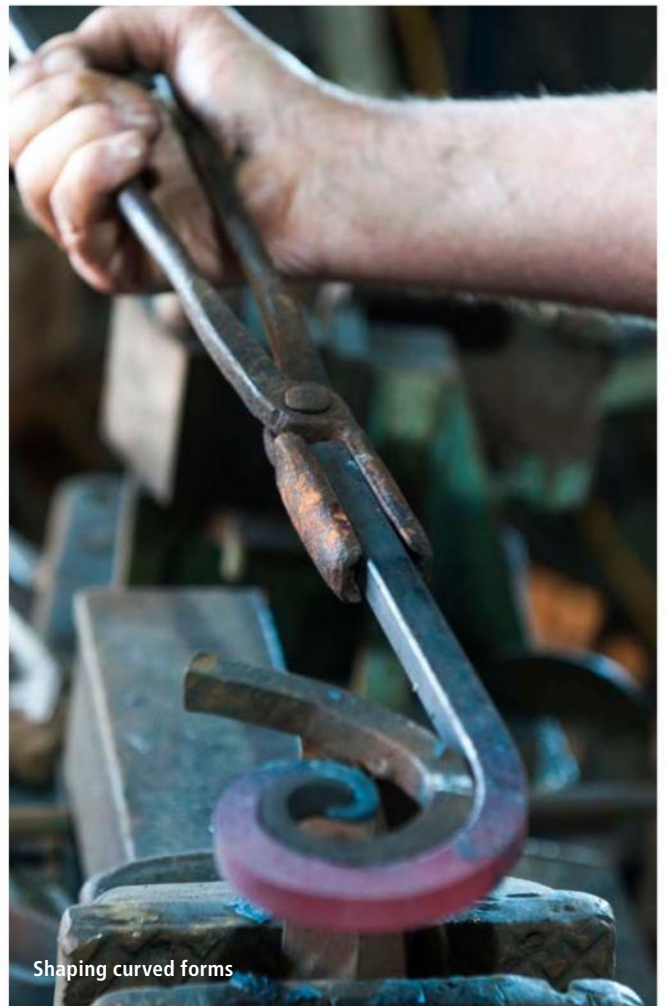
Making a twisted form with the hot iron secured in a vice



Bending heated iron in a bending dog to form a hook



Hammering and refining a curved form



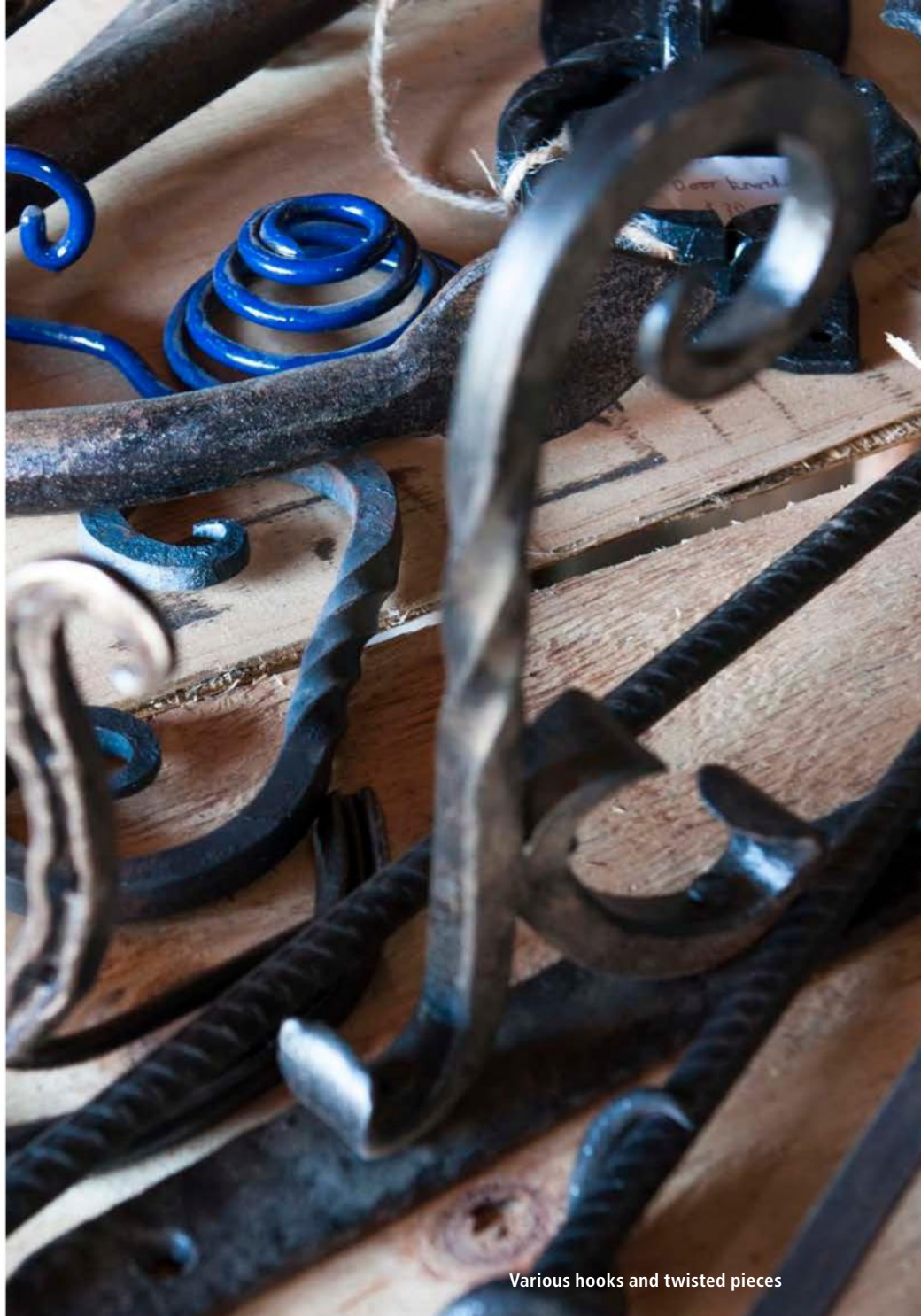
Shaping curved forms

Scrolls and hooks



The carbon in steel turns to liquid at 900°C, allowing it to bend, Les explains. To make decorative scrolls and hooks, he heats the metal, then pulls it around a jig or 'bending dog'.

Les makes a lot of his own jigs and tools. To make a scroll, he holds the 6mm steel rod with tongs, first hammering the hot metal to draw it out to a tapered point. When bending, it's important to keep the rod evenly heated so that it doesn't curl irregularly. Les heats the tapered rod, quickly fits it into the curling jig, and walks it around until the shape is formed. For a double-ended scroll, he repeats the process on the other end and finishes by hammering out any imperfections. Making hooks is a similar process, except the malleable metal is pulled around the prongs of a bending dog.



Various hooks and twisted pieces



Authentic artefacts

► The forge, quenching trough, and some equipment were still intact, and the rest was re-fitted with authentic artefacts from the district. This includes a set of double-acting leather bellows from Robinsons Bay made by the English automobile maker, Alldays and Onions. The bellows is operated using a wooden shaft fitted with a cow-horn handle. "They used cow horn on the end because it's greasy, even after all these years, so when you're pumping it you never get blisters," says Les.

Oaklands Bay Maori and Colonial Museum

has loaned them the anvil, while the swage block came from Luney's construction. (Swage blocks are anvil-like dies with an array of templates forged into them, making them useful for forming a range of shapes.)

The watering trough by the road is original as is a lot of the horse tack inside. Old accounts show that draught horses with names like Ada, Tommy, Maggie, and Duke were regular customers.

Les often starts his working day by grabbing a few handfuls of leaves from the old cabbage tree outside. "They make the best fire-starters," he says.

*It was a perfect spot
for a blacksmith to ply
his trade in the 1880s*

Once lit, the coal-fired forge is mechanically operated with air coming into the centre of the fire through a 'twier' (mouthpiece) at the end of a pipe encased with water for safety. Les only uses the bellows if the fire is "a bit lazy". Bituminous coal is best as it reduces to coke, which burns hot and cleanly.

"It's hot work," says Les, who, even on the hottest summer day, puts on a woollen jersey when he has finished at the forge. Humans, like forged metal, should cool down slowly, he maintains.

Family ties

Les's yard is full of old iron and steel. "I'm always after steel," he says. "I go through a lot and it's hard to come by and expensive to buy." People drop stuff off, and he has picked up a few bargains in post-quake Christchurch. "I've got quite a few rivets from demolished old buildings. They're about \$1 a kilo at the knacker's yard. It's all about recycling."

Alongside the smithy is a small outbuilding that Les is turning into his own museum of historic curios, while out the back smoke is rising from an old railway carriage. This is his smoko shed and daytime home for his two Australian kelpies, aptly named Digger and Anzac. A mobile phone sitting on the ledge is his only, and reluctant, concession to the modern world.

While Les Schenkel is no ghost of the past, those of his ancestors might well be lurking in the smoky shadows. His family has been living on the peninsula since before the blacksmith shop was built and he has a poignant reminder sitting alongside the smithy. He points to a long iron rod lying in the grass. "I got that from Saint Cuthbert's Church in Governors Bay when it was being demolished. That's the rod that was above the altar. My great-great-grandfather, Edward Morey, was the stonemason who put it there in 1862."



The distinctive bumblebee outside the blacksmith shop started out as a rusty 44-gallon drum with one end blown out. Les coated it with Blackguard rust-killer, painted it, then created wings out of polycarbonate and added antenna made from twisted steel



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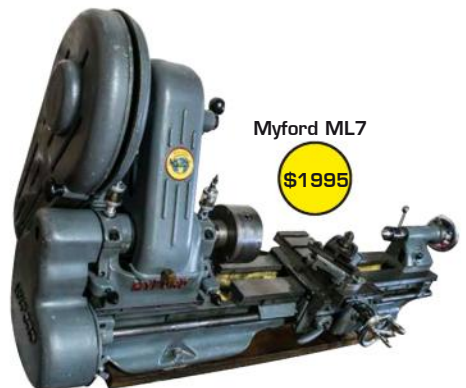


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ALARM BELLS

**TIPS FOR CHOOSING
AND INSTALLING A HOME SECURITY SYSTEM**

By Mark Beckett

Photographs: Mark Beckett



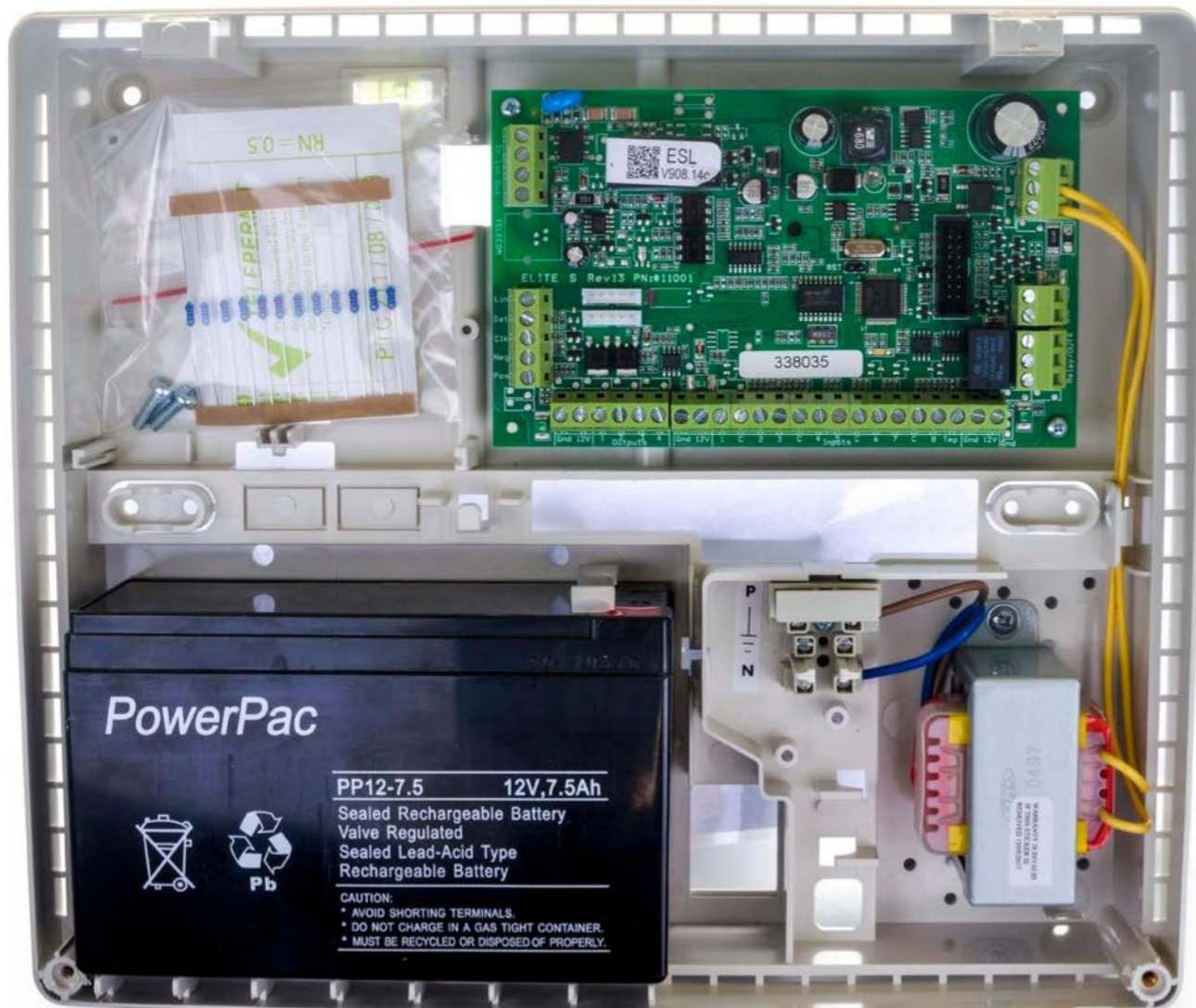
Nowadays when anyone uses the word security, it means different things to different people. Some may consider the PIN number for their phone, for others it might be their car. It might be the person you see standing outside the bank, or a secure transaction.

Home security is something that we hope is adequate and that our measures will prevent a criminal from accessing our place and stealing our goods. We can lock the doors, fit deadbolts, try to make it look like there is nothing of interest, but is it enough? If a criminal is determined to access your place, there is

nothing you can do to stop them.

You can make it more challenging to enter and get away unnoticed, which may stop opportunists from trying to break in, and at the least it will alert someone else to the situation.

This article came from a request to add a security panel to my son's place. While I'm not a registered security guard or consultant, I can offer some of my tips and explain some terms to help you make a more informed decision about choosing a home security system. It is our understanding that a homeowner can purchase and install these for themselves in their own premises, much like electrical work.



System panel showing battery and brain in top right

Components

A typical security system consists of a central box that is hidden away from view. This contains a backup battery along with the brains, and responds when the various zones are triggered.

An outdoor/satellite siren is usually fitted at the front of the house and contains a light and sounder. Better models will contain a battery as well. These will tell people that your alarm has gone off and act as a visual deterrent to criminals.

Indoor sirens are designed to confuse the offender and alert occupants to the alarm going off.

Passive Infrared Receiver (PIR) detectors are used to detect movement in a room, while magnetic switches are fitted to doors and windows.

Keypads are a means of turning the system on or off, and are placed at

suitable locations to arm/disarm the system. They also display the history and status messages for the occupant.

Diallers are usually part of the brains, but can be an extra module. They used to be a means of communicating with a monitoring service, who receive the activation and respond accordingly, but nowadays the dialler options can include sending SMS to a cellphone or ringing people with voice messages.

Wired smoke alarms can also be fitted which will sound the alarm in Fire mode.

Panic buttons are often fitted in sleeping areas and will trigger the alarm in Panic mode.

Terms

A **zone** is one or more sensors grouped together so they can be isolated or disabled, or perform a special function. The front door may be one zone and

when triggered will allow time to turn the system off.

Indoor PIRs may be in another zone that is isolated when the occupants are home, but still monitors the doors and windows.

Duress is a special code that will activate the silent alarm (call the security company) but make it appear the alarm is disabled. It is useful in commercial access situations but can be employed for most monitored systems. The monitoring company may have special procedures or safe words.

Tamper switches are fitted on some components to prevent defeating the system. They will trigger the alarm and signal that a tamper has occurred. Good-quality **outdoor sounders** will have these fitted as you don't want someone removing the item that warns people.



PIR and Cover. Note jumpers for settings and tamper switch on left

"I was able to work out where the blind spots were and could have entered without tripping the system"

Loop resistors are fitted at the sensor and the system looks for this value. If the wiring is shorted or cut, the alarm will be triggered and ensures that the system can't be bypassed or tampered with.

Entry delay is the time to allow you to deactivate the system. One or more zones may be configured to give this delay, while other zones will trigger instantly, so consider which doors you enter from, and how much time you need to put down your bag and enter your code.

Exit delay is the time for you to exit and close the door after arming the system.

Home/Away or Stay mode is available in some systems and reconfigures the system.

If you are at home you might want the doors and windows protected but not have the PIRs active.

Some systems use this option to detect the assigned door being opened (as you

leave) and will change to 'Away' mode which turns on the PIRs.

One-time codes are used to allow a person to enter and exit once only. You may have arranged for someone to come and do some work and they will need to disable the system. Obviously giving them a full-time code is not ideal.

There are other variations that allow someone to set the system but not disarm it, or are only allowed during certain hours and certain days of the week.

Most systems have some sort of feature that you'd need to see if it matches your needs.

Walk Test is a setting to check if the detectors work without setting off the system. PIRs also have this as a jumper which will bring on the red LED inside. This is designed for testing but it is surprising how many installations I've seen where the installer hasn't disabled it.



Keypad for arming/disarming and status messages

Power outages

Traditional phones had the 48V supplied from the exchange which had back-up batteries or generators for power outages.

The trend to fibre connection to deliver phone and internet removes that and means that unless you have a UPS powering your network and fibre modem, you'll have to rely on a cellphone when the power goes out.



Internals of the outdoor siren. Tamper switch is on the right



Unit is designed to be mounted vertically, evident by the moisture guard around the cable hole in the centre (... but they have left a hole above the tamper switch guard)



Sight seen by visitors

In one I was able to work out where the blind spots were and could have entered without tripping the system. So ensure they are disabled when you've finished installing it.

Alarm time – it wouldn't be right if we didn't discuss that alarm down the road that goes off and doesn't stop. Every system should have a time limit that it makes noise for, and then rearm itself. Once the neighbours have been woken, peered out the window and done everything they can, it's time they were allowed back to sleep.

False alarms will happen and the cause or trigger should be investigated. Some years back we used to have one set off regularly due to poor installation. Eventually everyone ignored it and one day there was a genuine break-in and everyone ignored it. There is value in having the odd false alarm, as word gets out that you have an alarm installed, but respect your neighbours as you'll need them when the situation is a real event.

Budget

There are very cheap systems and there are very expensive systems available. A quick look on Trade Me will give you some idea, but your local electrical retailer may have some better prices.

If you chose to have the system monitored there will be an ongoing cost, and cost for any response. The police will not attend alarms unless the key-holder is present and I suspect there would need to be evidence someone is actually committing the crime before you see blue lights arrive, so having someone in a security van turn up might be worth the cost.

Insurance companies may offer a reduction in their policy, but you'd need to check the wording and conditions. Any good insurance company should offer some discount as it helps to protect their investment.

The hardware is only part of the cost

and installation may be much more. Running cabling is likely to be the bulk so you may wish to consider it during construction when access is easy if you are building or renovating.

There has been a trend to wireless-type systems which have no wiring running to the sensors. I don't have any information on the reliability of these systems, but you will need to replace the batteries on a regular basis and the initial hardware cost is often more than wired systems.

Car Alarms

It wouldn't be fair if we didn't discuss the use of a simple car-type alarm in a domestic situation. They include a couple of zones (door switches) and you could connect a PIR. They can drive a siren (or two) for a certain time, and most will rearm.

Many car alarms have a wireless remote to get you in and out, but they



Wired smoke alarms supplied with kit. These have a cable connection in the rear

“If your pet likes jumping up on the back of chairs, then you may want to consider where you place the PIR to avoid false alarms”

lack any detailed history of what zone triggered the alarm. If the door is left open, many alarms will ignore that input when it rearms, which is a common trick used by car thieves.

There is no ability to connect to a monitoring service and they cannot detect shorted wiring (they are normally closed so a break will trigger the alarm).

If you simply wanted to monitor two doors and could provide a battery and charger, then it would be hard to argue over the price.

Locations

The first thing to consider is where each part will go. The central box needs to be somewhere out of sight, but accessible during the install process. I found a suitable cupboard that kept it out of sight, but I have seen them in attached garages, laundries and hall cupboards.

The keypad to arm/disarm the system needs to be close to the entrance door to reduce the ‘entry’ time. Every added second is another second a criminal gets before the system goes off.

LCD versions tend to be backlight, but other versions may require illumination to see what numbers you’re pressing with an arm full of groceries.

PIRs can be fitted on walls or in the corner, and work best when the object crosses the beams at 90°.

Establish where someone will walk when they enter and position it accordingly. Most have pet detection and they either modify the beams or have

some digital filtering, but if your pet likes jumping up on the back of chairs, then you may want to consider where you place the PIR to avoid false alarms due to the furry object playing while you’re out and the alarm is set.

The outdoor siren/sounder needs to be visible from the street or as you approach the house. If it is in clear sight then your neighbour doesn’t have to risk themselves confirming it is yours going off, and it may be enough to deter the opportunists who will knock on the front door to check if you’re home. The indoor siren is best placed where it can’t be shut off by closing the door. The hallway is one place, but a lounge is just as good. Hopefully it will disorientate the criminal and make them want to leave empty handed.

Stickers on the front door will be useful. Try to avoid anything that has the brand or the monitoring company name on it. The less information you provide to criminals the better your odds are.



Wiring installation and getting it down the wall to the keypad location

Wiring

The kit I purchased included 100m of 4-core wire. This allows two wires for the 12V to the PIRs, keypad or siren, and two wires for the detection or data to the keypad.

The electrical regulations state that low-voltage wiring should be 50mm from mains cables, so don't be tempted to run it next to the other cabling.

You need to ensure when you run the wiring in the ceiling that it is protected from being pulled or stood on when other work is carried out.

You'll need to run mains power from the switchboard to the alarm panel. The homeowner is not allowed to do this, so you'll have to employ an electrician for that.

Installation

I determined the PIR locations and drilled a small hole just out from the corner. I used a 400mm long bit with an extension so the drill angle was closer to 90° to the ceiling. If the corner is on an outside wall, then be aware it may have roof framing coming down right where you are drilling.

I left the LED on (until we tested it) and set the Pet jumper to suit, before terminating the wires at a reasonable height and pushing it back up to the corner, and screwing it to the wall.



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Wiring the PIR at ground level then fitted in the corner leaving clearance at the top

Follow the connection diagram to ensure it's the right way up and don't forget the resistor that the panel requires (2k2 for this unit).

The keypad connection requires getting the wire down the wall.

After discussing the exact location, we determined we could not access it from above, and running it on the surface in capping wasn't going to be as tidy.

After determining where the studs and dwangs were, we drilled two holes into the gib, and then angled the extension bit to drill through the dwang and top plate.

This left two small openings in the Gib board which are easily patched later. You can now see why pre-wiring a security system during construction is a good idea.

Because of the house design, access to the outer edges was almost impossible. The picture gives you idea of the low pitch, and it also illustrates what a

poor job of installing a heat pump some professional installers did. Leaving the pipes unsupported is guaranteed to cause issues later. I caught most of their other poor workmanship and made them fix it, but I should have checked inside the roof as well.

Once the wires were fed into the roof space from below, we taped a piece of soft wire on the end of a set of fibreglass tent poles for a hook to reach the extra 2.5m where the wire was and pull it back.

The PIR in the lounge was on the corner of the outer wall, which made it doubly difficult, but since the house is permanent material, mounting the sounder on the soffit allowed us to make a large access hole and feed the wires from there.

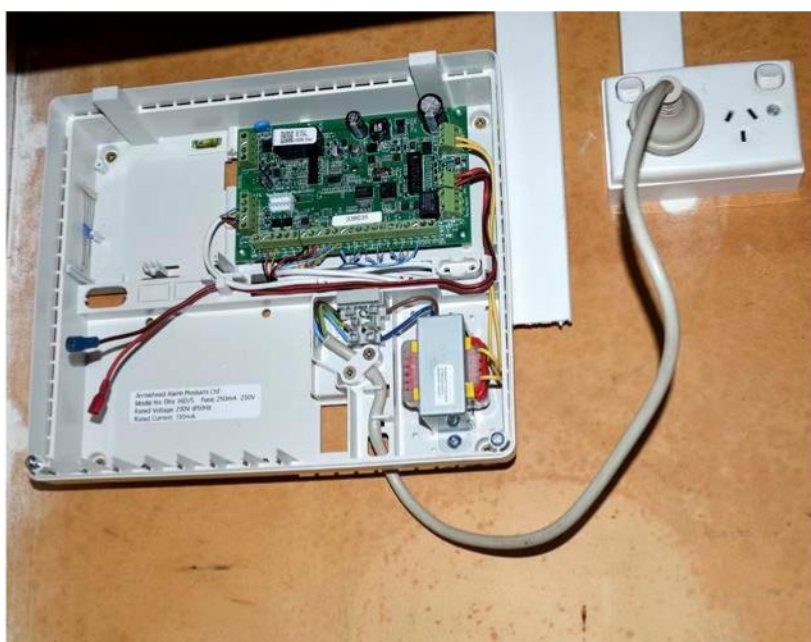
A 5m length of grey plastic 15mm water pipe with a string taped to the end allowed us to 'steer' it where we wanted it. The lounge PIR and outdoor

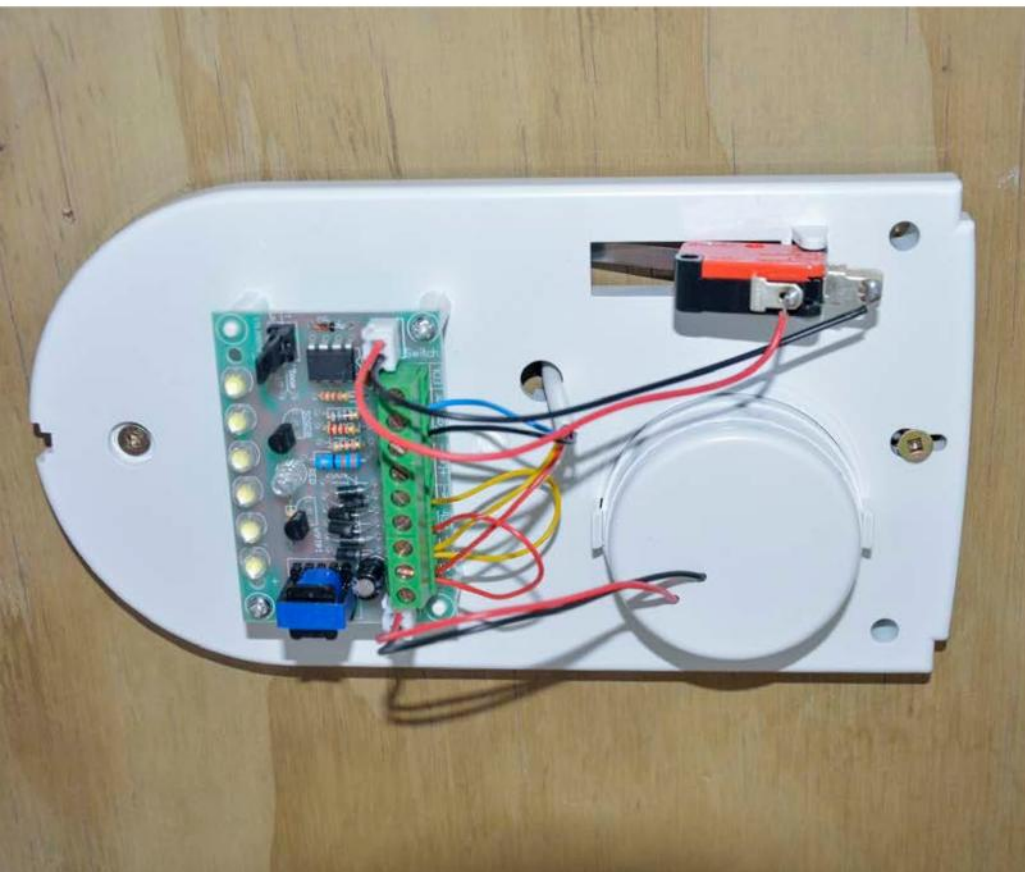




Wiring battery lead before fitting and terminating cables

Right: Hole in soffit to allow flexible pipe to be used to pass cables into roof space





Outdoor siren just waiting on some paint on the new board

siren were lightly taped to this and fed into the abyss in the hope it would come out somewhere. Luckily it did make it to somewhere it could be reached, and as the photo shows it would have been impossible to reach otherwise.

The system panel location was determined and a hole into the ceiling was made. Some capping was fitted and the cables routed out the side into the panel. Any excess will be pushed into the ceiling once the system is tested.

Any unconnected inputs need to have the loop resistor fitted as per the instructions. A separate hole was provided for the mains power and a socket fitted to allow it to be plugged in.

Testing

Once everything was connected, it was time to check that the keypad worked and start programming codes, etc.

Most of the default timing and zone behaviour was left at default. The additional user codes were entered and this panel allows 1-6 digits, which means users are not forced into rigid rules for no reason.

Since each PIR had power, we conducted a walk test to ensure it detected our movement by bringing on the LED, and that the sensing worked as we expected it to.

Each system is different so you'll need to spend some time deciding how you want to configure it. I recommend copying the pages and writing the setting down on the copy first. Any changes can be made before the final settings are written in the manual.

Once you're happy that you've done the programming and it arms and disarms, you can try setting it off to ensure the indoor and outdoor sirens work.

This is best done during the day and with your neighbours aware that you're home and testing your new alarm. Like I said earlier, they are the ones who will respond to it going off, and you want them on your side.

Since we were not connecting to a monitoring service and there is no physical phone, we fitted a smartphone unit that uses the home network to send messages to a cellphone. This will only work if the network has power, so while



Tight corner and exit point of cables

You can now see why pre-wiring a security system during construction is a good idea

it is attractive, it also requires careful consideration (see sidebar).

Hopefully this gives you an insight into what is required when installing a security system. The most time-consuming job is running the wires back from the sensors, but it's not impossible in an older house, as I've demonstrated.



Above: Showing low roof pitch and unsupported air conditioning pipes by 'professional installers'



Left: Unused inputs terminated with resistors

Deadlocks



Deadlocks will lock the door and it requires a key to open it. This helps to stop criminals from gaining access and simply opening the door to unload your goods. Obviously they only work if you don't leave the keys in them, but you need to consider egress during a fire or other emergency. There are versions that will deadlock by turning the key the opposite way or twice, so check with your locksmith if you want some options.

THE
RIGHT
STUFF
PART ONE

TOP TIPS FOR GETTING THE BEST FROM
YOUR METALWORKING HAND TOOLS

By Bob Hulme

Photographs: Bob Hulme



These tips are a random collection of thoughts grouped under the classification of things that relate to working at a bench using hand tools, rather than using a lathe, mill, or other machine tool. If you have only a workbench with some hand tools in your shed, this is meant to be useful for you too.

Set-up

You may already have your shed well set up to suit your needs but if not, here are some ideas to get you started or to improve your current arrangement.

Mount your vice so that the fixed jaw extends beyond the front edge of the bench. This ensures that anything large that you put into the vice can extend down as far as the floor without fouling against the bench. Soft jaws are important for those times when you don't want ugly teeth marks on the job you are holding in the vice. It's no good blaming it on the dog — those excuses ran out years ago when you blamed the family pooch for eating your homework! Nowadays there are readymade, magnetic soft jaws that simply fit onto the existing vice jaws and they don't cost the earth either. I have been fortunate enough to have had plenty of off-cuts of aluminium lying around to make my own from, but I know that is often not the case in most home workshops.

If your workbench does not have drawers, you can make great use of the space under the bench by using inexpensive plastic bins. I use ones that I bought from one of the larger hardware retail chains for around \$5 each. They stack on each other and I have labelled them with a marker clearly so I have no trouble finding what I want.

A set of good ring / open-end spanners is a must, and I find that a good way of keeping them together is with a spanner ring. It also means that you can hang up the whole set on one hook. Having each spanner on its own hook on a shadow board is lovely, but takes up a lot of space and it is not so easy to grab the whole set and take it to the job you are tackling. Being a bit pedantic, I put



Making the best use of under bench space

the spanners on the ring in size order so that it is easy to find the particular one I want. This saves time, and it is easy to spot if one is missing. Plastic holders and roll-up bags are good too, but spanner rings are good for when those holders give up — usually well before the spanners themselves are worn out.

A cheap way of creating cupboard space is to watch for auctions for used office furniture. I have found that credenza units work well when mounted up on a wall and they don't cost that much. Amazing how few businesses will tolerate ageing office furniture. They only seem to want new, so the old stuff can be bought really cheap.

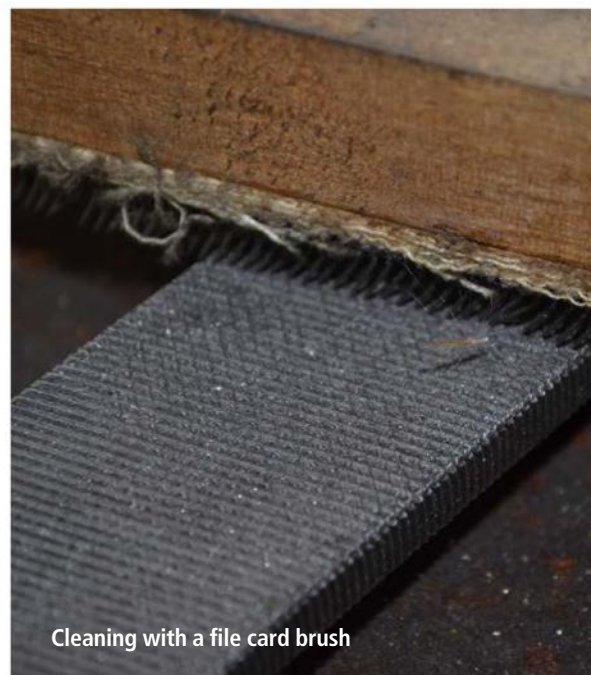
Files

Good, sharp files are an asset; blunt, worn-out ones are only good for grinding up into scrapers, etc. However, an underperforming file might just need a clean to get it back to usefulness. Invest in a 'file card' — a small wire brush-like thing with hook-shaped bristles specially shaped for cleaning the grooves in files.

Another way to clean a file is to rub a piece of brass across it in line with the grooves. Some people say that old files can be given a bit more life by

sand blasting them. I have not tried this myself, but if you have a sand blaster at home it would not hurt to try it on an otherwise dead file.

Another tip to help stop clogging of file teeth when filing soft materials such as aluminium is to rub over the file teeth with chalk before filing. This will help prevent the aluminium from sticking in the grooves.



Cleaning with a file card brush



Spanners are easy to find when placed on a ring

Sharpening

Sharp tools are good tools, the saying goes. One of the most annoying sharpness issues for me is blunt hand taps. Cutting internal threads is a breeze with sharp taps; blunt ones just make me swear. I won't buy plain carbon steel taps. Yes, they are cheap but false economy in my opinion. They are only good for cleaning existing threads that

are full of dirt or have minor burring.

High-speed steel (HSS) taps cut and stay sharp, and when they have served a long and distinguished life they are still good for cleaning out threaded holes. When they do eventually lose their sharpness, you can re-sharpen them with a little care and a steady hand. Use a 'mounted point' (that's the correct term for a wee grind stone on a steel

spindle) in a pneumatic die grinder or a Dremel tool.

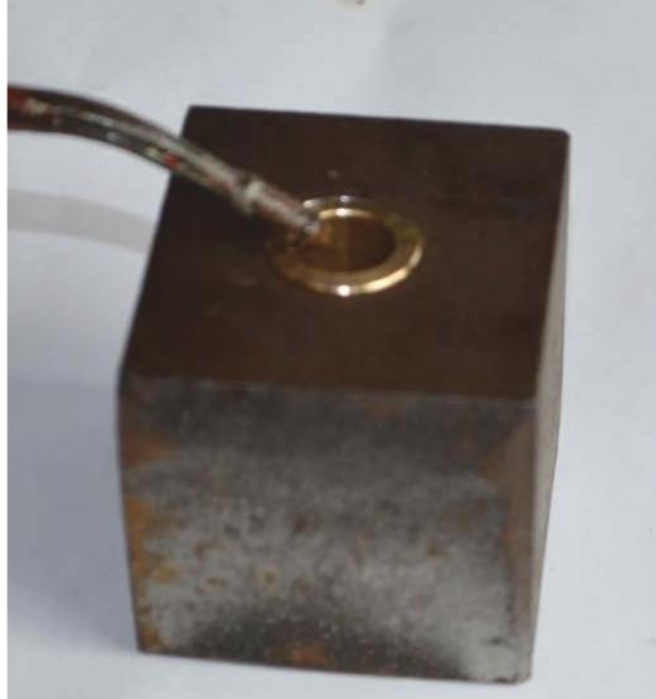
Use a mounted point with a cylindrical-shaped stone about the same diameter as the flute or trench that runs along the tap. Try to take about the same amount off each row of teeth and undercut the teeth so that there is a 'positive' rake to the cutting edge. When a tap has eventually served all of its useful life, it can be ground into a handy centre punch.



Sharpening an old tap

“Cutting internal threads is a breeze with sharp taps; blunt ones just make me swear”

Sharpening stones — the big flat ones — are useful for maintaining the sharpness of tools such as chisels and plane blades. (I know, this article is about the metalwork workshop, but hey, we are all flexible and can tackle all sorts



Making it easy with hydraulics

of materials, right?) Inevitably they lose their flatness and develop depressions and grooves. Of course, I understand that this would not happen to you — it's when you lend it to someone else! One way to get it back to flat again is to use a piece of coarse sandpaper on a flat surface. Sandpaper with silicon carbide abrasive is better than aluminium oxide for this. Rub the stone backwards and forwards over the sandpaper until its surface is flat again. It will of course only be as flat as the surface under the sandpaper, so find the flattest you can. Use a sheet of glass if you do not have a piece of suitable steel.

I have had to extract many bushes to replace them when reconditioning machinery, and on a lot of those occasions the bushes have put up a fight

Blind bushes

Removing bush-type bearings from blind holes is always a hassle. Understandably things are made to a price and slapping a bronze bush into a blind hole is easy for manufacturing but doesn't take account future servicing. I have had to extract many bushes to replace them when reconditioning machinery, and on a lot of those occasions the bushes have put up a fight.

However, the first and easiest way to get them out is to apply some basic hydraulics. This involves popping the bush out using some oil and a solid pin that is a close fit in the bore of the bush.



Stamping is a very neat way to label metal

The oil does not have to be anything special, but one with some substance is best — say, SAE 30 grade or higher.

First, nearly fill the hole in the bush with oil, leaving enough space at the top to start the pin into the hole. The solid pin should be a good close fit in the hole. Ideally use a dowel pin or some stock-size silver steel rod. Put one end of the pin into the bush and give it a good whack with the hammer. The hydraulic pressure created will get under the bottom edge of the bush and push it up. It might take two or three hits. Oil will splash about, so perhaps put a rag loosely around the pin.

In some cases when the bush has worn too oval, the fit with the pin will not be good enough to contain the pressure, so you will have to resort to slitting and collapsing the bush or even drilling it out, but give the hydraulics a go first. It is easy and the result is good.

Stamping

I don't mean stamping your feet and shouting unprintable words to no one in particular when a mistake is made, or when a speeding hammer has a collision with your thumb. I mean those punches — number and letter stamps — which are a nice way to permanently label or

mark metal items. It's certainly much neater looking than freehand grinding with a die grinder. However, to get all the stampings in a tidy line takes more than just a good eye.

Some people use a piece of masking tape stuck to the surface and line up the back of the punch with that by eye. I am sure this works but I prefer to use a piece of flat steel, or wood for that matter, clamped to the job, and I hold the punches hard against that. The only eye work needed is for the spacing between the letters. The small amount of time it takes to set up in this way is certainly worth it to produce a far better looking result. 

GETTING UP TO speed

A GUIDE TO ELECTRONICALLY CONTROLLING A 3-PHASE MOTOR IN THE HOME WORKSHOP WITH A VFD

By Geoff Merryweather

Photographs: Geoff Merryweather

The rapid development of electronics has had many positive effects for the sheddie, and one such example is the Variable Frequency Drive (VFD), which allows the speed of 3-phase motors to be electronically controlled, with the bonus of adjustable speeds. Historically, continuously variable speed motor drives involved mechanical systems such as the Reeves drive, which is similar to a motor scooter CVT transmission where belt-drive pulleys can be varied in size 'on the fly' and hence vary the drive ratio.

These and other transmissions were universally expensive, difficult to

retrofit and inefficient. The increased use and falling prices have brought new and used VFD drives within the reach of the home user and have opened opportunities with industrial machinery that previously did not exist.

My introduction to VFD drives was with my 1951 Colchester Chipmaster lathe. These lathes came from the factory with a Kopp Variator mechanical drive and no gears other than the 10:1 spindle back gears. The Kopp allowed a speed range of 300-3000 rpm, and when it finally died, I fitted a second-hand PDL Xtravert drive.



Electric motors

The standard electric motor sets the speed based on the line frequency (50Hz) and the number of sets of windings (called poles) in the motor. A 2-pole motor runs at around 2800rpm, 4 pole at 1440rpm, 6 pole at 960rpm and 8 pole at 720rpm. The difference in frequency is the reason why motors in America run 60/50th of the New Zealand speed due to their 60Hz line frequency — e.g. a 4-pole motor in New Zealand is around 1440rpm, where it is 1730rpm in America.

A universal motor such as the brush-type motors used in a hand drill set the speed on the voltage, hence a voltage controller such as a light dimmer or autotransformer can be used to adjust the speed. This cannot be used for a synchronous induction motor, as it will eventually burn out or draw excessive currents while remaining running at the name plate speed.

The VFD provides a variable frequency supply to the motor at a constant voltage, hence the speed of the motor can be varied. This speed variation can be above and below the rated speed — with limitations. Older VFD drives simply set the frequency and therefore the motor speed, such as the



VFD drives through the ages



PDL Microdrive in Figure 1. If the motor load was too much then the speed would drop without the VFD correcting for the slippage. Newer VFD drives help to reduce this by indirectly measuring the torque requirements of the motor and boosting the motor power on the fly to maintain the speed setting. These are called sensorless vector drives and, while they usually cost more, they give a wider useful speed range.

An important point with VFD drives is that they can only work on 3-phase motors. If you have a single-phase motor (e.g. the motor is plugged directly into a 230V standard wall socket) then it will

need to be changed for a 3-phase motor. These are common, reliable and cheap second hand so it is often not a major issue to change to a 3-phase motor from a

single-phase motor. The problems usually come from any ancillary contactors, relays and controls, and getting it to fit in the space.

Figure 1.

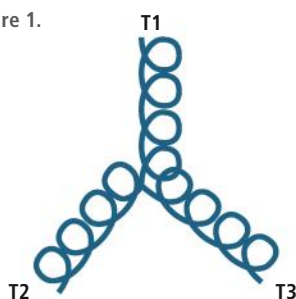
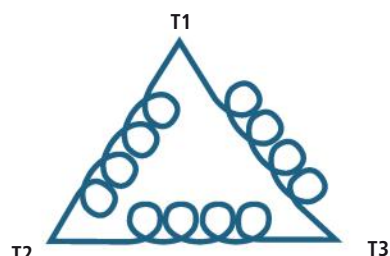


Figure 2.



Star winding on left, delta on right. T1-3 are the wiring connection points in the terminal box



Motor name plate — dual voltage figures show this motor can be wired star or delta

The way the motor windings are connected is also important, and there are two types of winding connection. In a delta connection, the opposite ends of three coils (one for each phase) are connected together in series. In star connection, the ends of three coils are connected together to form the neutral point (see Figure 2). The standard 440V motor is star wound by default and needs to be delta connected for operation on 230V. This becomes important as most VFD drives output the same voltage as the supply, so to run a motor on 230V single phase at full power, the motor needs to be wired for 230V.

Many newer 3-phase motors can be changed from star to delta by changing connections in the terminal box. Check the name plate (see Figure 3) and see if it can run on dual voltage, and look in the terminal box on the motor if there are instructions. If it is not able to be changed easily, then options are:

A motor rewinder can change the

connections within the motor.

Replace the motor with another one that can be changed.

Use a transformer to increase the supply voltage to 400V and a 400V in/400V out VFD.

Use a VFD that can take 230V in and output 400V. They are not common but are available.

What is a VFD?

A VFD converts the line voltage and frequency (50Hz, single or 3-phase input

depending on the model) to a 3-phase output with the frequency altered to suit the speed required. It does this by providing a varying width voltage pulse which is smoothed to approximate a sine wave. It is not perfect and hence can lead to harmonic noise and 'cogging', or rough movement at low speeds. As the frequency and voltage is controlled by the microprocessor in the VFD, it allows controls over the motor operation to be programmed into the VFD. This includes the rate of acceleration and deceleration

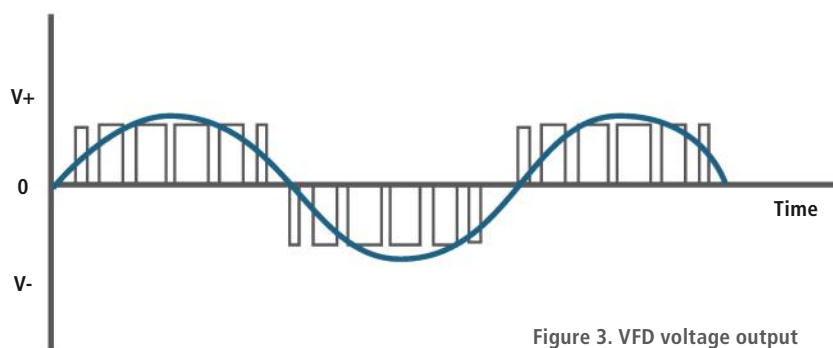


Figure 3. VFD voltage output

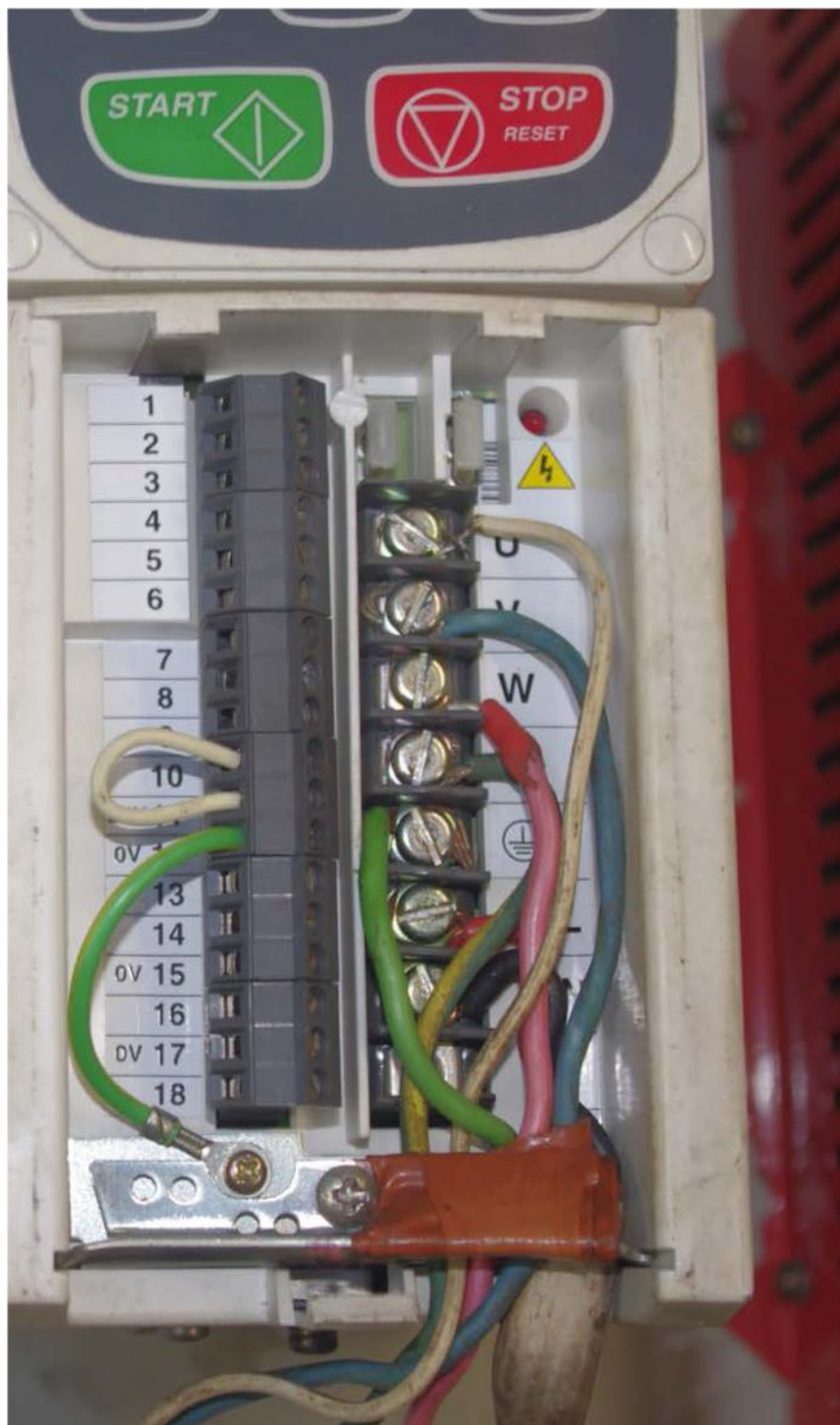
It is not perfect and hence can lead to harmonic noise and 'cogging', or rough movement at low speed

on start-up, change to pre-set speeds on a control signal, motor braking and emergency stopping, and remote control switching. Many manufacturing or air conditioning processes connect multiple VFD drives together under computer control to synchronize operations.

Advantages and limitations

VFDs bring a number of advantages to home machine tools. Even with gears or stepped belt pulleys, being able to alter the speed over a wide range without changing gears is convenient, and being able to slow the machine down below the lowest speed makes operations such as threading and power tapping easier. VFDs can also increase the motor supply over 50Hz, so that the motor can run faster than the listed speed. The amount of over-speed you can achieve depends on the motor, the quality of its windings and how well balanced it is. Aside from the practical limit of bearings and balance, the motor windings limit the top speed when they reach their limit for the magnetic flux developed in the windings, so the motor simply cannot go faster. A rule of thumb is a maximum of around 75Hz or a 50 percent increase in speed for a 4-pole motor.

There are advantages beyond the obvious one of a variable speed. The big advantage for the home user is the ability to run 3-phase motors on a 230V single-phase domestic supply. As above,



The terminal block in the VFD showing the power inputs on the right and the control connections on the left

this requires the motor to be wired to 230V 3 phase and the VFD being able to take a 230V single-phase supply, or be the type that can take 230V in and output 400V.

Other advantages include the ability to ramp up to speed instead of being abruptly switched. This reduces driveline stress and the start-up currents

by spreading the acceleration over several seconds, so that a heavy load such as a lathe chuck can be spun up to speed within the limits of the available allowable current of the power supply and VFD. VFDs can also allow braking and controlled deceleration.

There is no such thing as a free lunch, and there is a trade-off for speed against



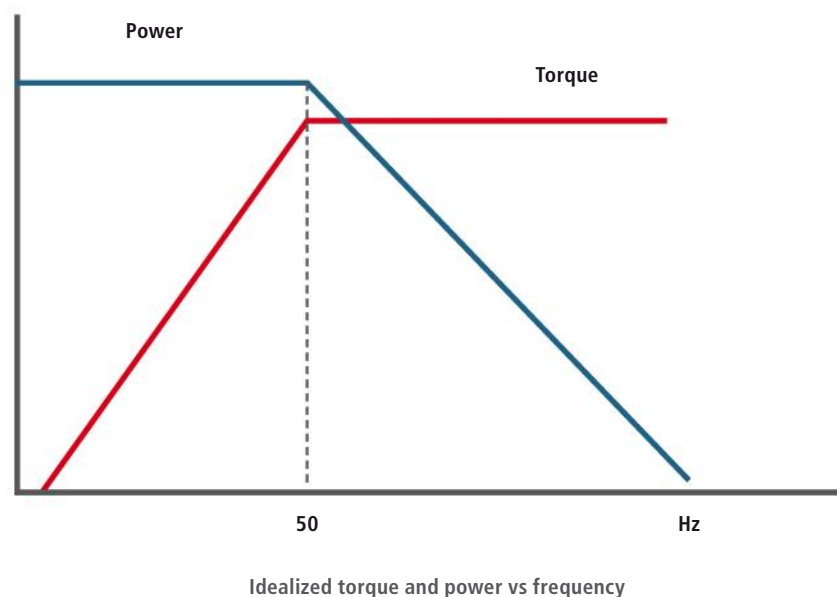
Left: VFD in base of Colchester Chipmaster. Yes, the drive is upside down — not recommended for cooling, but it has been on the list to change for the past five years since I changed the motor over

There is no such thing as a free lunch and there is a trade-off for speed against performance that some mechanical variable speed drives don't have

performance that some mechanical variable speed drives don't have. VFDs have traditionally been used for air conditioning fans and pumps and they are ideally suited for this as the torque requirements reduce as the speed drops. Machine tools have constant or increasing torque requirements as the speed drops, and this is where one of the limitations of VFD becomes apparent. As the speed drops below 50Hz, power remains constant, but the torque available reduces (see Figure 4).

When I originally installed the VFD in my Colchester Chipmaster, I used a 4-pole (1440rpm) motor, controlled by

Figure 4.



the VFD. I found that the loss of torque was a problem as the speed was reduced with large pieces and heavy cuts, especially since this machine does not have any other way of adjusting speeds. This limited the speed range, especially at the low end as it could not usefully go much below half or one-third speed.

The solution was to use a second-hand 4hp, 6-pole motor. As the motor is more than twice as powerful at a given speed up to 50hz, it has twice the torque at that speed and hence a wider usable speed range and low-end speed. The VFD also overdrives the motor to 75hz, giving the top speed of 1440rpm, so the useful speed range of the motor is from around 250rpm to 1400rpm with the turn of a knob. For fine work or threading where there is little torque required, it will go slower. Note that due to the extra windings, 6 and 8-pole motors have larger frames, which can make installation more difficult on an existing machine. They are also much less common than 2 and 4-pole second-hand motors, and more expensive to buy as new motors.

An issue to be aware of if you are running heavily loaded motors at low

speed is cooling, as the cooling fan on the end of the rotor is running at much less than its expected speed. If it is an issue, a computer fan on the end of the bell housing will provide additional cooling.

Installation

As VFDs have developed, they have become increasingly more complex and adjustable. The early drives such as the PDL Microdrive (Figure 1) had only a speed control knob and a power switch. More recent VFDs are highly programmable and require some set up. Getting a VFD without an instruction manual in English or being able to download one online can be an exercise in frustration if you need any more than the default settings.

While the wiring is not hard for someone who is careful and can follow instructions, it will legally need a registered electrician to do the connections and certification.

VFD manufacturers usually specify shielded cable to reduce noise affecting radios and other equipment. Having said that, mine have been running on unshielded cable for many years.

Selection

The set-up will vary according to the VFD model, however the general requirements are the same.

The VFD needs to be selected to match the supply voltage and motor voltage requirements, and the power or current draw of the motor. Get a VFD larger than the minimum you need for the motor to give you the flexibility to use it on other machines. It will provide more allowance for the start-up currents when you start under load or with high inertia loads, such as heavy lathe chucks. Remember also when you run a 400V motor on 230V, the current will approximately double as well, so you need to work within the limit of your single-phase supply.

The VFD instructions will say how to programme the drive for the maximum current allowed to provide overload protection, and the acceleration time on start-up. If you are on the limit of your available current capacity of the VFD, look at a longer acceleration time to reduce the peak current load.

Location

Location is important for VFD drives — they are not sealed so that they need to be kept clear of dust and metal chips, but with adequate ventilation and free from vibration. The drive manufacturers give the requirements for the minimum size of enclosure and airflow needed for each drive if it is to be in a covered box.

Look for a VFD with a remote-control panel, as it gives flexibility in the mounting location while still having the drive out of the way.

I find the rotary knob is the easiest way to adjust the speed. It is a 10k Ohm potentiometer that is wired into the control terminals of the VFD, which are set up for this purpose. You may need to adjust the programming to tell the VFD to set the speed based on the external signal, rather than the internal fixed settings.

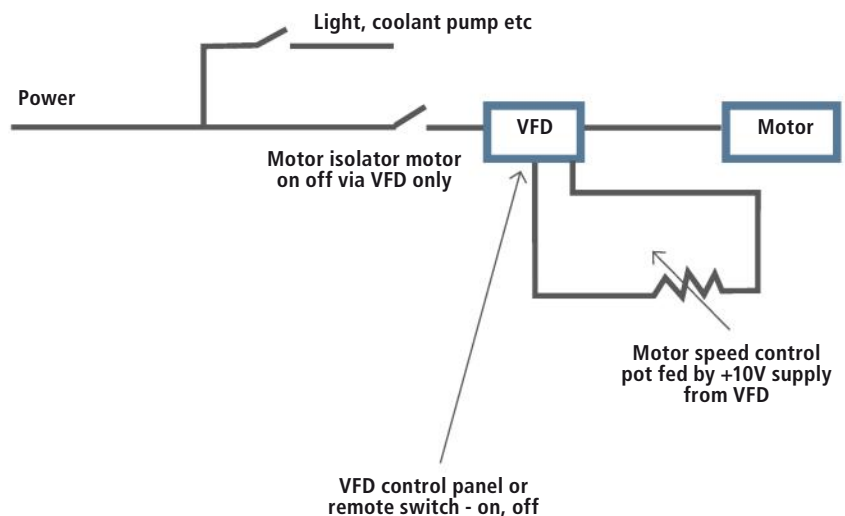


VFD remote-control panel with speed adjustment knob

Switching

A key point with VFDs is that the motor is controlled with the VFD and there is no switch between the VFD and the motor. Switching between the VFD and the motor will lead to power spikes that will damage the VFD.

Ancillary equipment (lights, relays, pumps) come off before the VFD, so it is running on the unmodified power supply. Watch out for how the machine is switched inside the machine control or electrical cabinet. If it uses contactor relays — rather than direct switching for start, run, and emergency stop — you will need to rewire this so they are bypassed. At the very least ensure they are not between the VFD and the motor, with the relays or their switches providing low-voltage signals to the VFD terminals. Read the instruction manual very carefully and double check the wiring and connections, as putting 230V into a 10V signal terminal will not end well. 📖



VFD switching

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The indoor water garden greets visitors at the entrance to the author's home



Make a Splash

By Coen Smit
Photographs: Coen Smit

A READER SHARES HIS EXPERIENCES OF CREATING AN INDOOR WATER GARDEN, COMPLETE WITH FISH AND PLANTS

This article is designed to start you on the fascinating journey of creating your own indoor water garden. We often see great examples of a variety of exotic water gardens in open gardens, magazines and programmes involving stately homes which require massive physical and financial resources to establish. I found that with a little planning you can achieve similar low-maintenance effect indoors.

All plants need a source of sunlight and nutrients to grow successfully. Fish need some food and a clean, stable environment. An indoor pond can meet these needs in a complementary manner as well as being a source of peace and tranquillity.

Before we go into the specifics of creating your own water garden, there are a few guidelines you should follow. Situate the garden in an area close to a reliable power source. Ensure the site has adequate filtered sunlight for the plants. Before buying any equipment you will need to match the size of the water garden to the number of fish you intend to keep and the available space. However,

as a general principle remember that the larger the water garden, the more stable the ecosystem you develop will be.

A water garden is essentially an ecosystem in which plants and fish live in a sustainable interrelationship. Fish waste is used by the plants to grow and the water drained of its nutrients is returned to the fish. Filtering the water of fish waste is achieved by means of a small pump which pumps the water from the fish tank into the adjacent tank, situated slightly higher than the fish tank and filled with gravel. The pump discharge pipe is placed in the centre of the gravel bed tank with its outlet level at the top of the gravel bed. The gravel bed tank has a concealed outlet that allows water to flow back to the fish tank (see diagram).

Choosing your tank

The ideal tanks to make a water garden are the smaller-sized farm troughs. Not only are they of a good size but they are also very robust and come fitted with threaded fittings that can be utilized for plumbing the system. The plastic version of these watering troughs can be easily



Elephant Ears growing towards the light

fitted with skin fittings for the required plumbing and are easier to manoeuvre into place than the concrete options. If you decide to opt for the concrete tanks, bear in mind that they will need to age before fish are introduced as the concrete will leach chemicals for some time after manufacture. Be careful when placing them so that they are evenly supported across their bases to avoid cracking. Of course, it is possible to use any other suitable containers.

The water garden system operates by slowly turning over the water supply between the two tanks; therefore it only requires a modest-sized aquarium pump capable of lifting water less than a metre. A large-volume pump will only cause the water to drain too rapidly from the fish

tank and will not give the return pipe sufficient time to gravity feed water back to the tank and prevent the gravel bed from overflowing.

Even so, to avoid this happening I installed a 'T' valve in the fish tank which diverts a portion of the pump's output directly back into the fish tank. I installed another valve just below the surface of the gravel bed to further restrict the flow as necessary. I also ensured that my return pipe was at least twice the diameter of my pump's discharge outlet.

The aquarium pump inlet side has a large sponge filter which prevents large particles like gravel from blocking the impeller. In my own installation it has only required a thorough rinse every three months or so, combined with a clean of

I installed another valve just below the surface of the gravel bed to further restrict the flow as necessary.

the sump in which the pump sits. I bent some perspex to make a sump, however a suitable plastic container and strategically placed large rocks will hide the presence of the pump in the base of the fish tank. It will also ensure that the pump inlet isn't accidentally choked by small rocks and the like.

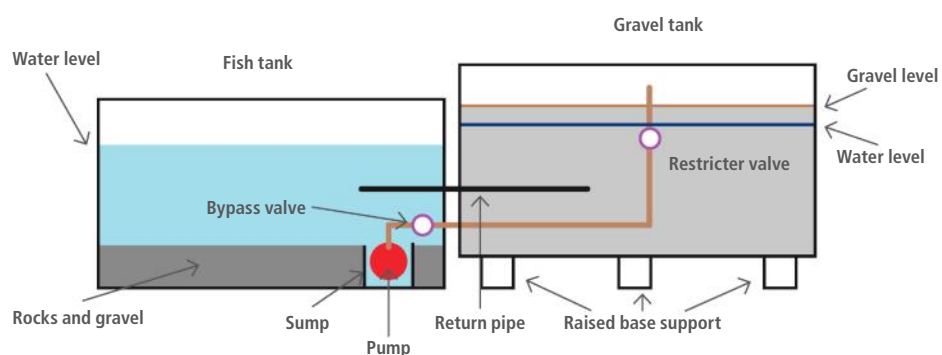
Getting started

This list is based on the equipment I used to set up my own indoor pond. There are a number of variations you can opt for to suit your particular site.

- 2 x round concrete water troughs 1 metre in diameter by 500mm high
- Aquarium pump suitable for a larger aquarium
- 12mm hose to match the pump outlet (I used 2m)
- Four threaded poly fittings with tails to suit 12mm pump outlet hose
- Four plastic reducing bushes to match fittings in the tanks to the 12mm aquarium pump output hose
- Two 25mm poly threaded tails to fit tank skin fitting and to connect the return hose
- 25mm clear plastic hose (2m)
- 4 x 12mm hose clamps
- 2 x 25mm hose clamps
- 1.5m x 12mm poly pipe plus one elbow to construct the riser in the gravel bed
- 2 x plastic inline shut-off valves to control and divert pump output
- 12mm plastic T to divert pump output into the fish tank
- Roll of thread tape
- Assortment of large rocks to cover the bottom of the fish tank and camouflage the aquarium pump
- Approximately 0.4 cubic metres of fine washed river gravel
- Three metres of treated timber approximately 75 x 35mm to elevate the gravel tank
- Panelling and timber to enclose the tanks



The pump riser in the gravel bed



Behind the façade – the tanks, return hose and step-down transformer

What to be careful of

There are plenty of layout options for the tanks other than the one I used. For example, the two tanks need not be directly adjacent to one another, in fact it is quite feasible to have one tank inside and the other outside, as long as the slight height differential is maintained. Or you may want to install low-voltage lighting in the fish tank as an additional feature.

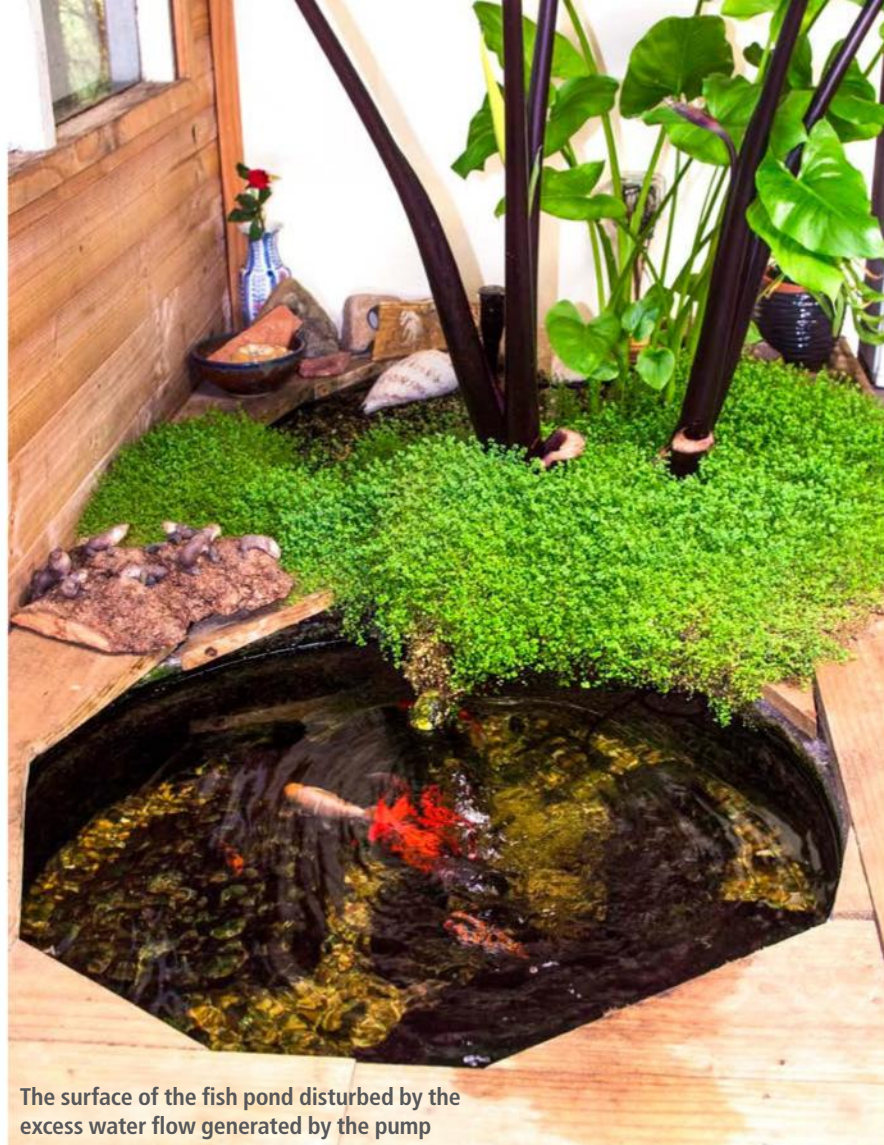
There are a number of things to be careful of when setting up your water garden. The most obvious is to ensure that the bottom tank doesn't overflow from the higher tank in the event of a power outage. The height of the back-flow outlet on the gravel bed should be at such a height that in the event of a power failure, the water held above this outlet is less than can be held on top of the existing water supply in the fish tank.

My tanks have an outlet placed about midway on the side of the tank where the float valve is normally installed that proved to be just the right height. Alternatively, route the connecting hose so that it rises to just below the normal height of water in the gravel tank. In the event of a power failure, the water level will only drop to the highest point in the connecting hose thereby preventing accidental flooding of the fish tank.

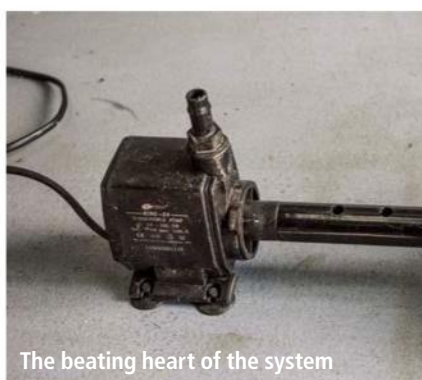
When first starting your system observe the rate at which the gravel bed fills and using the two valves mentioned previously, control the level of water in the gravel bed by restricting the outflow and diverting the pump's output in the fish tank. A little bit of fine adjustment will ensure that the water in the gravel bed stays about 1-2cms below the level of the gravel.

Planting up

The plants and fish you opt to have in the garden is really only determined by your situation. My own water garden is located in an entry area with filtered light which, although it is enclosed, is subject to significant temperature variations from season to season. For this reason I



The surface of the fish pond disturbed by the excess water flow generated by the pump



The beating heart of the system

have opted for simple gold fish in the fish tank. In the gravel bed I have had the best results with Elephant Ears (*Colocasia Esculenta*) and the ground cover Baby Tears (*Soleirolia Soleirolii*), which both thrive in moist conditions. However any plant that likes having its roots in water and which will flourish in the light and temperature conditions pertaining to your situation can be considered.

Whatever selection of plants and fish you settle on, you will be rewarded with a special low-maintenance feature in your home.

Choosing a pump

The pump I used in my pond shifts 2400 litres/hour, has a 2.4 metre head and is rated at 35 watts. As my pump is not used anywhere near its capacity, for this tank arrangement you could easily opt for one which shifts 1000 litres/hour, has a 1.95m head and is rated at 20 watts. The standard voltage in Australia and New Zealand is 230 volts. It is also possible to get submersible pumps of a similar rating that have a 12-volt stepdown transformer which in the scheme of things is probably an intrinsically safer option. Purchase a pump from a local manufacturer or reputable importer. Bear in mind that the pump only has to lift the water about 150mm above the fishpond level so it doesn't need to be all that powerful, and a pump capable of generating a head greater than that will be up to the job.

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Stephen Snedden's
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ASTONISHED BY THE COST OF A PLASTIC WELDER, AN INVENTOR MAKES ONE HIMSELF

By Jude Woodside

Photographs: Jude Woodside

Stephen Snedden is one of those irrepressible entrepreneurs with an imagination teeming with ideas. We have covered his projects in the past, particularly his rotational moulded boat, SeaHull. SeaHull is a twin-hull, unsinkable, rotational plastic boat designed to be a multifunction vessel.

A welder by trade, who refined his craft building alloy boats and barges, he built the mould for SeaHull, a complex arrangement with multiple folding

S-shapes and compound curves, in his workshop. He even built his own oven to mould the boat and then went through a long and costly exercise of learning how to effectively mould them until he finally perfected the process.

Not content with this, he went on to design a trailer that is also plastic moulded and floats so that you can launch and recover it easily.

But that wasn't his first entrepreneurial effort. Steve was one of the first to

The original Speed Welder Mark 1



start importing welders, especially AC/TIG welders, from China. He virtually pioneered the trade here, and it has now become a multi-million-dollar industry with all the major brands involved.

It was after his first moulding effort that he developed his latest invention. The first boat was far from perfect and had some holes in the hull that needed to be repaired. He looked to purchase a plastic welder but was astonished by the cost, so simply made one for himself.

Snedden's first version was made out of an old vacuum-cleaner tube and underwent some modifications along the way

Weld rod

Plastic welders usually involve a digitally controlled hot-air gun and a nozzle that directs the heat. Speed welders are an attachment that can have a plastic weld rod inserted that melts in the hot-air

stream and preheats the plastic substrate at the same time. As they are drawn across the weld, the heated tip presses the weld rod into the work. It is a faster method of welding plastic than using a hot-air stream and a welding rod, where the rod is laid down while using the air to heat both the material and the rod separately.

It's similar to the difference between TIG and MIG welding, where one involves adding a welding rod to the work by hand and other feeds the weld metal directly. The Speed Welder fits over the nozzle of a hot-air gun. Snedden's first version was made out of an old vacuum-cleaner tube and underwent some modifications along the way. He discovered that it was necessary to cut vents in the piece to release some of the heat, otherwise the gun could easily overheat.

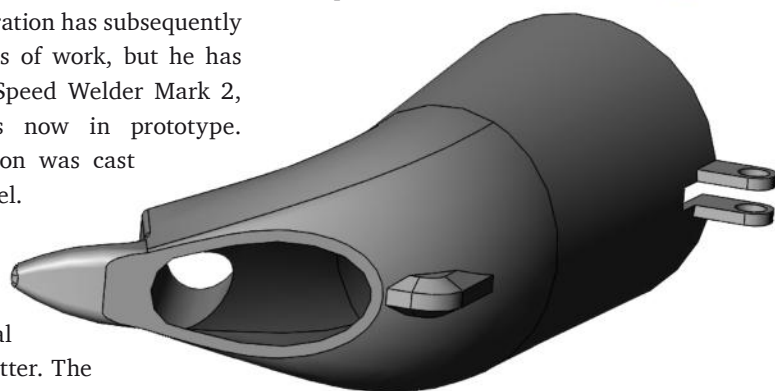
Steve's first iteration has subsequently done many hours of work, but he has now developed Speed Welder Mark 2, and Mark 3 is now in prototype. The newer version was cast in stainless steel.

Casting makes for a more solid design and the thicker cast metal will hold heat better. The newer versions have a horn that

follows a groove cut for the weld in a similar way in which you cut a V-shape to join metal in welding. The nozzle preheats the work and melts the rod as it is pulled along.

Plastic can be sanded and flamed smooth after repair, which makes the join invisible. The Speed Welder will work on most plastics that can be welded: ABS, polypropylene, polycarbonate, acrylic, nylon, and vinyl. It will accept welding rods up to 8mm but Steve prefers 4mm rods as they fulfil most applications.

Mark 3 has been formed from wax and is ready to be cast. From there Stephen hopes to be able to manufacture in bulk, offering them on the market at less than half the price of current top-end models. He is planning a Kickstarter campaign to raise the capital for full-scale manufacture. 



The new model features a second horn to follow the groove cut in the plastic



Using the Mark 2 Speed Welder



Just like welding metal, welding plastic allows multiple passes



The welder preheats the plastic then melts and presses the welding rod in place

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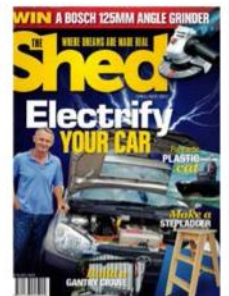
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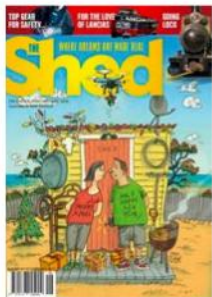
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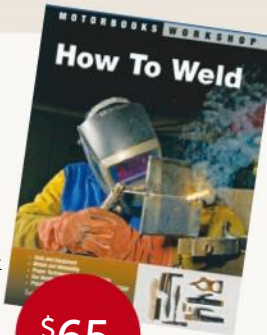
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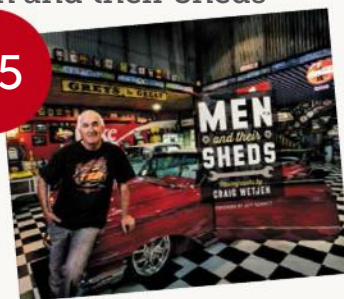
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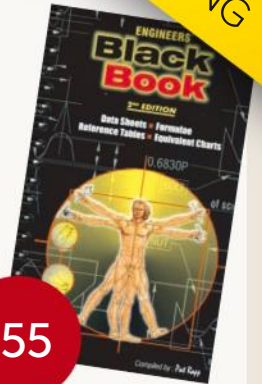
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027 901 4212 menzshedwhk@gmail.com

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Contact: Bill Rogers
06 845 4064 or 027 672 779 bill@rogers.co.nz

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Contact: Mike Whelan
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Contact: Andrew Thompson
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FEILDING MENZSHED

Contact: Jeff Wakelin
06 323 9642
secretary.feildingshed@gmail.com

MENZSHED MANAWATU

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06 357 4045 or 027 4514 572
chapple.arch@xtra.co.nz

PAHIATUA MENZ SHED

Contact: Vince Charlesworth
022 0339 010 or 06 376 7902
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LEVIN MENZ SHED

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menzlevin@gmail.com

EKETAHUNA MENZ SHED

Contact: John Bush
027 499 9430
henleymenzshed@xtra.co.nz

OTAKI MENZSHED

Contact: Tony King
022 4069 439
all@kingfamily.co.nz

MENZSHED KAPITI INC

Contact: Alan Muxlow
04 904 2318
muxala@paradise.net.nz

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Contact: Mike Parker
04 562 8688
mikeandcarolynparker@gmail.com

CITY MENZSHED WELLINGTON

Contact: John Shrapnell
04 473 7128 or 021 1725 430
info@citymenzshed.org.nz

MENZSHED CARTERTON

Contact: David Parr
06 379 7766 or 021 811 984
davidparr44@gmail.com

GREYTOWN MENZ SHED

Contact: John Boon
027 500 5072 or 06 304 7960
johnmboon@gmail.com

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Contact: Garry Thomas
027 450 0660
featherstonmenzshed@hotmail.com

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Contact: Phil Kidd
027 239 4828 or 04 528 9897
prcmk@xtra.co.nz

MEN'S SHED NAENAE

Contact: Archie Kerr
04 569 7069 menzshednaenae@gmail.com

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Contact: Ric Geisler
021 905808
martinboroughshed@gmail.com

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Contact: John Bush
027 499 9430
henleymenzshed@xtra.co.nz

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Contact: Geoff Golding
03 929 5222 nelson.menzshed@gmail.com

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03 574 2558 ianc.cameron@xtra.co.nz

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03 573 8007 eagark.s@clear.net.nz

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Contact: Tony Small
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MENS SHED WAIMEA

Contact: Alan Kissell
027 282 0185
mens.shed.waimea@gmail.com

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03 522 4616 menzshedtapaewera@gmail.com

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Contact: John Black
03 314 9095 john.r.black@opus.co.nz

MCIVER'S OXFORD COMMUNITY MEN'S SHED

Contact: Trevor Scott
03 960 4919 t
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MENZ SHED OF KAIAPOI

Contact: Frank Overend
03 327 2737 or 027 683 8286
bdirect@xtra.co.nz

BISHOPDALE MENZ SHED

Contact: Richard Rendle
03 359 7275 rendle@xtra.co.nz

ST ALBANS MENS SHED

Contact: Barbara Roper
03 352 4860 or 027 693 1278
rpb@papanui.school.nz

NEW BRIGHTON MENZ SHED

Contact: Ray Hall
03 388 7277 or 027 895 2488
secretary.nbmenzshed@gmail.com

HEI HEI MEN'S SHED@126

Contact: Henk Buunk
027 372 3338 or 03 349 0102
htbuunk@hotmail.com

LINWOOD MEN'S SHED

Contact: Shane Hollis
03 981 5594 or 022 062 0744
shane.linwoodresource@accd.org.nz

HALSWELL MEN'S SHED

Contact: Roger Spicer
027 229 1928 roger.s@xtra.co.nz

REDCLIFFS COMMUNITY SHED

Contact: Cameron Holdaway
03 384 4055
redcliffscommunityshed@gmail.com

ROWLEY COMMUNITY MEN'S SHED

Contact: Sven Christensen
vikings.bumettchristensen@gmail.com

FERRYMEAD BUSMENZ SHED

Contact: Ken Watson
03 355 7366 ChChBusMuseum@gmail.com

ROLLESTON MEN'S SHED

Contact: Stephen Rushton
03 347 4769 or 021 106 0148
rollestonshed@gmail.com

MEN'S SHED OF LINCOLN SOCIETY

Contact: Myles Rea
03 3252 632
secretary.lincolnmensshed@gmail.com

AKAROA COMMUNITY MEN'S SHED

Contact: Howard Wilson
027 407 9559 or 03 304 7480
h.wilson@xtra.co.nz

ASHBURTON MEN'S SHED

Contact: Bronie McMurtrie
03 308 6562 or 027 7716427
ash.menzshed@outlook.com

TIMARU MENZ SHED

Contact: Kevin Wildey
021 206 7291 or 03 6846087
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Contact: Russel Heckler
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Contact: John Walker
03 434 5987 eve. 027 445 5265
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Contact: Neil McArthur
03 448 9377 alexmenshed@gmail.com

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03 474 0060 or 021 1445 8531
madnel@vodafone.co.nz

TAIERI BLOKE'S SHED

Contact: Ian Miller
03 489 3666 or 027 485 1452
ianvalmiller@gmail.com



Dinkum beats dollars

By Jim Hopkins

Much has been said of late about two 'great sounds'; one in Bermuda, the other in New Zealand. The Great Sound in Bermuda is millions of litres of salt water on which boats sail. The Great Sound in New Zealand was millions of people cheering because one boat sailed faster than the other.

There's plenty to ponder about the relationship between these two great sounds, and how events on one gave rise to the other. Speaking of rises, let's start there. Being curious coves, many of you were probably wondering, as Bermuda's sun-bathed splendours shimmered on screen, how did this sensuous speck of soil rise up in the middle of the ocean?

Happily, *The Shed* has the answer. It's all down to pillow lavas, released in "a global plate kinematic reorganisation", including an "episode of unusually titaniferous sheet intrusion in the Bermuda edifice ... supported by anomalous asthenosphere ... and/or heavily influenced by lithospheric structure" sometime during "the early to middle part of the Middle Eocene".*

Fabulous, so that's cleared that up. You need wonder no longer. Bermuda is what's left of some dead volcanoes. As is Auckland. It too began with a hiss and a roar and will surely go off again in four years' time.

But here's another, harder, question. Why did our plates move? Why did we

erupt with joy at the end of this exotic, expensive, elitist event?

Let's face it, most people making the Great Sound in New Zealand as they watched those two catamarans fight it out wouldn't have had the foggiest idea how they did what they did. It beggared belief. Boats aren't supposed to whiz around on stilts or zoom across the open sea at speeds more commonly seen on the open road.

So how did it happen? To be honest, I couldn't tell you, or not for sure, anyway. But here's my theory. Imagine the Oracle and Emirates catamarans are light aircraft — which, in a sense, they are. Then the wing (formerly known as a 'sail') would have been doing the same job as a plane's engine, giving forward momentum, with constant trimming replacing the throttle to generate speed, and cyclors replacing pumps to deliver the hydraulic juice that made everything go.

Beneath the hulls, the vertical daggerboards served as a tail fin of sorts, preventing the boats from tipping over, while the foils, short as they were, did the heavy lifting, trading hydrodynamics for aerodynamics to boost water flow over their upper surfaces, thus heaving the hulls out of the ocean.

If this is wrong, so be it. It was fun thinking it through and it is semi-convincing, at least to a bear of little brain. Better still, it provides a rational

base for our irrational glee. Because it was irrational. None of us had designed the boat or built it, or paid for it, and yet, despite that, we felt the victory was ours. Understanding (maybe) how Burling and the team did do the smart stuff better and did achieve more with less, bolsters our faith in Kiwi ingenuity and No. 8-wire resourcefulness.

It explains how the little guy, short on cash but long on savvy, came up trumps in a regatta that left one of the world's richest men crying, 'Curses! Foiled again' after every race but one. It was a classic David and Goliath showdown. Which we won! Dinkum beat dollars. Brains beat bucks. Theory got thumped and practicality prevailed.

If that's true, and the results suggest it is, at least in part, then there's a lot of Kiwi shed in the mix. A history of backyard boatbuilding and experimentation, first with fibreglass, then with carbon fibre, has left a legacy of hands-on expertise and created a world-class workforce.

While the racing was on, we'd often hear about the boats going 'back to the shed' and, if you're looking for the place where this fierce belief we have in the power of our ingenuity was born, you need only go back to the shed to discover it.

**Origins of the Bermuda Volcanoes and Bermuda Rise — Peter R Vogt and Woo-Yeol Jung.*



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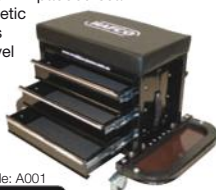
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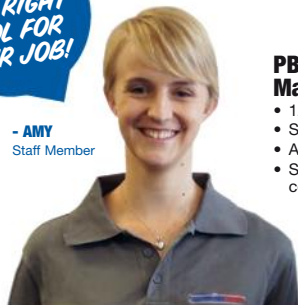
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