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JANUARY-FEBRUARY 2018

ISSUE 76

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Confession time

Hello, my name is Greg and I'm a fire-oholic.

There, I've said it. It feels good to make that confession — I feel much better now.

I'm not sure when this addiction started but I suspect, like most, probably when I was a young 'un. When my parents built their new house in the mid '60s with State Advances support, they installed a very classy fireplace. Slim, deep, dark red-coloured bricks made up the fire surround and, well, it just looked so very cool and modern to an impressionable wee fella.

We didn't have that many fires really but when we did it was usually on the weekend and I jumped at the chance to scurry under the house, chop the wood, and lug it up to watch it burn in our elegant fireplace. Lifelong addiction done and dusted, simple really. I wonder what would have happened if we had sat around discussing economics after tea?

So when *The Shed* team was planning this issue's content and what we all like to do over summer, outdoor fires and pizza ovens were the number-one favourite. No one got any arguments from me: "That sounds like a brilliant idea, let's do that," I said as I tried to somehow contain my excitement about watching the creation of and learning more about the building of some outdoor fire structures. More fires, mmm ...

So we are featuring two outdoor fires that

you can have a crack at building this issue. One out of a single sheet of weathering steel (COR-TEN) and one out of bricks. One freestanding and portable and the other placed in your favourite spot in the garden. One costs only a couple of hundred dollars (if you have the tools) and the other is simple in its design and takes probably only two days to put together at most. So, why not have a go? Come join my fire-oholic club; hasn't done me any harm — as far as I am aware.

New Shed website

After a very, very long wait, our new *Shed* website is up and running. We have got many articles up there for you to read at your leisure and we will be gradually adding more and more features as we drift into 2018. Videos, news, extra unpublished photos from articles, and so much more. We want it to be a great resource for sheddies everywhere and will keep improving it until it is just that.

Please have a look and feel free to contact us and let us know what else you would like to see up there — theshedmag.co.nz.

As this is our last issue for 2017, the whole team at *The Shed* would like to thank you for sharing in our love of all things shed-like this past year and hope you will join us again in 2018 for even more sheddie fun.

Merry Christmas and a happy, safe and prosperous New Year to you and your family.

Greg Vincent
Publishing Editor

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THE WHERE DREAMS ARE MADE REAL
Shed

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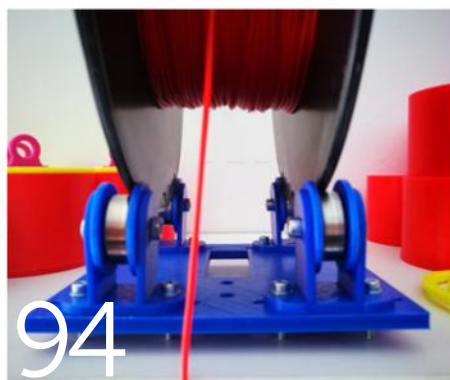
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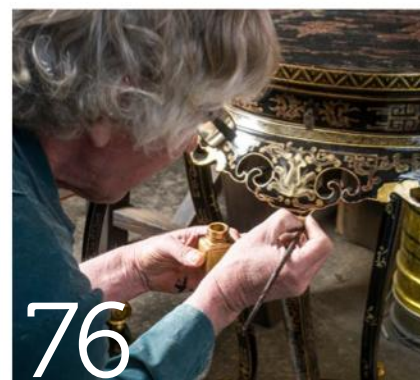
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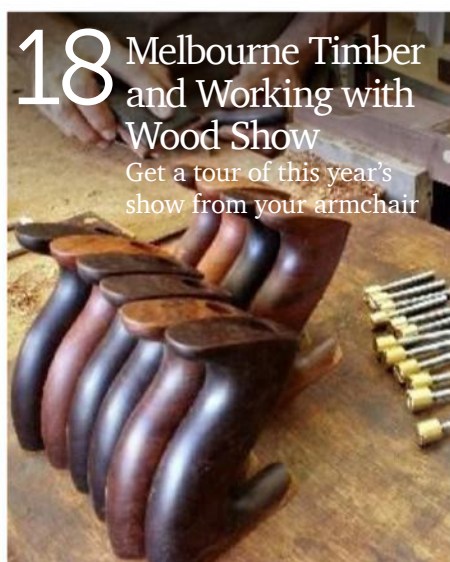
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Proud owner/creator Des Thomson



ON THE ROAD

**A FORMER ENGINEER AND MECHANICAL
DESIGNER USES HIS SKILL SET TO CREATE
THE ULTIMATE SPACIOUS CAMPER VAN**

By Sue Allison

Photographs: Juliet Nicholas



The fully expanded camper van with telescopic pod supported by jacks and legs

When Des and Kath Thomson decided to take to the road in their retirement, they wanted a camper van that was comfortable. They didn't want to be clambering up ladders, tangoing at teatime in too-narrow aisles, or struggling to turn tables into beds at night. But neither did they want to trundle around the countryside in a cumbersome mobile mansion.

They wanted a small, manoeuvrable vehicle that had masses of space inside. Space for everything, including the kitchen sink, plus another in the bathroom, a separate shower, toilet, cooker, microwave, barbecue, table and chairs, wardrobe, drawers, hot and cold water on tap, plenty of storage ... oh, and a double bed.

Kath was confident that her ingenious husband could achieve the apparently unachievable, and she was right. A year later, they were rolling down the

driveway in a compact converted camper van that, like Mary Poppins' carpet bag, appeared to contain the impossible.

The pod

The magic component of the space-defying vehicle, aptly nicknamed 'The Tardis', is a telescopic two-piece pod that cantilevers out the back. The extension perfectly fits a double bed without encroaching on the living space. The bed stays made up and the mattress squabs simply fold over for speedy get-away and set-up.

"It was Kath's idea to make a pull-out. I said, 'Oh yeah ...?'" It got Des thinking, and for a guy with a background in mechanical design and engineering, his wife's proposed pod posed a challenge but not a problem.

Des started with a 2003 Toyota Hiace SBV van, an ex-Kea rental with 130,000km on the clock. "We decided

View in from the side door to the back





The framework of the first pod takes shape



The second pod ready for the installation of the bendy ply



First coat of paint



on the Hiace because it was easy to drive, park, and store, and we wanted something that could be used as a second vehicle when required. It didn't make sense to have a large camper van that was only used a couple of times a year," says Des.

Des gutted the van, designed a new interior, and made almost all the components himself, from bolts and brackets to the moulded plastic fittings.

Dry as

The pod's framework is 25mm square pine covered in 'bendy ply'.

"It's amazing stuff I learned about from one of our joiners down at the Halswell Menzshed." He bent it over a frame, screwing and gluing it into place, and secured the joints — always an area of weakness — with fibreglass weave. The pod is finished with spray-on acrylic enamel. "Originally, we weren't going to

His wife's proposed pod posed a challenge but not a problem

Gluing the upholstery fabric to the pod interior





Eight ball bearings mounted on steel brackets support the slide-out

have two slide-outs, but we needed it for length,” says Des. “There was lot of added complexity in making a double slide-out.”

The main bearing beam is 18mm plywood with a steel rail bolted onto it. The pull-out runs on two sets of bearings with a shaft running through to lock it in place. The rear of the van sits on a pair of sprung lift-and-lock legs, which Des made using components out of a car jack, while the first pod sits on simple folding legs. The whole double pod only weighs 100kg.

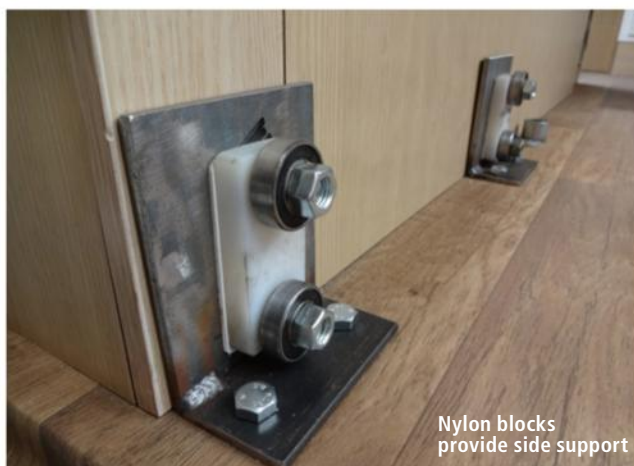
Des made all the brackets, locks, and fittings but says the trickiest part was sealing the extension with rubber compression seals. “But we’ve been in some really heavy rainstorms and it hasn’t leaked,” he says.

Attention to detail means every bit of space in the van has been cleverly used to ensure the living area functions well and, at the same time, seems surprisingly spacious.

“It’s a matter of thinking each detail through,” Des explains. “I would get Kath to come out and give me advice. A lot of this is her inspiration.” ▶

Attention to detail means every bit of space in the van has been cleverly used

When fully extended, the pod makes electrical contact for the LED lights



Nylon blocks provide side support



Vacuum moulding



Retracting the pod and packing up

A light push is all that's required to open and close



Des got into vacuum moulding when he started thinking about making the composting toilet for the camper van: "I did some research on the net and it seemed like a pretty simple process." His first effort was making the toilet bowl using a sheet of acrylic shower lining from a local supplier that sells off-cuts. He first makes the plug or pattern in MDF, finishing the form with fibreglass filler and undercoat paint to ensure a smooth surface. The pattern has rows of small holes strategically placed to suck the warm plastic around the form once the vacuum has been created. The pattern sits in a box that has holes in the bottom chamber to fit a pair of vacuum-cleaner nozzles. A sheet of plastic, held in a wooden

frame, is positioned about half a metre above a pair of double-bar heaters laid on their backs. When the plastic begins to sag, Des lowers it over the form in the box and turns on the vacuum cleaners, which suck it around the form. "It's very low-tech," says Des, who emphasizes that people normally should never disable safety devices on heaters. "It was necessary in this case so [that] I could use the heaters horizontally, but the arrangement I use should never be left unattended. When vacuum moulding, the heaters only run for about five minutes so it is safe. The MDF panels on the temporary enclosure hardly get warm." The process only takes a few minutes, after which he trims off the excess plastic with his homemade bandsaw.





Storage, storage, storage

Storage is paramount and the interior configuration includes push-button drawers, all of which have two tiers which slide independently to double the capacity. There is a wardrobe big enough to hang clothes, a linen cupboard in the bathroom, and a long sliding storage 'coffin' under the bed for items such as deck chairs and including space for a fully enclosed awning, which they put up if stopping for a few days.

Des made bearing housings for the under-bed storage unit on a homemade press tool, using 1.2mm thick stainless steel. "I made them to minimize

All interior joinery is 12mm lightweight ply with a Formica wood veneer finish

He even designed and moulded a covered toilet-roll holder to stop the paper getting soggy when showering

The overhead drawers are made from 3mm ply — light and strong

The kitchen drawers



A bit about Des



Des started working life as a meat inspector in Southland. "After nine years, I realized I was a square peg in a round hole," he says. He took a correspondence course in mechanical design and engineering drafting, along the way inventing a charcoal-driven car in the days of fuel shortages.

His invention appeared on the motoring pages of *The Southland Times*, fortuitously just before he fronted up for an interview for a job as a mechanical design draughtsman with New Zealand Aluminium Smelters in Invercargill.

They snapped him up and he began the "wonderful job" of being part of a team developing engineering solutions for the smelter's production department.

"They would ask you to come up with a concept design and, if they liked it, would give you the money to build it," he recalls. When the engineering department closed down seven years later, he moved into trade training, working with mechanical apprentices until another restructure saw him shift into the realm of health and safety. "The smelter had the worst safety record of the Australasian group," says Des, who helped get the figure of 50 lost-time injuries a year to zero in three years. The company was starting an alumina refinery on Australia's Gold Coast and asked Des to go over to set up the health and safety system. He and Kath, whose three sons had left home, spent four years in Gladstone, but when their first grandchild arrived, they were keen to head back to New Zealand to settle in Christchurch and build a house.

His health and safety expertise was soon sought by a multinational engineering firm, Fluor, which was opening a gold and copper mine in central Australia. Des spent three years flying between South Australia and Christchurch on a two-weeks-on, one-week-off roster, followed by a stint in Saudi Arabia, a year-long project in Korea, and four years in Abu Dhabi.

By then 62, he decided it was time to retire and settle permanently in Christchurch. Soon after his return, he discovered the Halswell Menzshed. "It was an absolute blessing," says Des, who goes down at least twice a week and is a supervisor, trainer, and on the steering committee.



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View from the bed towards the front with the door open into the toilet and shower area

the amount of space required for the drawer runners,” he says. “They are recessed into the bottom plywood of the drawer, making it possible to have minimal clearance but still have the drawer running smoothly and able to take heavy loads.”

Des also made the vacuum mouldings for the shower tray, basins, and composting toilet. He even designed and moulded a covered toilet-roll holder to stop the paper getting soggy when showering. The kitchen sink was a surgical tray and has hinged flaps each side which lift to become benches. The table, which fits into a tubular steel moving arm, slots into

a recess under the bed and can be used outdoors by attaching four legs.

Water, power, and finish

Des fitted the van with a 14-litre gas and electric Truma hot-water boiler, as well as a 53-litre fresh-water tank and 67-litre one for grey water. “Because it needed to be a special shape, I made my own fresh-water tank doing all my own plastic welding. Normally a plastic welder costs around \$600, but I bought some stainless-steel welding nozzles and a cheap Tool Shed hot-air gun and had everything I needed for \$130.” ▶



Above: The back (top) and front (bottom) of the MDF mould that formed Des' camper-van sink

Below: This one is for a hand basin being made for a caravan Des is fitting out for his sister in his spare time. He is cutting off excess acrylic with the homemade bandsaw





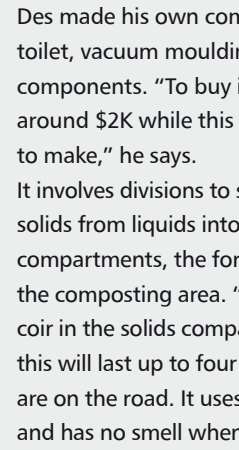
When not at the Halswell Menzshed (see article on page 90), Des can usually be found in his converted garage-cum-workshop at home. He has built many of his machines and tools from scratch, including a dual-purpose bandsaw, press tool, and foundry. A fleet of recycled vacuum cleaners are hooked up to a homebuilt dust-extraction system that he has replicated down at the Halswell shed. "I made the cyclone dust collectors because I hate dust in the workshop," says

Des. "Because they are so easy to make, I've fitted them to all the machines and several of the Menzshed members have made them as well. If you buy commercial units, they are over \$100 each, but [they] cost next to nothing using scrap." His bandsaw has three cast aluminium wheels and a two-speed drive system allowing cutting of mild steel and wood. "It takes just a couple of minutes to change from one to the other. The dust extraction system and a 12V LED work light-strip

starts with the saw and is very effective." Des used his homemade press tool to make the stainless-steel bearing housings for his camper van's under-bed storage 'coffin'.

"I made the tool out of scrap steel welded together. It was the first press tool [that] I've made and there was probably quite a lot of dumb luck involved. The press uses an air-operated 20-tonne hydraulic jack, and since building it I wonder how I got by without it."

Composting toilet



Des made his own composting toilet, vacuum moulding components. "To buy a composting toilet would cost around \$2K while this one cost around \$500 to make," he says. It involves divisions to separate the solids from liquids into two compartments, the front for the composting area. "The composting area has a coir in the solids compartment. This coir will last up to four years. It is perfect for those who are on the road. It uses a fan to draw the air out and has no smell when



composting
ing the plastic
it would be
one cost \$300

separate
different
mer going into
"We use coconut
artment, and
weeks when we
no chemicals
n operating,"

says Des. A small 12V fan runs continuously, extracting air from the toilet to the outside of the van. "The toilet is really only necessary for night use or when freedom camping. During the day while travelling, we use public toilets," he says. For background on composting toilets, Des recommends the following website: gonewiththewynns.com/all-composting-toilet. "Mine is basically a copy of the design and it works very well."



► He reinstalled all the 240V wiring and had it recertified, adding several 12V USB points, along with wiring for lights. A 500W inverter means that things can be charged when the van is parked, while a solar panel on the roof keeps the house battery topped up. A 2000W gas heater vented from a side locker and with a thermostat control keeps the van warm on chilly days.

The interior is finished with Formica veneer plywood and the walls and ceiling lined with 25mm foam-backed fabric. "It's well-insulated and cosy," says Des, who picked up the sliding side windows from a ute at a wrecker's yard and added insect screens.

His ingenuity extends to the exterior of the van. Des picked up a nifty Italian boat barbecue on

He also devised a telescopic extension to keep the gas cooker a safe distance from the vehicle and adapted it to double as a grill

Above and right: The sliding bench housing an Italian barbecue from the marine industry — it grills too





Left: The awning is lightweight — only 7kg — and takes less than 10 minutes to set up
Below: Relaxing in comfort after a day on the road



Trade Me for \$12.50 and fitted it into the side of the van. He devised a telescopic extension to keep the gas cooker a safe distance from the vehicle and adapted it to double as a grill.

Rather than carry a separate gas bottle, the barbecue hose plugs into a

bayonet fitting on the side of van that connects to the main supply bottle.

Even the cab has not escaped his attention, with a spirit level beside driver's seat to make it easy to park the camper van on a level site.

When the couple headed off on

their five-week maiden expedition around the North Island following the *Lord of the Rings* trail, the revamped vehicle — which is fully certified for freedom camping — passed the acid test. "Kath and I were still talking at the end," says Des.

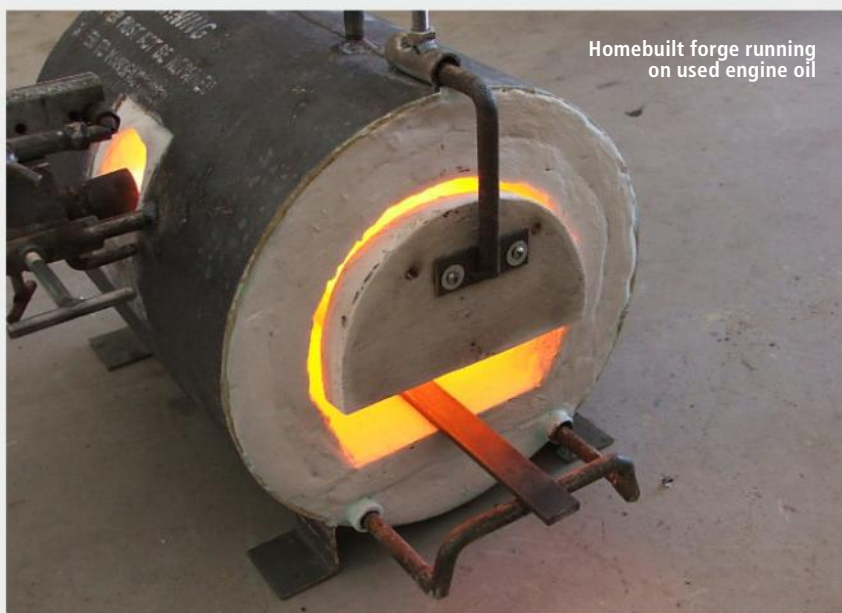
The foundry

Foundry work has been one of Des's hobbies for the past 30 years. "When I discovered aluminium casting, it opened up a whole world of possibilities of what is able to be made in the home workshop," he says.

His current furnace is made from an old hot-water cylinder, lined with Kaowool and coated with a ceramic slurry. The furnace, which runs on LPG or used engine oil, easily gets to 1100°C and will melt bronze and aluminium.

"The design of the used-engine-oil burner is my adaption of one I saw when visiting a traditional knife-maker in Japan. The burning is super-clean with no soot or smoke."

The burner uses 15psi compressed air to lift the oil from the reservoir and atomize it. LPG is used to preheat the furnace for five minutes but after that it is not required. Des also designed the LPG burner.



"I've used the foundry many times for making my workshop equipment, and now my nephew is using it to make patterns for a linisher [that] he wants to construct," says Des, who uses green

sand in a pit for casting and makes all his own patterns.

Des plans to move his foundry equipment to the Halswell Menzshed as soon as there is space for it.

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Fellowship of woodworkers

By David Blackwell

Photographs: David Blackwell

THE MELBOURNE TIMBER AND WORKING WITH WOOD SHOW IS A GREAT MOTIVATOR FOR WOODWORKERS

Those of us who work away on woodworking projects in our home workshop need stimulation and ideas that we are usually unable to get working alone.

Obviously the professionals can be motivated by the necessity to earn an income, but those of us who make for family and friends need to stimulate our minds and interrelate with other woodworkers.

I have found attending one of the Australian Timber and Working with Wood Shows to be very useful, and over the past 10 years or so I have attended shows in Sydney and Melbourne on numerous occasions.

This year I attended the Melbourne show in early September at the Caulfield Racecourse. With a great public transport system it is easy to get around

Melbourne, and I used the tram to get from my hotel to Caulfield. In 2017 there were shows in Melbourne, Sydney, Canberra, and Brisbane. The format is more or less the same at each of the venues.

The show did not appear to be as large as the previous shows I have attended in Melbourne, but there was certainly enough to keep me busy all day and I could have easily spent another half-day there.

*I liked the groups' motto
— promoting fellowship
in woodworking —
as that is what it is
all about*

Perfect hobby

Col Hosie and Pam Corrigan purchased the Gifkins Dovetail business about six years ago and they have continued Roger Gifkins' hectic schedule of demonstrating and selling the jigs at woodworking shows all around Australia. The jigs are ideal for those who want to make small boxes and comprehensive instructions are available with the jigs. Box making is brilliant for the home hobbyist, as it requires minimal space — the corner of a garage is sufficient. As part of his woodworking-show demonstrations, Col goes through the process of making a box, from raw timber to the finished box. The jigs are all beautifully made and range from the basic at \$A345 to the works at \$A1235. You need a router and router table, which Gifkins also has available.



Left: Turning displays are guaranteed to attract a crowd
Below: HNT Gordon and Co make around 50 types of tools, all of the highest quality



Canadian-made Veritas planes, spokeshaves, and marking-out tools

Woodwork only

There were approximately 50 trade stands with displays and, in most cases, demonstrations of every imaginable aspect of woodworking. A good thing from my perspective is that they are all woodwork orientated and aimed at the hobbyist woodworker and the smaller professional operator. Thankfully, there were no stands selling trinkets, ventilation systems, insurance, or other non-related products.

In addition to the trade displays, they have what they call the 'Timber Theatre' where there are presentations by experts on items such as hand tools, planes, turning, and chair upholstery, as well as an expert panel where attendees can ask woodworking questions. These are well attended, usually last about half an hour each, and you could easily spend most of a day just at those seminars.

Carbatec had the biggest stand, being very professionally set out and displaying a huge range of woodworking machinery, including a range of SawStop table saws with their unique safety devices. While I had seen videos of these devices in use, it was good to see one triggered live. The operator used a sausage, and when the sausage touched the blade it stopped the blade instantly and lowered it. There was barely a mark on the sausage. ▶

Plane speaking



Terry Gordon from HNT Gordon and Co Classic Plane Makers was one of the experts doing presentations in the Timber Theatre as well as demonstrating his planes on his stand. He talked about blade angles and some of the studies he had done over the years to work out what blade angle works best on Aussie hardwoods. He found that a blade angle of 55–60 degrees works best on curly grain. Reversing the blade to bevel up an angle of 85–90 degrees forms a scraper plane to tackle those woods that you can't plane. This high blade pitch was not being produced when the HNT Gordon planes came onto the market. The small family company is situated in New South Wales near Byron Bay and today makes around 50 types of tools, all of the highest possible quality. Most woodworkers will know that low-angle planes are designed for end-grain, but many of the seminar attendees seemed surprised when Terry said that you can probably only get about 15 minutes of planing before the blade needs sharpening. Any woodworker would be proud to have one of HNT Gordon's planes in their toolbox.



The Arbortech stand attracted so much attention that it was difficult to get a good view of its carving demonstration

► I am sure once competing devices enter the market they will become mandatory for all table saws sold.

Carbatec also had a number of experts from suppliers on its stand, such as the man demonstrating the Tormek sharpening machines. Throughout the day, he had a large number of people watching his demonstrations and asking questions. There was even an area where attendees could make themselves a mallet.

Expert advice

The quality hand-tool manufacturers were out in force — including HNT Gordon and Co. and Lie-Nielsen Tool Works — all with experts to talk about their tools, demonstrate them, and then let prospective customers try them.

Another regular at the shows is the team from Gifkins Dovetail, which always attracts a huge crowd when demonstrating its excellent box-making

dovetail jigs. These were designed and manufactured by Roger Gifkins in Australia, and when he retired in 2011 he sold the business to Col Hosie and Pam Corrigan.

The Arbortech stand attracted so much attention that it was difficult to get a good view of its carving demonstration using the Arbortech equipment. Woodturning was also popular, with dozens watching each demonstration. There were large screens to ensure that everyone could see the finer details of the demonstrations.

Timber is a significant product displayed and sold at the shows. The range is enormous, and I am always a bit envious of others buying pieces, as it is impractical to put some prize pieces under my arm and board the plane for home.

I have had a number of projects recently that required special finishing and it was great to visit the FeastWatson stand and talk to the company's experts



Above left: the Hand Tool Preservation Society stand; below: make your own mallet



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Tom Walsh

New IAAF World Champion,
Olympian, NZ record holder,
qualified builder, NZCB member
and ITAB graduate.

about a number of its finishing products. I have used several FeastWatson products over the past year or so and to be able to get quality information direct from the horse's mouth, so to speak, was invaluable. I am always a bit sceptical of some of the information dispensed from the staff at the big box stores.

Woodwork enthusiasts

Several volunteer membership-type groups were represented, demonstrating woodturning, pyrography, and scroll sawing. They had a large number of their members in attendance who were all great to chat to. I liked the groups' motto — Promoting fellowship in woodworking — as that is what it is all about. The Hand Tool Preservation Society was also there demonstrating some of the earliest scroll saws I have ever seen.

To have so many sellers of woodworking products in the one place at the same time is a great way for woodworkers to plan their next purchase, and to be able to have them demonstrated by an expert is of enormous value. Throughout my working life running businesses, I have attended dozens of conferences,

seminars, and workshops, and I always maintain that the best value from these are the one-on-one discussions at morning teatime, lunchtime, or with the fellow attendees you meet in the hotel lift.

These Australian woodworking shows, to me, are very similar, as they offer the opportunity to meet a huge

Every woodworker needs to sharpen chisels and plane blades regularly and the demonstrations by Tormek were very popular.

A sharpening expert demonstrated the Tormek wet-stone sharpening machine and all the available jigs, including knife-sharpening jigs, and he always had an eager group of listeners. After each sharpening operation, he was swamped with questions, which he either answered or demonstrated again to satisfy the enquiry.

The Tormek system was designed and established by Torgny Jansson in Sweden in the early 1970s and is now sold all around the world. A must-have for any workshop.

Sharpen up



number of people to share ideas with. I highly recommend the trip across the ditch to every woodworking enthusiast. Allow at least a full day, possibly more, in your travel schedule to be able to fully absorb the full atmosphere of the show.

Google 'Australian Timber and Working with Wood Shows' for the dates of and details on the 2018 shows. 📅

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The Shed magazine is not one I would normally pick up, but I was hanging with my dad a few weeks ago and came across his collection of *Shed* magazines. After perusing the pages I noticed we have some very talented Kiwis out there.

I was particularly drawn to the miniature trains in Issue No. 73 and the awesome glass art in the December–January 2017 issue. I also really enjoyed looking at the projects for people to have a go at in their own sheds.

It is fabulous to see such a range of quality talent and really great that people get to inspire and show off their skills to others.

Apart from writing to congratulate you on your awesome magazine I wanted to ask, is it possible to shout out to your sheddie followers to find out if anyone makes or knows of any person in New Zealand who makes miniature wooden puzzles?

Is there a sheddie out there who has a scroll saw yearning to be used, and start the creative challenge of making miniature puzzles?

I found a fantastic article online about a gentleman in America who was making these puzzles [pictured] as a hobby [see lilblueboo.com/2016/02/minature-jigsaw-puzzles-made-from-postage-stamps.html].

I'm an avid miniature fan/collector and would love to learn how to make these miniature puzzles, which are the size of postage stamps and made of wood using a scroll saw.

Keep up the great work.

Mikayla Power, via email

Thanks for your letter, Mikayla, and your kind comments re. The Shed. Hopefully there will be a Shed reader or two out there who will get in touch and share your enthusiasm.
— Editor

The winner of the letter of the month wins this fine Coast product



With a fiberglass-filled nylon handle and a carefully crafted thumb perch, the Coast BX311 Lock Back Folding Knife is designed for excellent grip control. With a simple-to-use back lock combined with a three-position pocket clip for convenient carrying and a thumb hole for easy opening, this knife is a great folder for everyday use.

This issue's winner is Mikayla Power.

Letters should be emailed to editor@theshedmag.co.nz, or posted to Editor, The Shed magazine, PO Box 46020, Herne Bay, Auckland 1147.



A very happy *Shed* reader

Recently a large truck arrived at our place and proceeded to unload a large package on our drive. I asked him what was he delivering as I had not ordered anything that I recalled. The name and address was correct and the packing slip which I read quickly was nothing I was expecting.

On a second read, the penny dropped and my wife said I was so excited I was like a kid let out of school early. It is a red letter day when my *Shed* magazine arrives and to win this [subscriber]

promotion was the icing on the cake.

I have purchased *The Shed* magazine since it was first published and keep them to refer to if required. Thank you once again.

Gary Maxey, Ashburton.

You are very welcome, Gary. We value our subscribers dearly, and it's a red letter day here too when we receive a letter like this. Congratulations!

Gary won this Campbell Hausfeld Pneumatic package worth from The Shed Issue No. 73 worth \$3595.
— Editor

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WARM IT UP

A STEEL CHIMENEA PROVES TO BE
THE PERFECT OUTDOOR HEATER

By Jude Woodside

Photography: Samantha Woodside

Outdoor fireplaces are great on a cool summer's night and even better during the chill of autumn and spring. But not everyone has the space or the time to build a brick fireplace like the Lowe family featured elsewhere in this issue. Chimeneas are intended to radiate heat in all directions. They are traditionally made of clay or cast metal but they can be made of sheet metal.

The issue with steel heaters, of course, is rust. However, Corten steel is weathering steel that is intended to rust to a point and stop. It is a corrosion-resistant ('cor') high-tensile ('ten') steel that will develop a patina of rust but not continue to rust through. It is popular as a building cladding and often used for signs.

“306 stainless wire will weld almost anything”

How to weld Corten

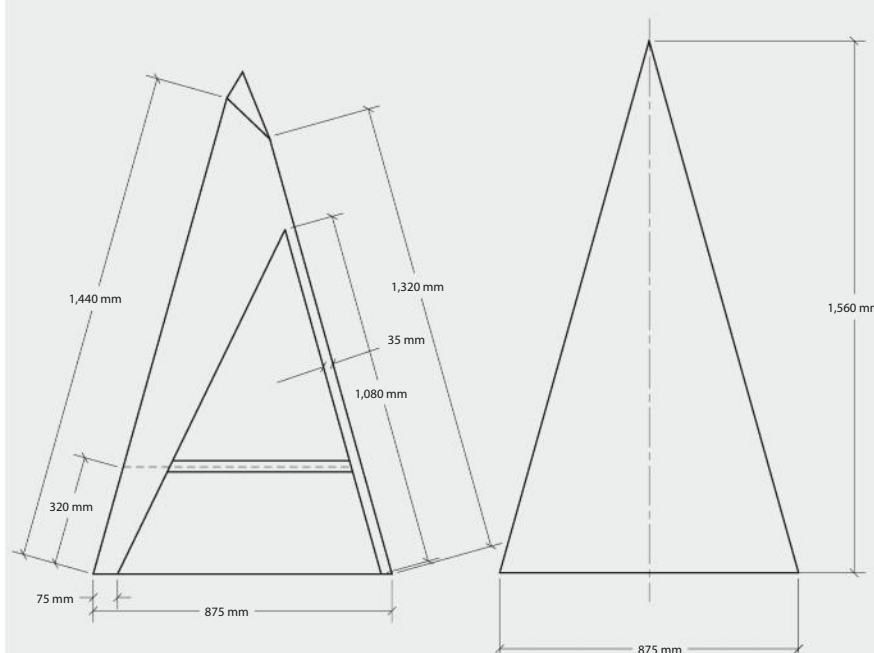
Corten is the ideal material for an outdoor heater precisely for this reason. These heaters are quite popular both here and overseas and many of them are made from folded steel. I don't have access to a folder big enough to bend a sheet of Corten, so I set about making a replica of one and simply welded the parts together.

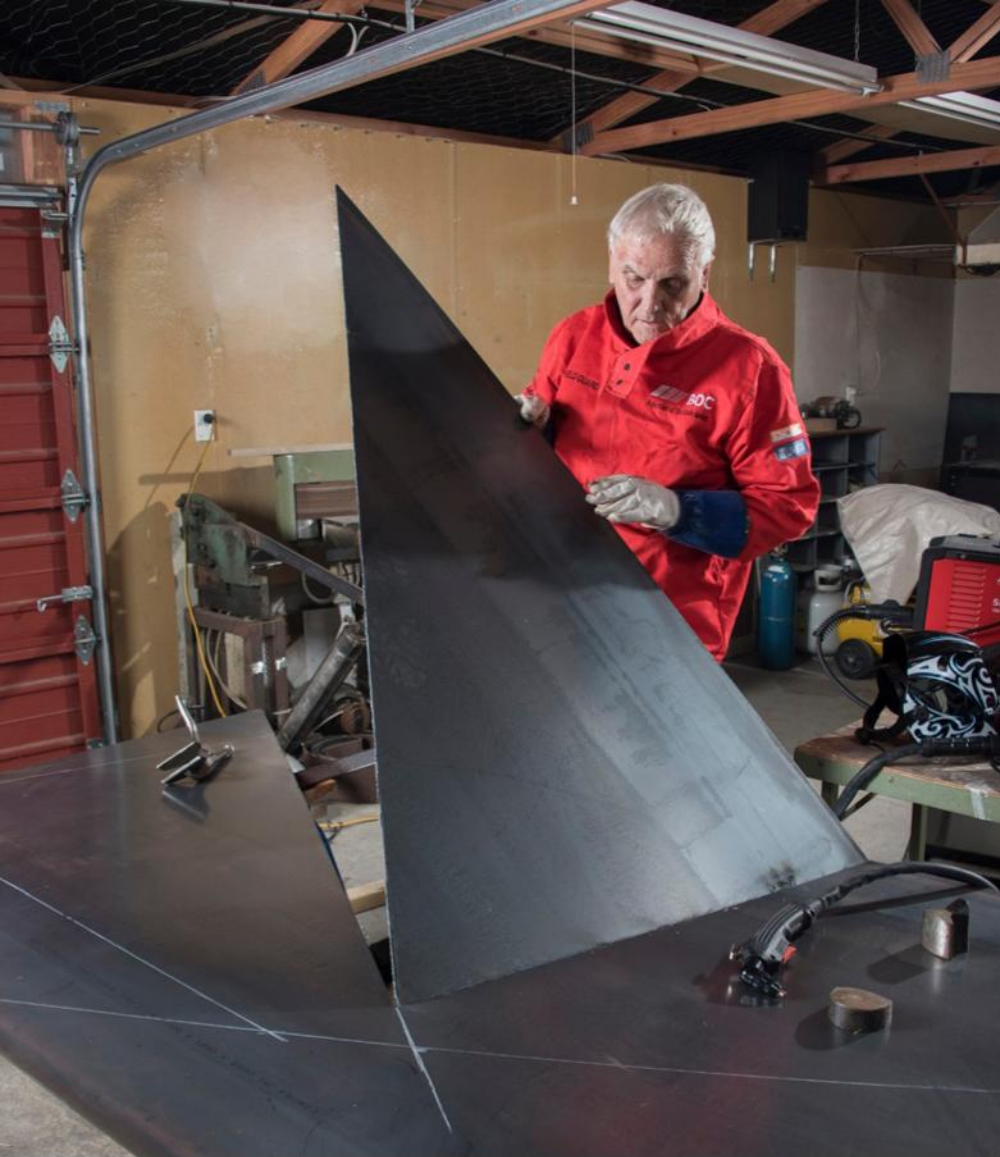
Welding Corten, or any corrosion-resistant steel, is an issue because the mild-steel welding wire is not as resistant as the steel itself and it could rust through in time. However 309 stainless wire will weld almost anything and it's the fallback MIG wire to use when you aren't too sure what kind of steels you are welding. ▶



Above: Laying out the parts
Left: Cutting the first section

Dimensions





Left: First section cut out
Above: Cutting the last section

► It will do one of two things in this instance — either it will not rust and provide some contrast to the uniform orange rust of the steel, or it will be sufficiently well mixed with the Corten that it will rust at the same rate as the parent material. Either way it's the best wire to use with Corten. However, 309 only comes in .9mm diameter wire size so you will need a larger MIG tip.

CAD design issues

I have just moved to a new workshop and I don't have any equipment for handling material. I ordered a sheet of 3mm Corten, which fortunately only weighs 70kg, so two people can handle it easily.

I was keen to make sure that the heater could be made from one sheet.

I tried to model the heater using CAD. I use Onshape — it's free and it works with Mac, but I could not manage to create a three-sided pyramid. My limited CAD skills defeated me no matter how hard I tried. So I made a mock-up of two

I was keen to make sure that the heater could be made from one sheet

sides using ply and worked out how best to lay them out on the sheet.

It wasn't possible to lay out three of the templates without cutting one slightly short, but that suited the design so I went ahead with the layout.

I planned to cut them with a plasma cutter, something I confess I have not done before. I have just acquired a BOC Smoothcut Plasma 40. This machine has a great rating online and it's very compact and light. Plasmas require compressed air — they work by ionizing air into high-temperature plasma. The plasma creates a needle-like jet that easily cuts through nearly any conductive material. It's important

that the air you use is free from oil and water. Compressed air is notoriously very humid and this will quickly wear out the plasma tips through which the plasma jet is directed.

Air-drying equipment

I have a good compressed air system in my new workshop, but it had no effective air-drying equipment. Air dryers for compressed air can run to some very big figures and are vital for manufacturing plants, but for little shops like mine and probably yours they are out of reach. The next best option is a 'desiccant dryer'. This is a filter placed after a condensing filter that can harvest some of the water. It contains a blue desiccant (silica gel beads) that change colour on reaction with water. I ordered a new desiccant filter and installed it in my shop so it can be used as and when I need a dry airline, for spray painting or plasma cutting.

The plasma cutter comes with a regulator so you can adjust the force of the air. I set mine to around 5bar. All



Cleaning up the edges



Cutting the relief for the feet



Sides clamped in place

that remained was to set the amperage. This machine can cut up to 10mm mild steel and that would require 40A. The 3mm sheet can be cut with considerably less but I opted for an amperage of around 25A. For small-gauge sheet metal you can simply drag the tip over the piece, although I found that it tended to miss bits, which may be due to the composition of the steel or the fact

that dragging the tip in contact with the steel is not a great idea. It is possible to get tips that incorporate a 1mm standoff and I'm looking out for them now.

I found that I had to go over the cut two or more times to take account of the areas it missed. Overall the cuts were very clean and very precise until the tip deteriorated, although in the entire cutting I only changed the tip once. ▶



Tacking the sides



Marking the cut-out for the front

Cutting the steel sections

With the template firmly attached to the work (I used some lead weights and a clamp), start the cut at an edge with the torch slanted. Bring the torch up to 90 degrees to the work and drag using the template as a guide. Don't go too fast — you can see how the torch is cutting — but don't loiter either. This is a very hot torch and you don't want to melt any more than you need to.

I cut out the three sides and cleaned up the edges with the angle grinder. The upper surface of the cut pieces was clean but the undersides had slag and solidified metal slag on the edges. At that point I realized that I had intended to cut a relief into the base of the sections to create feet for better stability and to prevent too much heat transference to the ground where it might scorch a deck. I cut one of the templates to create this relief and recut the two sides. The front piece didn't require feet as most of it would get cut away later.

With the piece cut to size I arranged two at 60 degrees with the help of a block of plywood cut to that angle. I tacked

the two pieces together. I could then fit the last piece in place and measure the cut-out for the opening. I left a strip to be welded to the right-hand edge. I cut the opening in the last piece with the plasma cutter and cleaned up with the grinder as before.

Overall the cuts were very clean and very precise until the tip deteriorated

Fireplace shelf placement

Before tacking this last piece in place I cut a piece out of the remainder of the sheet to act as a fireplace. I cut the piece to 60 degrees and to about 650mm. This fits at 320mm from the base. You can adjust this to your own preference, but I felt that this was high enough off the ground not to scorch the base and to allow enough area for the fire itself.

To make it easier to weld, I laid the piece down on its backbone and



Cutting out the front

supported it with sawhorses. That meant I could fit the fireplace with some persuasion and tack and weld it in place.

While it was prone I took the opportunity to lay a bead of weld in the V. The difficulty of this was that it couldn't be ground out, so I'm not sure if it was such a good idea; however, it isn't readily visible when the fire is in operation.

I attached a strip, also cut from the scrap, to the front of the fireplace to prevent embers falling out.

With the fireplace in place I set the piece on its feet again and fitted the front piece. This was not as straightforward I had thought. Sheet metal has a tendency to warp and the fireplace had caused it to bulge a little and dip in other places. I managed to get one side (the left) aligned and tacked it in place. ▶



Tacking the sides. The lack of a flat plane made clamping awkward



Below left to right:
Welding the sides from the inside
The sides and shelf welded
Forcing the sides to fit

Right: Tacking the shelf in place



► However, the other side was not cooperating. I laid the piece down on the ground again and used a shaped piece of wood to force the side out. It required some tricky manipulating with a clamp and a wedge to force the two pieces together long enough to apply a tack.

I also found that I had to use another shaped piece of wood, cut to 60 degrees, to get the sides in place between the tacks and at the ends.

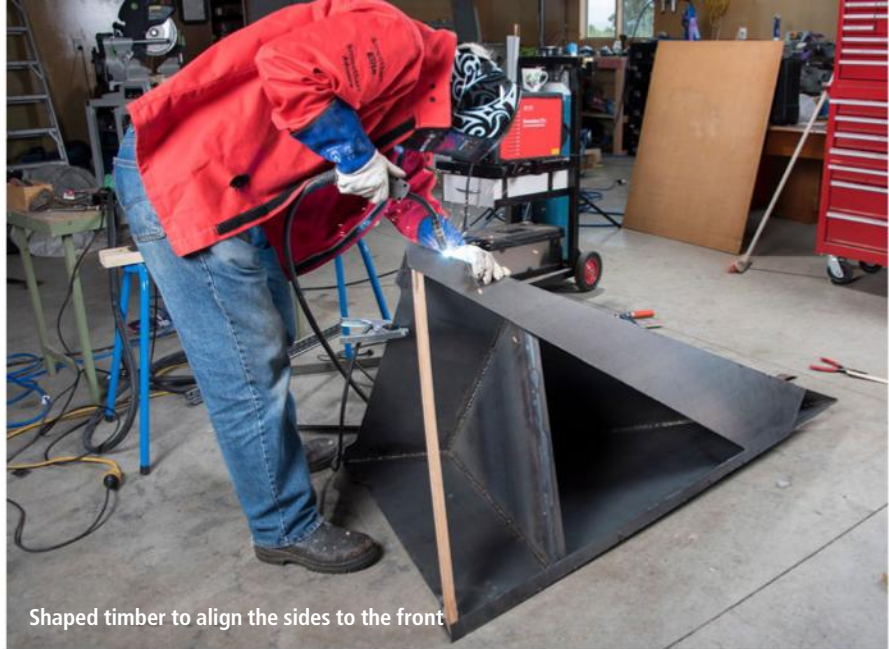
Great rusty finish

With the sides tacked it only remained to weld up the seams. I found the 309 to be harder than mild steel and I used a few flap discs until I was happy with the seams. The seams and the parts nearby had the oxides ground off them so I expect those bits to rust first. Unfortunately, I was unable to get this project finished in time to get it to rust. There are ways to get Corten to rust faster, including applying acid, salt water, etc., but none is really effective. The only way to do this is to wait, and it can take some months to get a homogenous coating all over the piece. At first it is often streaky and patchy but it will eventually rust to an even colour. Using it will hasten that process too.

Safely sited

To complete the piece I knocked up a base from galvanized steel for the heater to sit on and filled that with rocks and gravel to help prevent it scorching the deck. I also drilled a few 12mm holes in the base to allow air to circulate — but not so many that embers could fall through. I was prepared to add more, but its first firing proved this was unnecessary. The fire started well and worked as intended, radiating heat both from the sides and the open fire. The added advantage to the chimenea is that its small size means it can be easily moved and repositioned on the deck or in the garden.

It's a worthwhile summer project and can be achieved in a day or two in the average workshop, not to mention being an excellent excuse to buy that plasma cutter you have always wanted. 📁



Shaped timber to align the sides to the front



Clamp and wedge to pull the sides and front together

Sheet metal has a tendency to warp and the fireplace had caused it to bulge a little

Plasma cutters

A plasma cutter is a relatively simple piece of equipment. The cutter consists of a hafnium electrode and a tip with a very small hole that directs the plasma jet. The tip can deteriorate easily without

clean, dry air. A desiccant dryer is a good solution for drying air.

The front panel has a switch for setting the airflow duration after cutting ceases and an amperage adjustment.



Plasma-cutter parts showing the tip, the hafnium electrode, and the cap



An in-line desiccant filter



309 stainless MIG wire



The BOC Smoothcut Plasma 40

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CHOOSING THE RIGHT MATERIALS IS A VITAL PART OF A SUCCESSFUL OUTDOOR FIREPLACE BUILD

By Lachie Jones

Photographs: Adam Croy

If there's an element we Kiwis love more than the water in the summertime, it's fire. We use it to cook with; we use it to keep warm; and a good chunk of us just like to watch it, listen to it, smell it.

There's a magical ambience to a wood-burning fireplace that gas or electricity just can't replicate. Although pizza ovens are a real favourite with us sheddies, we decided that first this summer, we'd prefer somewhere to crowd around a space where chores are not involved —

time to kick back. So here we're going to take a look at an option to build your very own wood-burning block fireplace, so you can spend hours watching the flames flicker while perhaps enjoying a frosty beverage or two.

Good-looking and long-lasting

If the idea is to build something to ultimately become a focal point of your outdoor living area, you'll want something

that not only looks good and does the job but is also sturdy and long-lasting.

To ensure you get this longevity, good firebricks are essential. A good firebrick will protect the steel, concrete, or timber facade of your outdoor fireplace as well as keeping a steady, hot temperature inside the fire itself. Although this fire being built on the following pages, is not for cooking, when you're cooking in something like a pizza oven, this evenness in



Bevan Unchurch measures one of his firebricks to ensure it's within spec

Tips

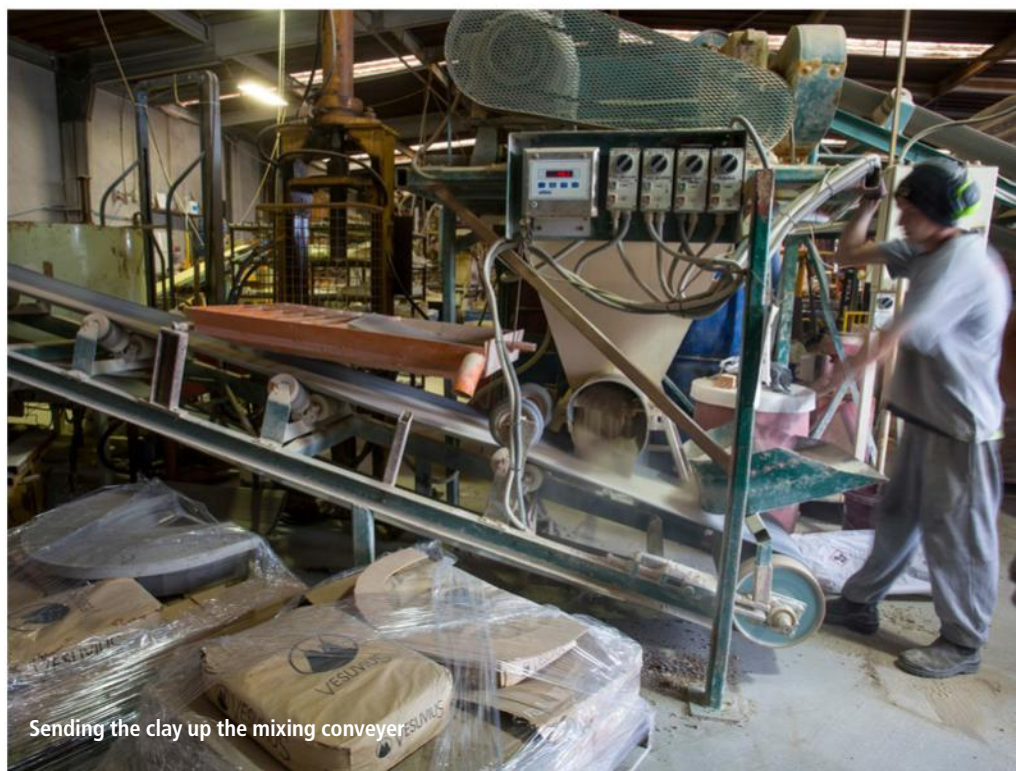


Firebricks are dense so you will need to use a brick saw or an angle grinder to cut them. A good diamond blade is also required. When cutting the bricks use running water, which will help the diamond blade by cooling it and will also keep the dust down.

temperature can be the difference between wowing the crowds gathered around your flaming masterpiece and calling for Chef Domino.

What are 'firebricks'?

A firebrick is used to line furnaces; kilns; and, of course, fireplaces. Built to withstand extremely high temperatures, they also have low thermal conductivity. This means that your fireplace will be more energy efficient as it will need less



Sending the clay up the mixing conveyor

A good firebrick will protect the steel, concrete, or timber facade of your outdoor fireplace as well as keeping a steady, hot temperature



Bevan checks the clay in the mixer



Final check of the mixed clay to ensure the correct consistency



The clay leaves the extruder and the team removes larger bits of the mix to keep a smooth finish

fuel to keep it hotter for longer.

Firebricks contain refractory properties, are heavy, and have low porosity. Regular, or masonry, bricks are more porous. Ordinary bricks begin to decompose at 650°C, whereas firebricks can withstand temperatures of up to almost 1000°C. Firebrick clay is a natural product, and its colour will depend on where in the world it was mined. But the colour can also be changed with firing temperature and oxides. The way the furnace is fired will change the colour you will get from it. However, firebricks are manufactured for their technical abilities not for colour.

While regular bricks can be unevenly shaped, firebricks are mostly uniformly rectangular.

A man who makes them

To learn how firebricks are manufactured, we met Bevan Upchurch of Certec in West Auckland, which manufactures and stocks a number of different-sized bricks, and has featured before in issues of *The Shed* when we have built pizza ovens. The company manufactures for a good portion of New Zealand's wood-fire industry, as well as the glass and foundry industries.

A number of different recipes and

techniques is used to make firebricks. Certec is able to manufacture firebricks from 35- to 66-per-cent alumina to add to the longevity of the fireplace, and can also make firebricks to order and import specialist bricks from around the world to suit kilns and other commercial operations.

How firebricks are made

Much like normal bricks, clay is fired in a kiln until vitrification occurs (vitrification is the progressive partial fusion of a clay, or of a body, as a result of the firing process).

As the vitrification process continues, the proportion of glassy bond increases and the bricks become gradually less porous. There are different types and weights of firebricks, and they have benefits dependent on your desired outcome.

Lighter firebricks can be cut using a hacksaw or chisel and are generally less resistant to heat than the heavier bricks with their mass made up of tiny air spaces taking on a honeycomb effect.

Lightweight firebricks are used mainly in industrial and hobby kilns, which use either electric spiral elements or gas burners, as well as furnaces,

What is 'alumina'?

'Alumina', otherwise known as 'aluminum oxide', is a chemical compound comprised of aluminum and oxygen molecules. When refined from bauxite, alumina generally looks like a white powder similar to regular table salt. Alumina flakes are used to give automotive paint its reflective quality, as well as, as an abrasive and a less expensive substitute for industrial diamond.



The clay in its unrefined form



Pressing the brick into shape in the brick press

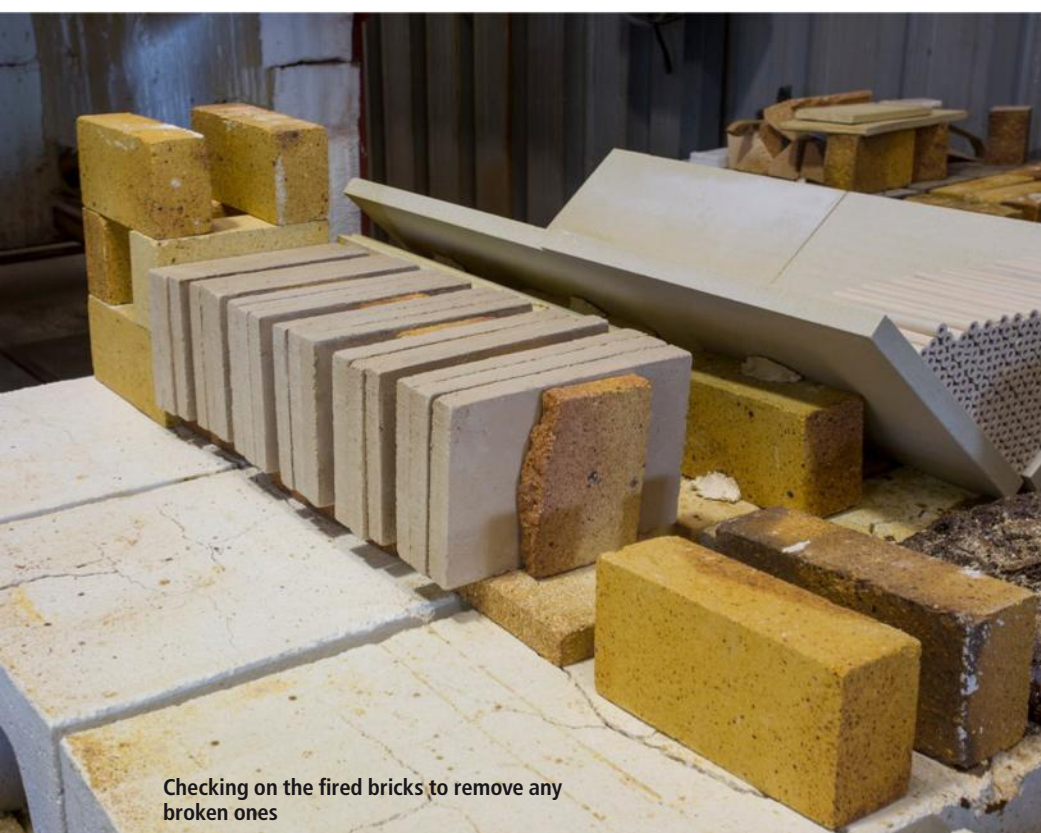


The nicely shaped brick coming out of the press

Alumina has an effect on the density, porosity, and weight of the firebricks



The bricks are loaded into the furnace for firing. The furnace is capable of holding two tonnes of bricks per fire



Checking on the fired bricks to remove any broken ones



both for lining or outer back-up heat insulation.

Heavy, dense firebricks are made from basic fire clay, which is about as close to mud as you can get. Fire clay is easy enough to track down, but requires the correct refractory properties.

The right brick for the job

The alumina content range is important for choosing the right product for the right temperature. Alumina has an effect on the density, porosity, and

weight of the firebricks.

The lowest grade you will get in New Zealand is a 35-per-cent alumina. The higher the alumina content, the harder the bricks, as well as the more they will cost.

Now you've got your firebrick knowledge sorted, you'll need to take a look at where you'll be building your outdoor fire, what type will suit you, and whether you'll be using it for cooking or if it will simply be for warmth and ambience.



Fired brick ready to go





Kerrin measures and prepares the first layer of bricks

CONSTRUCTING A KITSET BLOCK FIRE

THIS IS ONE OPTION TO CONSIDER WHEN CHOOSING TO BUILD YOUR OUTDOOR FIRE

By Lachie Jones

Photographs Tony Lowe

Around this time of year, you'll be heading to see friends and family at their homes. While you're catching up, it's quite likely that a fireplace will become a focal point. Be it standing around a good old gas barbecue burning some sizzlers or warming yourself poolside with a magnificent all-in-one fire, grill, and pizza oven, there will be fire. Most sheddies will quite likely say to themselves, "I want to build one of these!"

Now, there are options for that outdoor brick-fire build. You could design one yourself from scratch and build a bespoke fire suited to your own wood-burning desires. You could get a bloke in ... hmm ... that doesn't sound right. Or, what we reckon is the in between third, not-bad option is to build one from a kitset. It will need a good skill level to complete but all the hard design work and functionality will have been taken care of with your choice of product, so you can rest easy on that count.

The Shed opted for this third choice and we reckon it could be just the ticket for many sheddies.

We visited the Lowe household in rural South Auckland, who was about to install a kitset fire manufactured by Aztec Fires, and followed the build. No one in the family felt that they had the skills to put together the fire themselves, but Kerrin Thomson of Aztec encouraged them to at least build the concrete pad. He explained that a concrete pad build is not too difficult and after giving them a bit of a run down on the dos and don'ts, pointed the Lowe family to some useful online advice.

How hard is the build?

Kerrin tells us this is a great father-and-son project and encourages purchasers to do just that. To prove the point, he decided he would get his 14-year-old son Levi to help with the build.

Kerrin estimated it would take two

Tools

- A wheelbarrow or trolley is useful for moving pieces around the site
- Ladder(s) or platforms when lifting the chimney pieces in place
- Grinder with masonry or diamond disc
- Stanley knife and cartridge gun for applying glue
- Tape measure and long level
- Several sash clamps
- Six plus tubes of Gorilla Grip

Building the concrete pad



Build your boxing to the required size — for this particular fire, it was 1400x1200mm. As the weight of this fire would be 1.2 tonnes, the pad was made to a depth of 200mm complete with steel reinforcing. Mark out your pad then dig it out to the required depth



Secure the boxing with pegs, ensuring all is square and level prior to laying your base course. Ensure your boxing is also square with any fences, buildings, etc., nearby



After compacting the base course, put in a layer of sand



Put a layer of polythene over the sand and install the steel reinforcing mesh. Lift the mesh by placing stone or broken bricks underneath to raise it to sit into the middle of the eventual poured concrete



Pour in the concrete and level off flat with a concrete trowel



The completed concrete pad. This was poured six days prior to the fire build to ensure it was well and truly set for its upcoming heavy load



Bottom layer getting positioned on the pad



Young Levi does the first of his many glue applications



The first layer is critical to get accurately square and level

adults with some good sheddie clues four to six hours to build the kitset fire. Good call — it took Kerrin and Levi five hours to build the finished fire you see pictured here.

If your skills are not at that level, a whole day would see the job done. All up, with pad and fireplace, time taken for the Lowe's build was under two days.

The kitset

The Pavilion Fireplace kitset we used arrived as 30 separate pieces totalling around 1200kg — meaning access for this kitset fire is easier than the alternative of hiring a Hiab to drop in a pre-made fireplace, which often weigh up to four tonne.

Before you start lugging all of the

pieces to site, you'll need to figure out the best place to build your new fireplace. Wherever you are in New Zealand, it will pay to get in touch with your local

Safety warnings

- The two mantle pieces weigh around 90kg each — they are heavy. It's a minimum two-person lift and important to use correct lifting techniques.
- As the height of the fireplace increases, ensure any ladders or platforms used are suitable for the task and have a secure footing.
- Always wear gloves, eye and ear protection, and a dust mask when using a grinder.
- When applying Gorilla Grip, we suggest you wear disposable gloves as the adhesive is quite difficult to remove from your skin.

Kerrin grinds most of the bricks to get a really good fit





The rear hearth goes on



The side and bottom firebricks of the firebox



“Before you start lugging all of the pieces to site, you’ll need to figure out the best place to build”



Foreman Levi is happy — all is as it should be

council to establish what the rules are for outdoor fireplaces in regard to distance from boundary fences and significant trees. Keep in mind the finished height of the fireplace — based on the kitset-chimney provided, we knew that this one would stand 2.5m high.

Pad build

Once you’ve established the right spot for the build that meets your own and the council’s criteria, you’ll need to clear an area for a concrete base that the fire will sit on — 1400x1200mm and 200mm deep in this case. Once you’ve dug out to the required dimensions and ensured that the area is clear of any roots and loose debris, you’ll need to box up the area to prepare for the concrete pad. The pad itself will need to be reinforced given the weight of the fireplace — this one weighs 1200kg,

for example. Once you’ve boxed in the area, use stakes to hold it in place.

Make sure that the boxing is of equal measurement from corner to corner to ensure a true square and that it is level and square to any nearby fences, hedges, or buildings.

You’ll then lay a base course of stones to 100mm that will require compacting (which is always the fun bit!).

Then pour a layer of sand on top of the base course to 50mm below the framing level. This will fill in the gaps and make for a sturdy base for the concrete to be poured.

Pour the concrete

The next step is to place some polythene over the sand. Because of the weight of the fire, you’ll need to put some reinforcing steel through the concrete



Kerrin cuts a stress groove in the base firebrick

Assembly tips



- It is a good idea to 'dry fit' the various sections of this type of construction (wood box, outer firebox, chimney) before applying glue. Sometimes blocks fit better into one block than the next, but you will need to make a few adjustments with your grinder to get a snug and tidy fit on some blocks.
- Throughout the process, continue without fail to use your tape measure and level to check that what you are building is level and square as you go before you apply any glue.
- Kerrin recommends Gorilla Grip, which takes two hours to fully set and gives you a good 15 minutes to make any adjustments. Once set, this glue is as strong as concrete.



Above: Firebox completed

Below: The gap between the firebox and the outer bricks is filled with scoria to act as insulation



Above left: Fitting the rear firebricks and metal spine. The spine supports the firebricks, which are angled to push heat out the front of the fire
Above right: A real plus to this kitset is the interlocking bricks
Left: Firebox surround completed and sash clamps keep every layer tight and square until the glue hardens
Below: The stainless-steel visor slips easily into place



layer, so that the base will remain firmly in place for years to come. Elevate the steel mesh to about halfway between the polythene layer and the top of the boxing using bits of brick or stones.

Depending on access to the site, you'll now be ready to either pour your ready-mix or get a concrete mixer in to mix your concrete. Of course the concrete base will require trowelling and final smoothing off to get it looking its best — smooth and dead flat.

After waiting five or more days for the pad to properly dry, your base will be well set and you'll be ready to get underway with putting your kitset fireplace together.

Because the fireplace we used comes delivered as 30 separate pieces, getting the pieces together when the build is happening is as simple as a bit of grunt work. Once you've got all the pieces nearby, the instructions will step you through the process of assembling your fireplace.

Time to build

See the step-by-step photographs here to get you through the process of gluing and putting together your kitset fire.

This kit uses proprietary-designed firebricks for the sides and rear of the inside of the fireplace. The remainder of the kit is put together using strong glue, so you'll need to measure as you go to ensure that you're using the correct pieces.

The bottom section of the fireplace is designed for wood storage, with the fire standing at around hip height on an average bloke.

This kitset fire comes with a number of accessories, including steel visors, fire grates, and barbecue plates, all supplied by good old Kiwi manufacturers.

Plastering and painting

Once construction is completed, the fireplace must be plastered. You can use any exterior plaster system, as the plaster won't be exposed to heat.

Kerrin recommends the use of masonry mesh on all external joint lines and the centre join on the gathering blocks. The plaster should be sealed using a 'lime-lock' undercoat and then painted in the colour



of your choice. There is nothing stopping you from creating your own distinctive skin for the completed fireplace after plastering has been completed. You could wrap it in whatever takes your fancy — within reason, of course.

Next issue, we'll walk through the plastering and finishing of the fireplace and enjoy the finished product.

Many thanks to Kerrin Thomson of Aztec Fires (aztecfires.co.nz) for his help with the writing of this article. 

Above: The first part of the chimney goes on
Below: Father and son, Kerrin and Levi,
happy with their morning's work

*Good call — it took
Kerrin and Levi five
hours to build the
finished fire you see
pictured here*





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Inventor at the ready

A UNIQUE DESIGN CHALLENGE
LEADS TO A PLEASING THREE-
LEGGED ROLLING STOOL
PROTOTYPE

By Hugh McCarroll
Photographs: Hugh McCarroll



My wife, Rosaleen, loves to cook, and will happily spend an afternoon in the kitchen cooking meals to be frozen and given to our daughters and their friends whenever the need arises or opportunity presents.

However, arthritis makes standing in one position for long periods difficult for her. She wanted a stool for the kitchen, but ours is a galley-style layout and quite narrow. It's wide enough for one person to walk past another working in the space, but the presence of a stool would present a major obstacle. "Why don't you invent something?" she said.

I love a challenge like that.

Exciting design stage

A regular stool would be too bulky. There is already a small plastic step she uses to reach the high cupboards that I step over if I want to get past her to the far end of the kitchen. I thought of a shooting stick — a walking stick with a folding top that folds out to form a small seat. You can sit on it, balancing with legs apart, taking some of the weight off your feet. The idea grew from that.

A wheeled base would be better, more stable than a shooting stick, and with two wheels, so you can roll sideways while still sitting on it. Perhaps a third leg to make it like a three-legged stool. You could push

back with your feet to lift the third leg off the ground and slide sideways a metre or two to get something out of reach. The more I thought about the idea, the more I liked it.

So I developed a concept on Sketchup over a couple of evenings. It looked very promising: easily folded away when not in use, with two swinging support legs that fold out and a folding step to lock the legs in place. This would be very stable and also replace the step she currently uses.

Aluminium the answer

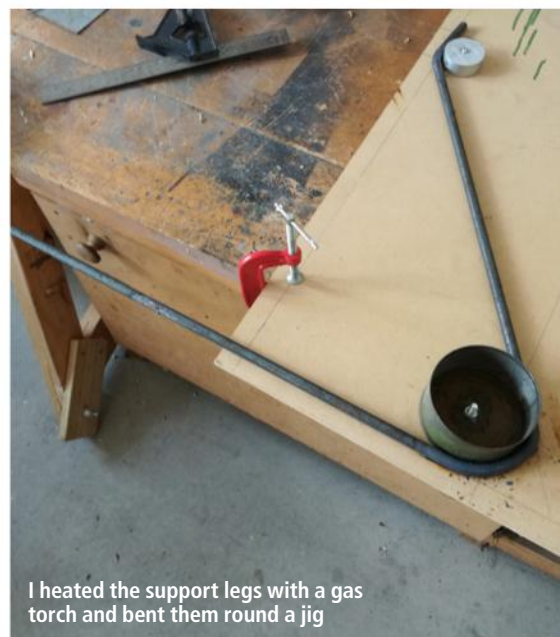
I started making the prototype out of timber, but it was clearly going to be



Setting up the diagonal supports which hold the vertical tube in position

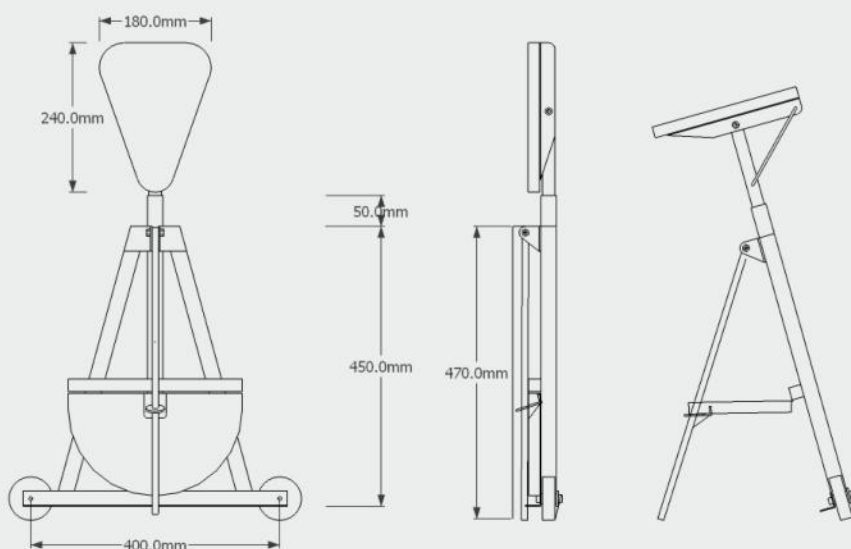


Original configuration with two support legs at 45 degrees



I heated the support legs with a gas torch and bent them round a jig

Dimensions



too heavy and bulky. I abandoned that approach and redesigned it to be made of aluminium extrusions, which looked much more promising.

Aluminium is such an easy material to use. I have a large supply from many years of buying it in 5m lengths and never throwing off-cuts away. A 25x25x1.6mm square tube, with a 20x20x1.6mm square tube inside (to allow height adjustment) was the choice for the base and seat support.

I bought a couple of cheap plastic wheels, 70mm diameter x 23mm wide hub, and a 10mm diameter bore. First up, I turned two aluminium sleeves 10mm outside

diameter (OD) x 6mm inside diameter (ID) x 25mm long from some bar stock. This allowed me to use 6mm diameter bolts, of which I also have a large selection.

I envisioned a bicycle-type seat on a pole and an undercarriage with two wheels, like an inverted 'T' on wheels.

The undercarriage bolts at right angles to the main vertical tube at the bottom, with a piece of flat bar 25x3mm on one side and 25x25x1.6mm L-section on the other. The wheels are bolted between these 400mm apart. The vertical tube is held square by two more 25mm square tube diagonals. These are pop riveted to the undercarriage at the bottom ends and to each other at the



The step sits on a bracket brazed to the support leg (final configuration)

“Why don’t you invent something?” she said. I love a challenge like that

Tools required

Lathe (if wheel bushes required)
Brazing gear
Pop riveter
Drill and hand tools



Centre punching the inner square tube ...

top using pieces of 25x3mm and 25x25mm L-section (similar to the undercarriage, but shorter). The inside of the vertical tube needs to be clean so the inner tube can slide up and down for height adjustment.

I made two folding legs out of 10mm diameter round steel bar, which I heated and bent round a jig. I brazed a washer in place at the top and drilled a 3mm diameter hole at the bottom. The two legs fit between the angle sections top and bottom, while the brazed washer bears against the top angle section. A 3mm diameter transverse bolt secures the bottom end.

*This is the enjoyment
of making stuff and
developing an idea
— you improve the
design as you go*

Three legs

The problems came with the fold-down step that secures the folding legs in place. The geometry is tricky and I couldn't visualize all the angles. I had in mind

that the step would be hinged to the diagonal tubes and fold down when it is stowed away. When the legs are folded out 90 degrees, it would swing up and the legs then be rotated to 45 degrees. The step would then fold down and lock them in place. I tried several different ways of attaching the folding step and shaping the step, but nothing made it work. Then I realized I didn't need two folding legs — one at 90 degrees would be sufficient and simpler.

So I replaced the piece of 25x25mm L-section at the top with a new one with



Checking the two support legs (original configuration)



I modified the step size and shape several times



... and drilling the holes that allow height adjustment



The step support bracket taking shape



The finished saddle and spring clip that secures it at a comfortable angle



Vice grips hold the step support bracket in the right position so the step will be level when in use

Easy imperial



I remember the old pre-decimal days and the nesting tubes with $\frac{1}{16}$ -inch wall thickness and $\frac{1}{8}$ -inch size increments. Everything nested easily, $\frac{3}{4}$ -inch nested in $\frac{7}{8}$ -inch which in turn nested in one-inch tube and so on. It doesn't work as well with decimals. Looking back, it's about the only advantage the imperial measuring system has over the metric that I can think of.

a single 10mm diameter hole centrally, and drilled another 3mm diameter hole centrally in the undercarriage L-section.

With just one support arm, it became a three-legged stool. The fold-down step continued to taunt me with its geometry. Everything is interrelated. If you make it deeper, that affects the attachment point and the height of the step. If you make it wider, it affects the support leg movement. I made four steps before figuring out all the limits and constraints. It was obvious afterwards, but hindsight is always 20/20.

And the final step was too small to realistically function as a step.

Eureka moment

This irritated me and I thought about ways to have the rolling stool and a wider fold-down step. Then the eureka moment: the support leg did not need to be attached at the bottom. Making it a straight length hinged at the top would allow it to be swung out when folding out the step. What was required was a locking system to secure the support leg to the step in the functioning position. Not what I originally set out to make, but a better design in the end. This is the enjoyment of making stuff and developing an idea — you improve the



The step support bracket brazed in the right place at the correct angle ...



... so the turned up end fits neatly between two steel strips screwed to the underside of the step



I turned two bushes to fit the bore of the wheels



The bushes hold the undercarriage side members 25mm apart and allow the wheels to turn freely

design as you go. By now the stool had gone through at least four iterations.

The new step can be as wide and as deep as needed. I settled on 280mm wide by 140mm deep, a semicircle big enough to stand on with both feet.

The step sits horizontally on a bracket brazed to the support leg. The bracket has an upturn at the end that locks in place in the bottom of the step so it cannot slide out when weight is applied. The step locks the support leg in place so the stool is very solid and stable.

Prototype done

The step and the saddle are from MDF off-cuts. The saddle has two lengths of 25x25x1.6mmL section screwed to its underside with a 6mm diameter bolt securing it to the 20x20mm square tube that fits into the base. The other attach point to hold the saddle at a comfortable angle for sitting on is a length of folded 4mm wire (good old No. 8 wire) bent to the shape of a spring clip. Several holes in the 20mm square tube allow the saddle to be adjusted to different angles.

The height of the saddle can also

be adjusted, with a number of 6mm diameter holes in the 20x20mm square tube and a single through hole in the base and a 6mm diameter bolt.

The saddle can rotate flat for storage so the whole thing folds to a 50mm thick flat pack. I was quite pleased with it.

The step works well too. You can stand on the step with both feet and the saddle between your knees so you are quite stable.

However, Rosaleen asked for a more comfortable saddle, and I realized it also needs a little wheel at the end of the support leg so it won't scratch the kitchen floor. So I made the executive decision to keep this stool for my own use in my shed and make another for her.

It works as I hoped, weighs 2.5kg, and folds flat so it can be kept handy for use whenever needed.

Having made the prototype, I'll make a number of other changes to the design to incorporate a better saddle, and add a little wheel on the bottom of the support leg so that the stool can roll sideways without having to push it back, just sidle sideways like a crab! That will be her Christmas present. 📦

Parts list

Undercarriage

- Two wheels 70mm diameter x 23mm wide at hub
- 25x25x1.6mmL al 425mm long
- 30x3mm strip al 425mm long

Base assembly

- Vertical: 25x25x1.6mm sq al tube 500mm long
- Diagonals: 25x21.6mm sq al tube ex 470mm long (two required)
- Top connector: 30x3mm al strip ex 100mm long
- Support leg: 10mm diameter steel rod 470mm long
- Support leg attach bracket: ex 40x40x3mm al L 40mm long (two required)

Step assembly

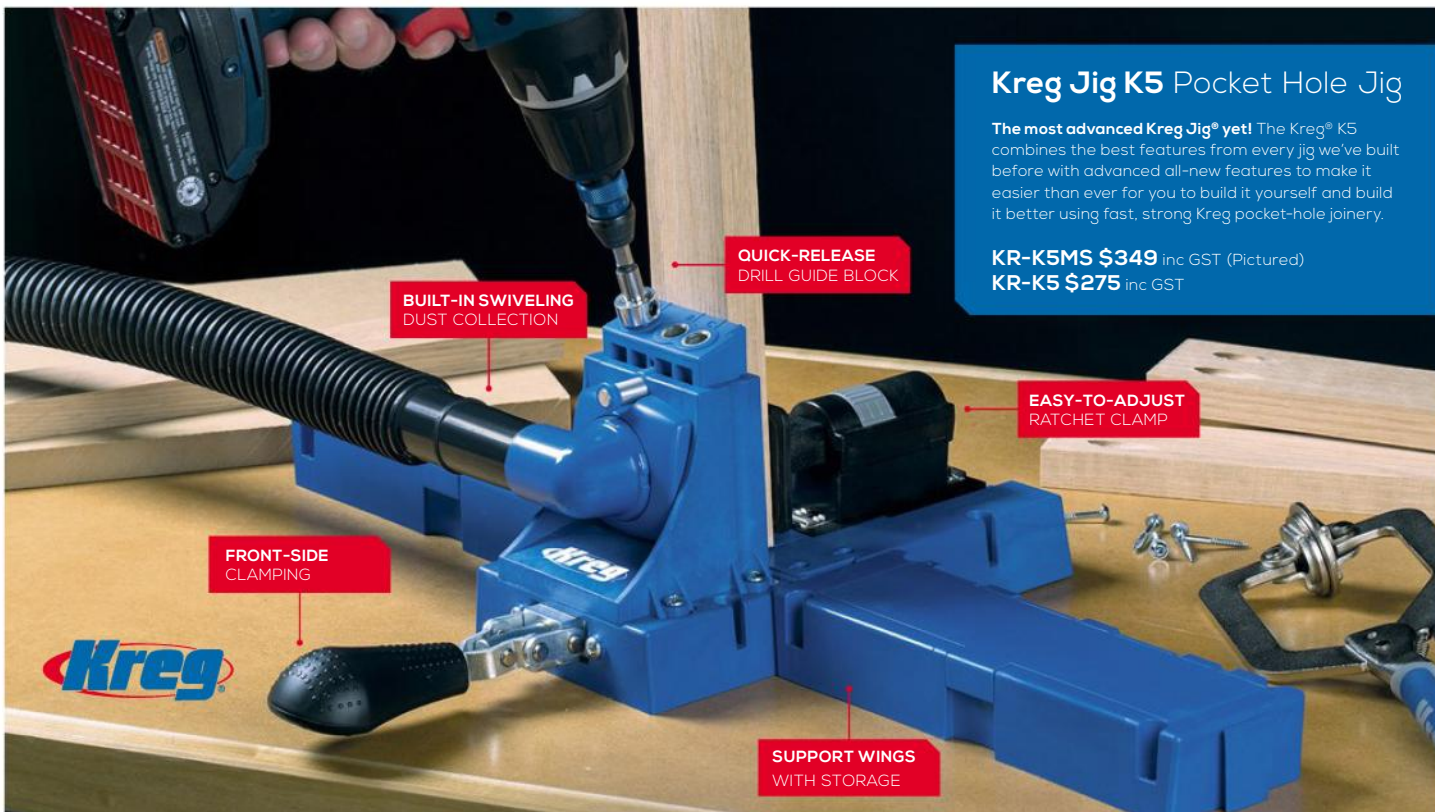
- 20x20x1.3mm sq al tube 280mm long
- Step: ex 280x165mm MDF
- Hinges: 50x15mm steel or brass (two required)
- Step support bracket: ex steel scrap 3mm thick

Seat assembly

- Seat: ex 240x180mm MDF
- Seat supports: ex 25x25x1.6mm al L 220mm long (two required)
- Vertical: 20x20x1.6mm sq al tube 600mm long
- Brace: ex 4mm diameter fence wire 400mm long

It works pretty well. Moving sideways is quick and easy





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Preserving The Past

A SHEDDIE'S EXTRAORDINARY COLLECTION OF OBJECTS GIVES A VIVID SNAPSHOT OF BYGONE ERAS

By Nathalie Brown

Photographs: Derek Golding

It started with a teddy bear, then an American Greyhound bus, a wind-up Sherman tank, and an aeroplane. Alastair Allan held on to his toys long after others would have put them aside. He's still got them, along with several thousand other items that he has bought or acquired over the past 70 years or so. He declares that he is holding on to the past for the future to tell the story of how people lived in North Otago as far back as 150 years ago.

Born in Oamaru in 1934, Alastair spent his first five years with his parents at Loman Run, a grazing property of just over 3000 acres at Kauru Hill in North Otago.

"It was quite well known around North Otago at the time — still is to this day," Alastair muses. "My grandmother drew it in a ballot in August 1914 just as World War I broke out."

*He inherited a lot of
equipment relating
to farming in general
from the run*

He recounts to us the family story of how, in 1916, they put a house, a woolshed and a hut on the run — "They were built by Craig and Co. from Oamaru and transported by Maheno transport who had to take the materials on a traction engine and trailer and unload them a mile away from the house-site because the formed road stopped there. For that last mile or so, it had to be sledged in. The buildings

were the typical weatherboard with an iron roof."

Before moving to Loman Run, Alastair's paternal grandparents owned the Palmerston Hotel and had previously owned hotels all over the South Island.

In the late 1950s, after Alastair married Margaret Gray, he bought a poultry farm about 7km from Oamaru with 600 hens, and built that up to around 3500 birds.

Special inheritance

Around the same time, he inherited a lot of equipment relating to farming in general from the run — horse gear, sheep brands, drenches, and the like.

A member of a vintage car club and vintage machinery club, he acquired old vehicles and their parts. He added to his hoard by visiting clearing sales and second-hand shops, while people who





knew he was interested in anything that reflected the (mostly rural) past would donate items they no longer wanted. Even after the advent of Trade Me, Alastair never bought anything online. In the early days, he stored all his finds in sheds on the poultry farm.

Margaret died in 1990 and six years later he married Dolina Hill, who became familiar with what was in the sheds and makes all the labels for what she wryly calls 'Alastair's junk'.

When Alastair retired from poultry farming in 2001, he cleaned out the two poultry sheds (24.5x8m and 14x12m) and the 15x8m feed shed he had built in the 1950s before installing his vintage tractors and machinery. He began mounting displays, and over the years people came to visit in organized groups and occasionally as individuals.

The pleasure in collecting, he says, is being able to tell people what things are — holding on to things from the past for the future.

Historic displays

Several of his displays are now housed in Whitestone City, the tourism

attraction in Oamaru's historic precinct. The grocery store, pharmacy, and most of the barber's shop there came from Alastair's sheds.

The grocery store carries a wall plaque to recognize Alastair's contribution to the tourist attraction: "Alastair Allan General Store — Local man Alastair Allan has been collecting items from the local community for over 60 years and we are proud to show in these shops the highlights of his collection."

The shelves of the store are stacked with boxes of Huntley and Palmers Cheesals, Rickitt's Bag Blue to brighten laundry whites, Ipana Toothpaste in the bright yellow and red tube, tins and boxes, and bottles of baking ingredients ... you get the picture. There's a smart black coffee grinder, a broad display of large biscuit tins, tea caddies, and bottles of fruit cordials. And there's more ... jars and bottles and thermos flasks, Tintex Makes Home Dyeing Easy, old-fashioned milk bottles, tins of Edmonds Acto Cake Baking Powder, and Andrews Liver Salts.

There are stacks of beautiful honey tins from regional apiarists — The Glass Bros.,



Step back in time

Whitestone City is a tourist attraction created jointly by Tourism Waitaki and the Oamaru Whitestone Civic Trust. It offers visitors a chance to experience something of what life was like for newly landed migrants arriving in Oamaru in the late 19th century and, through Alastair's displays, in the 70 years or so to the mid-20th century.

Opposite: Dolina and Alistair Allan



See more photos and videos on our website www.theshedmag.co.nz

The pleasure in collecting, he says, is being able to tell people what things are — holding on to things from the past for the future



No. 5RD Gore; the Wilsons at Elderslie, Oamaru; RD Benny in Central Otago; and RW Marshall of Hampden, North Otago.

Many of the items in the displays are faded, foxed, and rusted but that makes them all the more attractive than anything that might have been recently replicated.

The Chemist Shop has display cabinets full of little flat boxes and tins that anyone from the '40s to the '70s will recall. There is a display of little implements, glass bottles, and instruments from a bygone era for applying leeches; a "breast reliever"; and a selection of ferocious-looking

metal grips and plungers with faded red rubber tubes — seemingly the parts of a collection of medical syringes. Other items in the displays were sourced from the Pharmacy Guild.

Distinctive collection

The Barber's Shop and Tobacconist was largely supplied by Alastair: brushes, combs and clippers, bottles and jars of styling lotions and creams for the discerning gentleman; bone-handled cut-throat razors, razor strops, and things that look like early era curling tongs; little leather manicure sets with ivory handles; and a folder full of black-and-white photographs of the

Brylcreem Style of the Month for junior, mature, and senior men. Another cabinet holds an array of tobacco products in a distinctive array of tins.

The vehicles, machinery, and implements in the Whitestone City agricultural display came from Alastair's sheds, and you can still barely see a gap in his home displays.

A couple of small private museums have also acquired items for their displays, but there are still thousands of items yet to find a new curator.

Says Alastair, "Most of it has come from around North Otago, and it would be nice to think it would stay here."

Take a tour of the sheds ►

A tour of the sheds with Alastair



Above: It's too cold in the sheds in the winter for Teddy, so he sits in Alastair's childhood high chair up in the house

Below: The heavy-duty oil stabilizer is a two-chambered clear plastic container with an egg beater in each compartment to whisk the motor oil to prove which was the best lubricant and had the best clinging power



Below: Alastair's display of wire strainers and fencing tools has been exhibited at the Canterbury A&P Show. "I've got myself a wee bit of a name up there," he says. He takes great delight in knowing the provenance of the items he has collected. "Some of those strainers were made by Hayes Engineering at Oterehura in the Maniototo and the roll of barbed wire was made in Cooney's Corner, Oamaru, where the Post Shop is now." The display picked up a gold medal at the 2012 show, which was the show's 150th anniversary





Above: A life-size mannequin dressed in gardening clothes is ready to get down to work, surrounded by the tools and implements that she'll need to convert a quarter acre of couch grass into lawns and garden beds. Her Easy Lawn Mower, circa 1886, has a metal rather than wooden roller at the back. There are rotary hoes, fertilizer, and weed-killer containers. She's been to the Canterbury A&P Show too, and has the prize ribbons to prove her worth

Right: Where did the biro collection come from? Alastair says he almost never throws anything away. He'd get a ballpoint pen from a shop or business, use it until it ran out of ink, then throw it in a box with all the other old pens. Eventually, he mounted them on a board and put it on display in the shed. As you do

Below: The Sanderson Wallpaper sample books, 1938!



Below: Arkwright's General Store featuring the shop assistant with her hand in the till, and Grenville's delivery bike is a salute to the 1970s British television sitcom *Open All Hours*



Below: The collection includes bright red and yellow 'pallometers' (petrol pumps), Voco Power bowsters, and their precursors — the kerosene and petrol boxes. The two and four-gallon tins sat in the wooden boxes ▶



Gear and gizmos



The uses of some of these gizmos would baffle most baby boomers let alone millennials, but Alastair usually has a good idea of what they were used for because they are often from his era. In the early days, when he first began collecting, there were folk three and four decades older than he was and they were able to tell him what was what.

Left: The much sought-after Beattie washing machine relieved women of the hours it took to do the laundry

Right: Gramophones galore!



Below: Mops, brooms, and carpet sweepers have their own nook in one of the sheds





Above: Alastair has a shed full of farm vehicles including a four-wheel-drive Massey-Harris tractor and the second oldest Fordson in New Zealand — a 1918 model. The tractors are in running order but cranking them is beyond Alastair's strength these days

Left: The medical instruments for treating animals are terrifying. The stomach pump (don't even think about how that worked) and drench guns circa 1840 for horses belonged to Alastair's grandfather



Left: Other display areas are devoted to kitchen utensils: grinders, peelers, mincers, egg beaters, irons, a flour-bag collection, blue-and-white enamelware, and cardboard imitation willowware

Right: A seal-skin rug covers your legs while you take a ride in the open carriage



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ONE MAN'S JUNK ANOTHER MAN'S TREASURE

THIS TARANAKI SHEDDIE HAS
GONE FROM DIESEL MECHANIC
TO GARDEN ARTIST

By Ray Cleaver
Photographs: Rob Tucker



Andrew in his shed



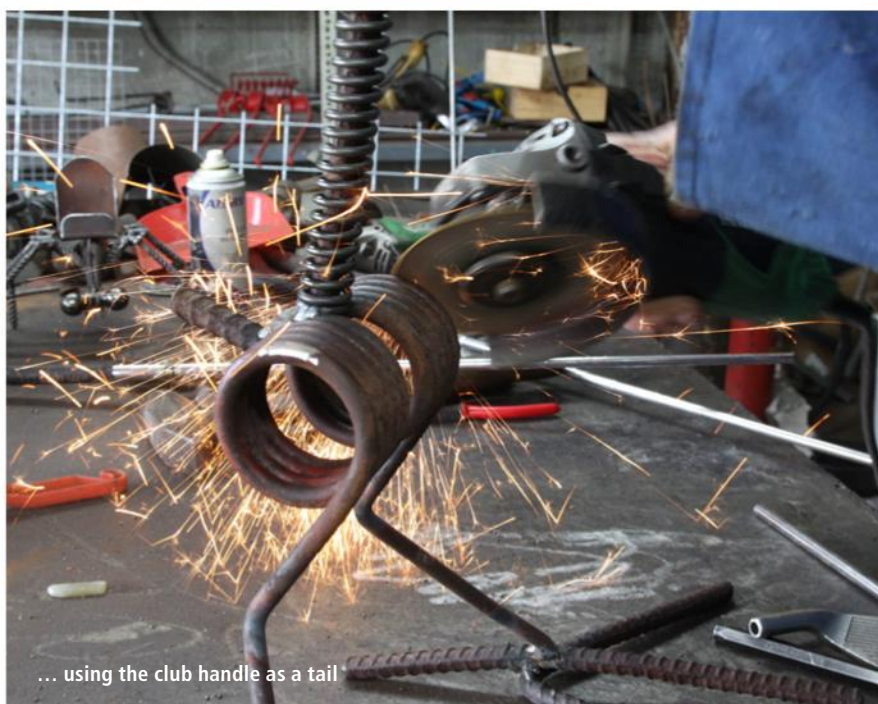
Making a 'noddie bird' for a golfer: selecting a club ...



... cutting a golf club head off with a grinder ...



... attaching the head with the MIG welder ...



... using the club handle as a tail

From major tractor repairs to creating quirky garden art, from welding digger buckets to welding ornate metal insects, Andrew Bellringer of Taranaki doesn't complain about being bored.

An 80-year-old walk-through cowshed under the shadow of Mount Taranaki is heavy diesel mechanic Andrew Bellringer's shed where it all happens.

There's a cluster of old buildings and piles of scrap metal and strange things everywhere.

Don't throw stuff away; you never know when you might need it — that's Andrew's motto, and making creative garden art from scrap is what he does.

Andrew's metal skills range from stripping down tractor engines to using



One of Andrew's noddie birds made from a hedge clipper, tedder tines, a motorbike fork spring, and farm cultivator tips

Kiwi innovation to make a range of creatures from scrap metal. Dragonflies that sway in the wind, giant spiders, and strange nodding birds come out of the old cowshed.

Change of direction

The big bearded man could well have been the village blacksmith in days gone by. Andrew was raised on a sheep and beef farm at Tarata, east of Inglewood. He and his family have lived on the Dudley Road property, just 1km from the Egmont National Park bush line, for the past 32 years.

The 56-year-old has worked on diesel engines for many years, repairing farm tractors and setting up a business selling tractor parts. ▶

"I buggered my back 20 years ago and I was on the lookout for a change in direction"



Noddie birds



Another popular line is what Andrew calls his 'noddie birds' (see above).

Motorbike front fork springs form the neck, allowing the birds to nod in the wind. The beaks are made from old farm cultivator tips, the bodies from hay tedder tines. Legs made of rebar, hedge-clipper blades for a tail, and old rake parts for wings combine to make an interesting creature.

He made us a noddie bird using old golf clubs. He cut the heads off two clubs and welded them on for wings with his trusty MIG welder and attached the club handle for a tail.

"A good present for a golfer," he says.



A giant weta made by Andrew on one of the buildings at Pukeiti gardens, on the slopes of Mt Taranaki



One of the free-floating dragonflies

One of Andrew's giant spiders



The spider business card holders are popular



“You can’t buy rust”

Moving insects

Dragonflies made from stainless-steel wire, springs, and ball-bearing eyes sway in the wind. These are very popular.

“I love things that move and float around in the breeze,” Andrew says. His biggest creation is a 3m long weta. He has been commissioned to make giant insects to adorn buildings at the Pukeiti Rhododendron Garden, out of New Plymouth. He has made some giant spiders for the famous gardens from rebar steel and 1.6mm mild steel plate.

He also makes garden stakes from old cutlery and ball bearings that are very popular. “I call them ‘garden bugs,’” he says.

He’s also making a big, ornate, metal gazebo for a commission.



Andrew Bellringer with one of his spider creations

► “I buggered my back 20 years ago and I was on the lookout for a change in direction,” he says. “Six years ago, I made a metal dragon for a mate. People liked it and I began to make garden art and sell my creations at markets all around the North Island.

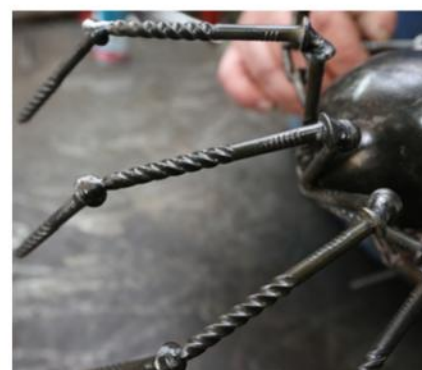
“I call myself a metal artist. Making garden art by hand is a lot more satisfying than pulling tractors apart. I also like things to rust. I love rust and

it gives things character. You can’t buy rust,” he says with a grin.

One of his more adventurous creations is a coffee table made from four cut-down shotguns topped with an old circular-saw blade. He engraved the top to make it look like the base of a shotgun shell.

“It was a lot of work but very satisfying,” he says. “The guy I made it for is into hunting and he loves it. I’d like to make

Old roofing nails make good spider legs



Using scrap



He has piles of scrap metal all around the shed. “People drop off all sorts of stuff. It looks like junk, but you never know when you have an idea and are looking for something strange to create something.

“I’m still fixing tractors and selling tractor parts, but I really want to get into making my garden art full-time. It’s very satisfying.”

Andrew enjoys travelling around the big markets all over the North Island to peddle his wares. Keep an eye out for him.



Left: A coffee table made from four shotguns and an old circular-saw blade — note the top is engraved to look like a shotgun shell

“Don’t throw stuff away; you never know when you might need it!”

The right tools

Andrew certainly has the tools for his works. He has a big old 305-amp MIG welder for welding tractors and more recently brought a Razorweld Xcel-Arc 165-amp MIG welder, which he uses for his garden art.

“I run a .6mm wire through the Razor — it’s really good for welding thin stuff,” he says.

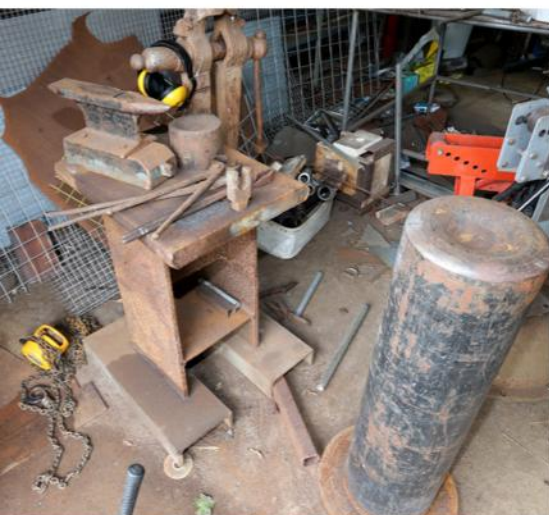
Andrew’s wife Brenda runs a riding school and this gives him access to old horse shoes. From these he creates pigs, dogs, elephants, and his bestseller — horseshoe cats.

He has a sand-blasting cabinet, a plasma cutter, and a drill press. Various benders and rollers of different sizes are very handy for Andrew’s artwork. He has a pedestal band roller, a ring roller, and a scrolling tool, which saves him a lot of time when making multiple copies of some creations. He also has a big metal lathe that was once used in a high school by metalworking students. “I had a coal forge once and enjoyed working that,” he says. “It’s a lot of work firing it up though. I’m making up a gas forge now.”

He has a homemade anvil made from a big old metal crusher drawer and a smaller anvil for fine stuff fashioned from a piece of railway iron. “I’d like to get an old blacksmith’s anvil, but they’re hard to find these days,” he says.

Andrew has set up two old oxygen gas cylinders upside down on stands for beating things into shape, explaining, “The domed bottom is ideal.”

Below: A small anvil made from railway track iron (left), and an inverted old oxygen bottle makes a good shaping anvil with its concave base (right)



more of these. It’s a matter of finding the parts.”

Andrew relates to these tables — he shoots black-powder muzzle-loaders for a hobby.

At the other end of the scale are spider business card holders, made from a piece of a garden fork handle with saw blade pieces for the body. He found a bucket of old-style roofing nails with twisted shafts and these are used as legs for his insects. Ball bearings are used for the eyes of his spiders, a big ball bearing for the body, and old conveyor-belt joiners make great teeth. 📦



Andrew’s big old lathe was once used as a high-school learning machine

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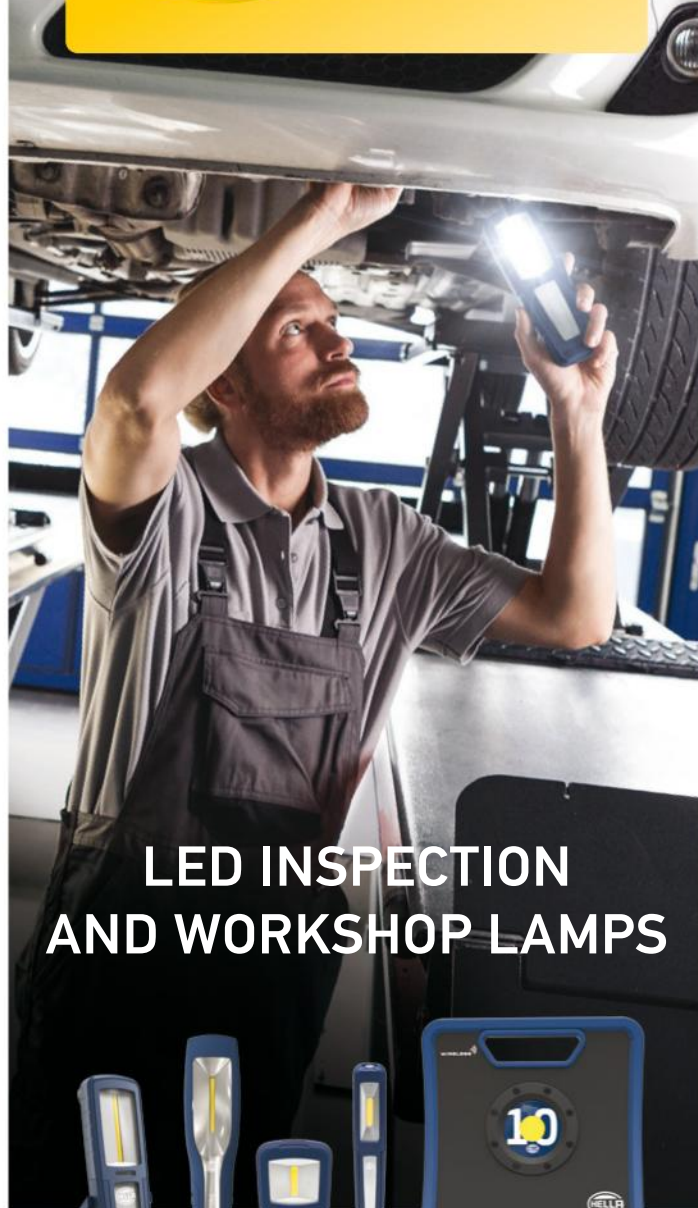
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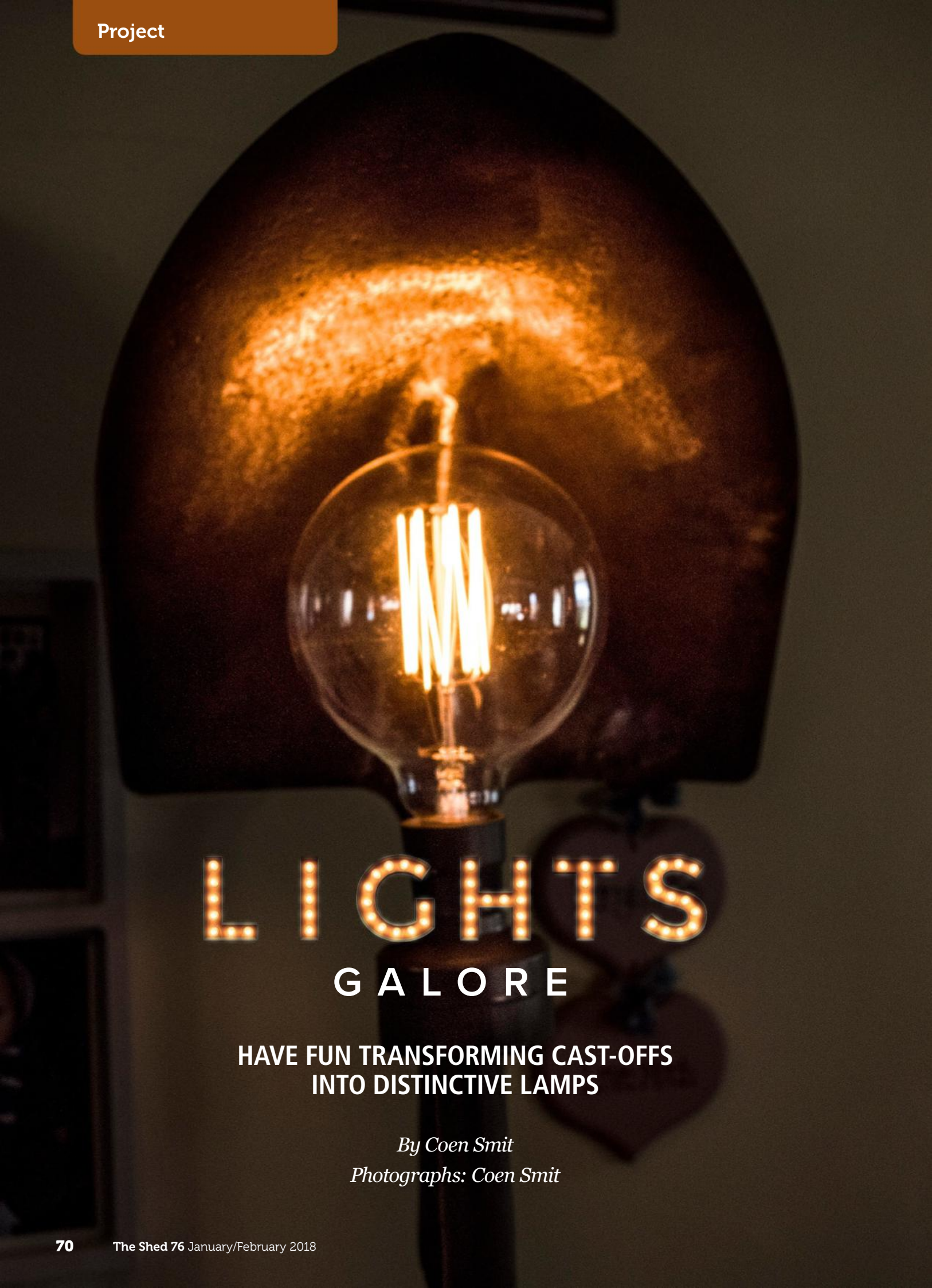
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LIGHTS GALORE

HAVE FUN TRANSFORMING CAST-OFFS
INTO DISTINCTIVE LAMPS

By Coen Smit

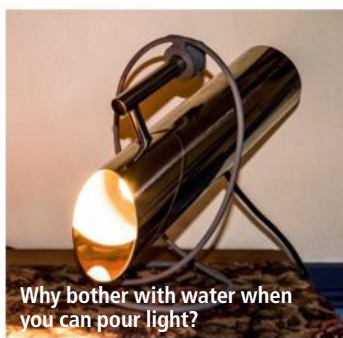
Photographs: Coen Smit



This automotive light is a mechanics de-light



A new life for an unwanted speaker



Why bother with water when you can pour light?



The Caltex girl lighting the way

If you are interested in adapting and using discarded bits and bobs to make something useful, then building lights, table lamps, and the like offers an endless source of relatively inexpensive projects to amuse you. What's more, they make unique gifts and nice conversation starters for visitors. Lamps are also a good way of supporting a decorating theme. Whether you are into an art deco, Arts and Crafts, modern, or industrial look, it is nice to enhance your chosen theme by constructing a light from an object that is reminiscent of it.

Of course, you are dealing with 240V electricity, which is potentially lethal, so it is essential that you use common sense and particular care when wiring up lights (see Making Sure Your Light is Safe to Use on page 65). The advent of 12V downlights powered by small transformers has also made the construction of lights much safer. Lights can now be wired in such a

It is essential that you use common sense and particular care when wiring up lights

way that the 240V transformer is remotely located or secured and independently earthed. There is no electrocution risk posed by the 12V wiring in the rest of the light.

Endless possibilities

The fun is in selecting something that can usefully be turned into a light. As you can see from the accompanying photographs, there is a host of objects that

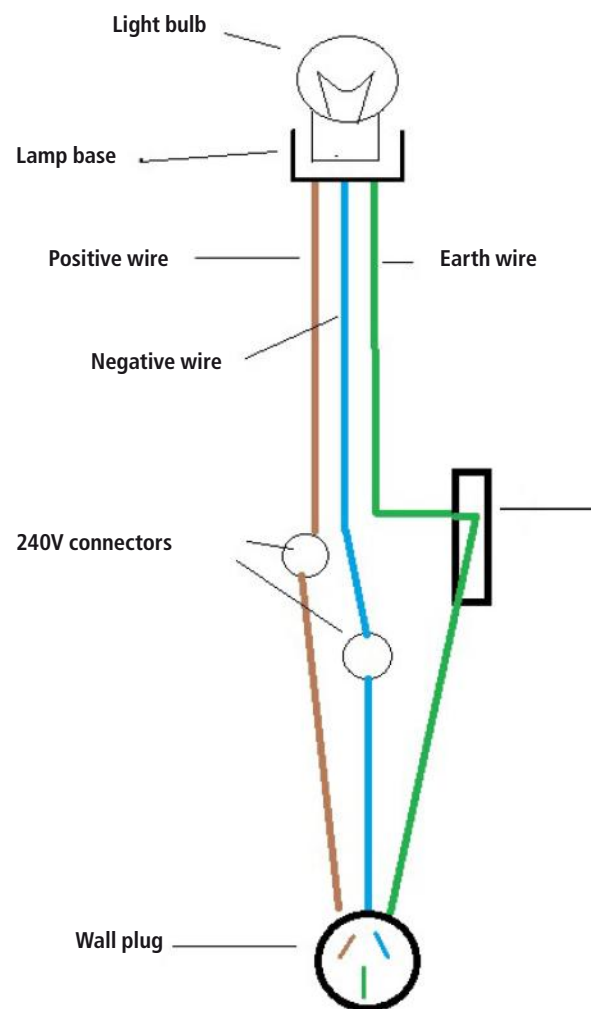
lend themselves to being transformed into lights. You might even consider using existing lights but in a different context.

A nice glass ceiling light can serve as an exotic table lamp, or the face plates of an old gas pump can be carried aloft by an art-deco figurine, which will give a soft corner light. Two damaged safety lights, their glass inserts replaced with copper sheet to soften their intensity, can be joined to make an unusual standing lamp. Automotive parts can also make interesting lights. They can be used in a variety of ways, such as a discreet bed light for those who want an intense light that will allow reading into the night without disturbing their companion or those who want a good source of light at a work desk.

On the next pages are two lights I have made — a 240V shovel standing lamp and a 12V inlet-manifold work-desk light. Hopefully they'll give you inspiration for a project of your own.



The shovel standing lamp taking shape



Shovel standing lamp

The head of an old shovel makes an interesting backing for a low-wattage bulb that will give off a soft, warmly glowing, fire-like light. The light can easily be made in any of three configurations — as a table light on a sideboard, as a hard-wired wall light, or a free-standing lamp. As we are dealing with an almost completely metal lamp, you will need access to a welder, angle grinder, and other metalworking tools.

In this instance, I decided to make a standing lamp and used an old disc brake as the lamp's base. They are heavy and make a good solid base that will stop the lamp falling over if it is accidentally bumped. Retired ones are readily available. The

*Having said that,
wiring up a lamp
is not one of the
dark arts*

stem of the lamp is made from a section of 25mm steel pipe, welded at the base to the disc and holding the shovel at the top. A short section of similar-sized pipe was given a slight bend to position the light bulb in front of the head of the shovel.

To make, on one side of the bend, cut the water pipe at an angle so that it can

be welded onto the main stem to make a smooth branch out. Prior to welding, cut an elongated hole in the main stem. Before welding the branch onto the stem, run a length of wire through both parts of the lamp. You will need this later to draw the flex through the lamp when it comes to wiring up the light.

I cut a circle out of a piece of scrap timber the same size as the base of the light fitting, with a recessed hole in the centre. I then glued it onto the top of the branch and ensured that it was large enough to allow the flex to pass through. (Note: if you opt to weld a steel base for the light fitting, insert a circle of Perspex of 3mm thickness or similar insulating material between the light-fitting base



Readying the branch for welding



A digger's desk light

Making sure your light is safe to use

Before testing your new light, use a multimeter on its ohm setting and check that it is functioning properly by touching its two probes together. A digital multimeter should go from 0L to 00.03 to indicate a 'dead short'. Note the meter will never read zero — it will be a low figure, perhaps .3Ω. The legal requirement is that it be less than 1Ω, not a 'dead short' as the termination, wiring, and contact resistance will actually add up.

A 'needle' multimeter when shorted should show a significant movement of the needle to indicate the presence of a circuit.

1. Touch one probe of the multimeter to the earth pin on the wall plug and the other to an unpainted steel part of the lamp. The multimeter should show that a 'dead short' exists between the two, which means the lamp is properly earthed.
2. Hold one probe of the multimeter in contact with the metal body of the lamp, and touch the other probe to the positive and negative terminals of the wall plug, in turn. The multimeter should show that there is no circuit with either of these pins and the lamp. If your multimeter detects one, you need to find and eliminate the short before testing the lamp again.

Earthing point on the lamp body

The circuit between the positive and negative terminals of the power source is completed by the wires in the light

and the metal to eliminate any chance of an accidental short circuit occurring between the live wires and the base.) When you have everything assembled and have cleaned up the welds and metalwork to your satisfaction, I recommend that you spray it with cold galvanizing paint, before applying a finishing coat in the colour of your choice.

Underneath the disc-brake base, I welded a short piece of flat bar with three holes in it. This is the earthing point for the light as well as a secure fixing point for the flex running to the wall socket. Between two of the holes in the flat bar, thread a jiffy strap to secure the incoming flex, cut and strip the flex back a short distance and crimp a ring terminal to the green earth wire.

This old brake disc is perfect as a base



Do the same for the section of flex coming down from the lamp. Then connect the two remaining wires from each section of flex using insulated joiners rated for 240V. Connect the two ring terminals with a small bolt to the third hole in the flat bar.

At this point, you can choose to put an on/off switch in the flex at a point close to the lamp, or rely on the switch at the wall outlet to turn the light on and off. I fitted a simple 240V on/off switch on the lamp's base and wired it in as per the accompanying diagram.

At this point, it's time to connect the three-pin plug, following the instructions on the packet as to how much of the outer sheathing of the flex to remove and which



Old Holden parts never fade ... they just light the way

colour wires to connect to the plug's terminals. I am not a qualified electrician, so if you have any concerns about doing the electrical wiring yourself, I suggest that you have someone qualified to do it for you.

Having said that, wiring up a lamp is not one of the dark arts and the diagram on page 64 shows what is required. Just remember that green is always the earth wire and should be connected to the earth terminal of the plug and the metal body of the lamp. The red or brown wire is normally positive, while black or blue is negative. The polarity of these two wires in this application is not critical, as long as the green wire is always connected to the earth pin and the green wire is connected to the metal parts of the lamp.

Manifold light

For this light, I used an old dual-carburettor inlet manifold for a 186-cubic-inch Holden engine, which has moved house with me over the years but never had the opportunity to reconnect with a motor. As it turned out, it was just the right piece to make a novel desk or bed-head lamp.

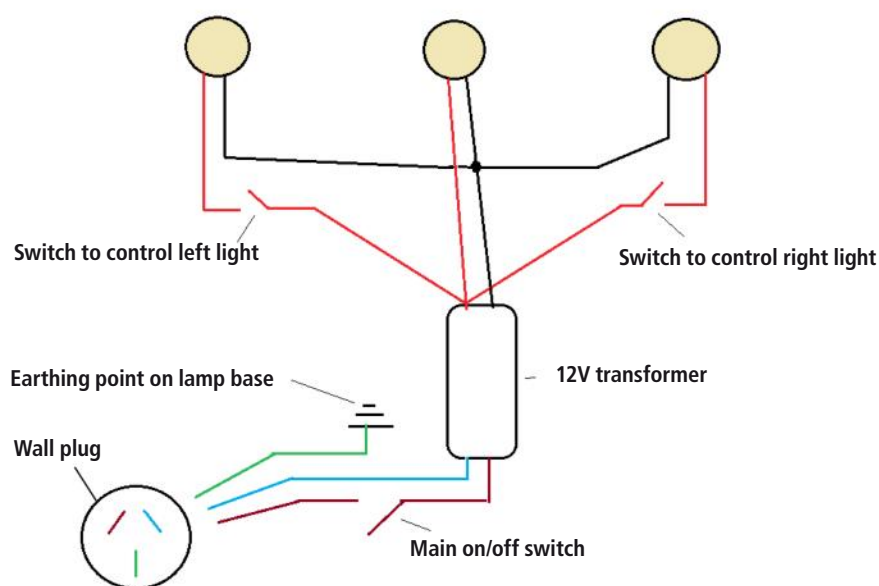
I mounted the inlet manifold on a 10mm diameter rod and used a section of thin, round tube left over from the foot of an exercise machine as the base. It was also the exact size to locate the 12V transformer. These little transformers normally power downlights and are therefore ideal for

I used an old dual-carburettor inlet manifold for a 186-cubic-inch Holden engine

this application. The halogen globes fitted neatly into the manifold's inlet ports and are held in position with washers turned up out of some nylon stock. I used small nuts and bolts to hold the nylon washers in place to continue the automotive theme of the lamp.

On the carburettor inlet ports, I mounted switches in some additional nylon washers to enable each of the two outer lights to be switched on individually or together. On the side of the base, I mounted the main on/off switch that controls power to the transformer which immediately turns on the centre light.

As you can see from the accompanying photos, a variety of objects can be repurposed to make unique and different kinds of lights. The overall cost of making them is not exorbitant, and as long as you are careful when wiring them up, they are quite safe. 



Note: When the main switch is turned on, the centre light will turn on. The other two can be switched on/off independently.

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Philip King in his workshop — old hand tools are often best for restoring old furniture

TRICKS OF THE TRADE

TRADITION RUNS DEEP IN ANTIQUE-FURNITURE RESTORATION

By Jon Addison

Photographs: Adam Croy

In parts of the country, rockets are being fired into space and cows are being milked by robots, but in Auckland, glue made from boiled-down cow and horse hooves is still being used in the restoration of antique furniture, maintaining a tradition stretching back at least 4000 years.

Animal glues were certainly used by the Egyptians as far back as 2000BC and may have been used thousands of years before that, but Philip King of Ellerslie-based Philip King Restorations Ltd says that when it comes to jobs like gluing down veneers, it's still ideal.

"Cows' hooves and a laundry iron will still get it down," he laughs.

The glue is painted on to the substrate surface while hot and allowed to set by cooling. Then the veneer is positioned and a hot clothes iron applied to heat and re-melt the glue beneath it. A characteristic of the animal glue is that as it dries, it shrinks and pulls together the pieces being joined.

Another benefit of animal glue is that

it can be softened with water so glued parts can be separated without damage. And, because it becomes brittle, a piece of furniture can be broken apart with relatively little damage to the wood.

*"Cows' hooves and a
laundry iron will still
get it down"*

"It's not the only glue we use, of course," Philip adds. "Even with veneers we'll use ordinary Super Glue to stick down a small repair patch. You can hold the repair piece down for a few minutes with your finger and it's there. Then a light sand before the glue is completely dry will result in the dust being stuck in the glue, which helps disguise the join."

Dramatic change

Philip was employed in insurance when he decided he wanted to work

with his hands. So he joined furniture manufacturer and restorer CF Neary Ltd before starting his own business under his house in Remuera in 1991. Soon afterwards he moved to a commercial building in Marua Road, Ellerslie, Auckland, where he now owns two units and employs four staff.

This period has seen dramatic change in the antique-furniture world. The appearance of very cheap new furniture from Asia has seen both substantially lower price expectations and the demise of many New Zealand manufacturers, which has been reflected in falling antique-furniture values. At the same time, the advent of Trade Me has increased competition, also pressuring prices southwards.

So it can be cheaper to purchase than to restore and Philip fears that the shoddy construction of much cheap modern furniture means that it will never be worth restoring.

"I think the only area where prices have held up is what I call 'Reader's Digest



A steady hand is needed for touching up gold paint, but matching the colour can be even trickier

furniture' — the Scandinavian-influenced retro furniture made in the late 1950s and 1960s," Philip says. "Good art-deco furniture has also held up quite well and is still reasonably popular."

Around 75 per cent of his company's work now comes from insurance companies, with the remainder through word of mouth and, increasingly, the Philip King Restorations website.

Useful tips

Of course, few sheddies would be daunted by the prospect of repairing a broken table leg, gluing down a bit of lifting veneer, or straightening a warped drawer, but even in these basics Philip has come up with methods to make the tasks simpler and more effective. For example, a great

collection of very long floor cramps hangs largely unused on the back wall, as he's found that using ratchet tie-downs can often do a better job of supporting a joint while glue sets.

Where the amateur is likely to come unstuck is in the finishing processes — staining, lacquering, or French polishing — particularly if the finish on a repair has to match that of the original piece.

Traditional French polishing actually describes the application of 'shellac', which is a natural resin sourced mainly from India and Thailand and delivered in the form of hard flakes. These are dissolved in methylated spirits and brushed or wiped onto the wood.

"Back in the '60s, a very high gloss was popular, so 20 or more thin coats



Wood works



Repairing a damaged piece of antique furniture often entails finding a matching type of wood. The bad news is that that's difficult to source and becoming more so.

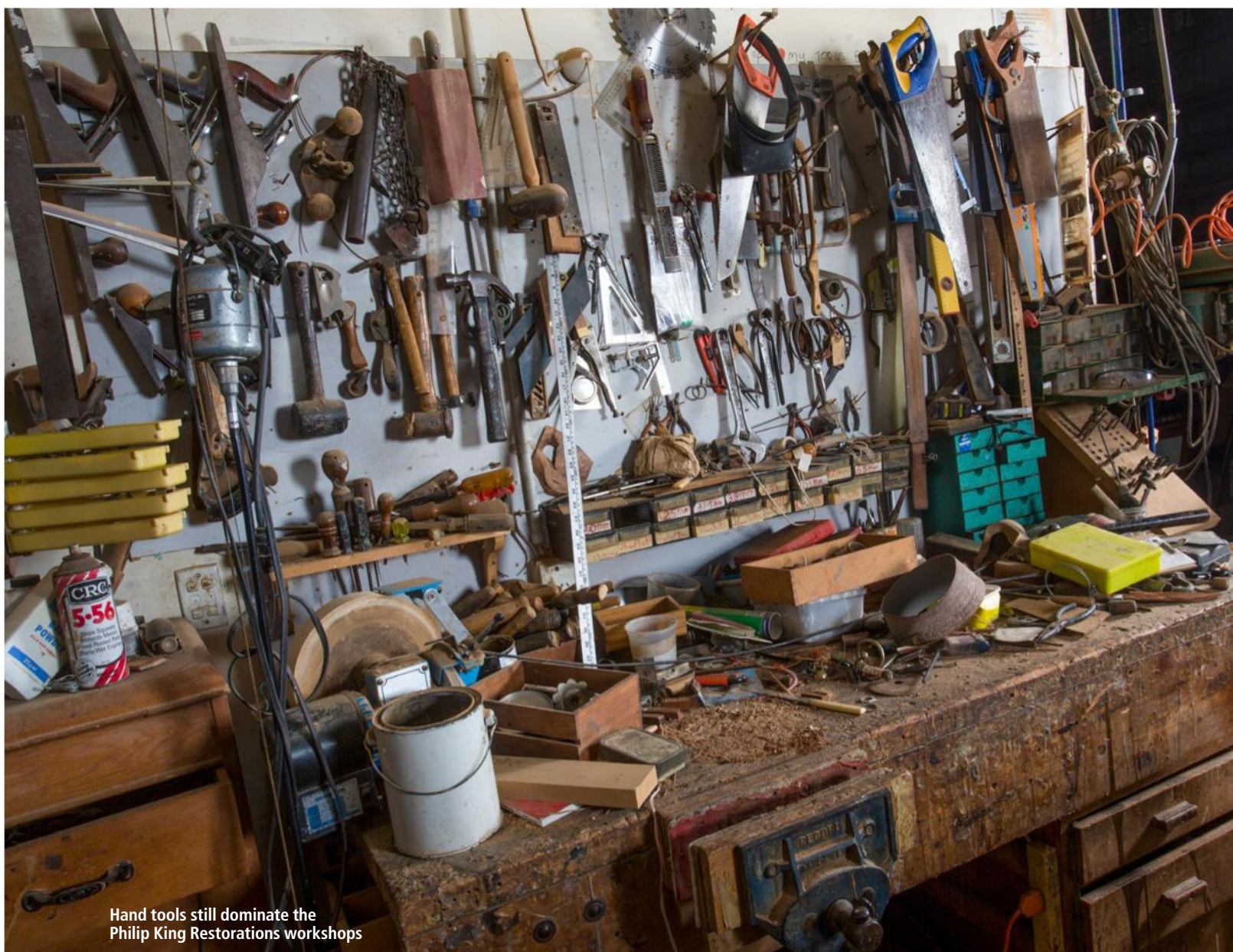
"In the past, there were the European staples — walnut, mahogany, oak, teak, and maple — and native New Zealand woods," explains Philip. "Now there are all sorts of lesser-known species coming in from places like Asia and South America.

"I've been in the business almost 40 years and my father was a cabinetmaker, but I can still only look at the colour and the type of grain and hope I get it right."

For example, he points to the base he's making for a Venetian funicular: swamp kahikatea, but even an expert would have been foxed. Ditto for a panel made from South American rosewood.

Even some of the traditional furniture wood types aren't what they used to be. Philip says lack of government support has resulted in New Zealand cabinetmaking shrinking to a level 90 per cent below that of the 1980s, which has reduced the demand for quality wood. The result is that timber merchants no longer stock it.

"Generally speaking, I can identify most woods," Philip concludes, "but I can't explain how I do it."



Hand tools still dominate the Philip King Restorations workshops

of shellac were applied and buffed up,” Philip explains. “However, while it does produce a lovely patina, shellac is probably the least durable of furniture finishes. It’s slightly porous and susceptible to damage from water, alcohol, and heat.”

Tricky process

As its application is so labour intensive, French polishing can become expensive, and it calls for an experienced hand. Experts can finish the process by wiping the surface with straight meths, but a fraction too much will begin to dissolve the shellac, while slightly too little will create drag. Because of this, the final stage is usually applying furniture wax, which Philip and his

The shoddy construction of much cheap modern furniture means that it will never be worth restoring



A line-up of carving chisels

team do with an extremely fine grade of steel wool.

“We tried to keep the cost down by spraying shellac, but it was an absolute disaster,” Philip says. “The coats are just too thick when sprayed.”

However, more modern lacquers can be sprayed, with two-pot urethane ones requiring just two or three coats, while standard furniture lacquers will need three to five coats. The nitrocellulose furniture lacquers developed between the world wars and the newer two-pot lacquers are more durable than shellac and less labour intensive to apply.

“We leave it to the customer to choose,” says Philip, “but we steer them away from French polishing on tables because of the susceptibility to damage.” ▶

Antique hardware



Remember plain steel, slot-head screws? They've all but disappeared in these days of stainless-steel square drives and electroplated Phillips head screws, but only the old-fashioned variety will look right on a piece of antique furniture, even if it's usually hidden away on the back or underside of the piece.

Finding the right bit of antique hardware can be a problem for Philip King Restorations and it's likely to be even more of a problem for the home handyman.

"Decent brass hinges have become difficult to find," Philip says, "and getting full sets of matching castors or drawer pulls can be really tough.

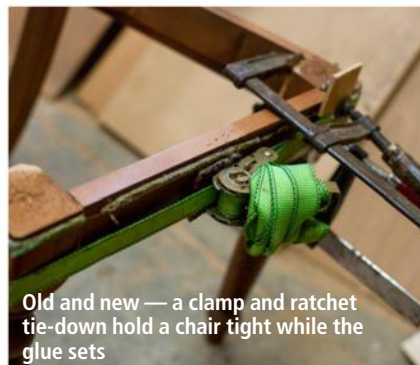
"We go to garage sales and watch listings on Trade Me and have even salvaged bits from the roadside. We also have sources overseas," he adds.

"For example, cabinet door and drawer locks are often available from England and sometimes from Australia."

If he's repairing a chair missing a castor, he will often find a new set of four and will always keep the three he removed to recycle into a new set. Philip does warn that the only metal that should be used is that in screws and nails — no metal brackets or gussets should be used to secure pieces of wood, as varying expansion rates will result in moving joints.



William Brenan sprays furniture lacquer onto a table top

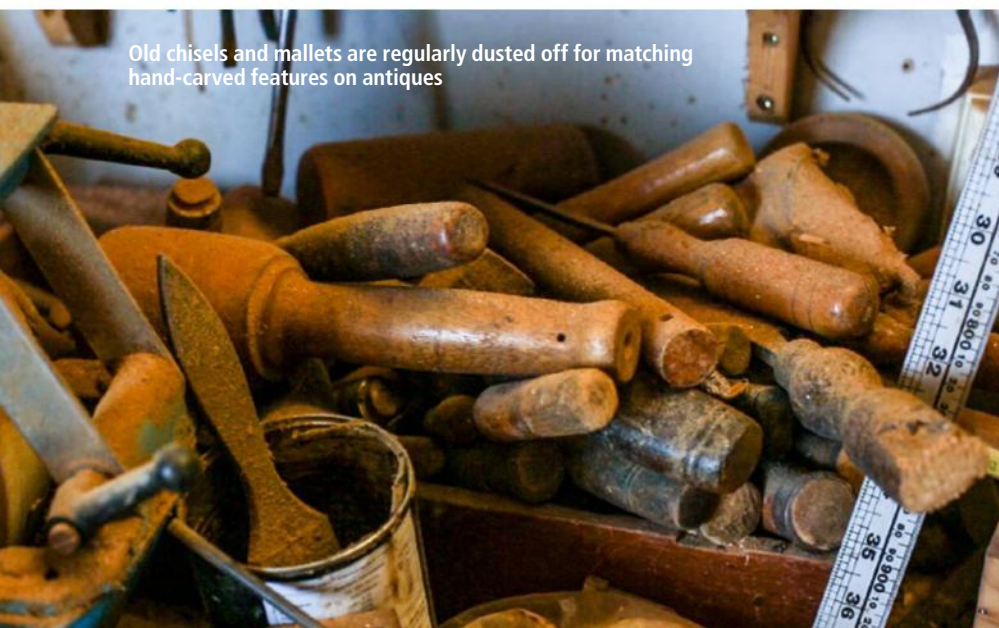


Old and new — a clamp and ratchet tie-down hold a chair tight while the glue sets



Philip applies the finishing touch to an antique

Old chisels and mallets are regularly dusted off for matching hand-carved features on antiques



Painting and staining

Some antiques are painted and Philip has a tip for refinishing these: "Instead of stripping the piece, we lightly sand the original paint, just enough for the new paint to adhere. Then the paint doesn't penetrate the wood and it can be stripped back later."

Whatever the surface finish, the staining beneath it is likely to be the most challenging process for amateurs, and Philip admits that after 40 years he still confronts challenges, particularly when dealing with pieces that have been badly stained in the past.

For a start there are different types of stains — modern water-based stains that Philip says are relatively forgiving to



The table saw Philip is using is about as close to modern machinery as it gets in his workshops

apply, spirits-based stains, and pigment-based wiping stains.

"All of them soak into the wood to a greater or lesser extent," he says. "But it's vital to use them sparingly or they will result in a finish that looks painted. With the water-based stains it's easy to mix colours to get the right shade and the only real negative is that they can raise the grain a little. With spirit-based stains it can be very difficult to apply polishes

over them without them bleeding into the lacquer.

"It's also possible to mix stains into the lacquer, but the disadvantage is that any chips will expose the clean wood underneath."

However, the most difficult part of staining is getting the colour right, and the golden rule, says Philip, is to ignore the name on the tin. To demonstrate he opens a tin marked 'kauri', revealing a

Tools of the trade



Don't expect to come across any large CNC machinery in the Philip King Restorations workshops — hand tools rule the roost.

"Oh, we do have a bandsaw, a bench saw, a lathe, and a table sander, but almost everything is done by hand, whether it's a power tool or a hand tool," Philip says.

Angle grinders are used for roughing out shapes and a Dremel for the finer work. Random orbital palm sanders, electric chisels, and routers get a lot of use, too.

But often the old tools are best. "You can't beat a chisel and mallet for carving, but it's very time-consuming," Philip says. "Because of this, a basic ball and claw leg will cost between \$200 and \$300 to produce."

It often transpires that a handsaw will turn out best for a cut, probably because that's the tool that was used originally.



Amy Yearbury uses a table sander to restore a furniture part



Repairing woven cane, as Amy Yearbury shows, calls for both skill and experience

yellow-orange colour nothing like that of the actual wood.

"We start with either walnut, which is basically brown, or mahogany [red] and tweak the colour with yellow, red, or blue from there," Philip explains. "It's absolutely essential to have a colour wheel when mixing stains.

"This is one of the most important aspects of antique-furniture restoration as virtually every piece is stained," he adds.

Restoring cane

Another restoration process that amateurs may find challenging is re-caning; however, it's the state of modern materials rather than the job itself that's likely to be the cause of the difficulty. "The quality of cane has certainly dropped over the past 40 years," Philip explains. "We have cane coming in for repairs that would have been done 50 or 60 years ago, but some of the modern stuff begins disintegrating after only six or seven years."

One problem is that reduced demand can see cane becoming brittle while sitting on suppliers' shelves for long periods.

The most common caning is with pre-manufactured mat, soaked in hot — but not boiling — water for half an hour to

"You can never be 100-per-cent sure how a job is going to go"

an hour, then secured by hammering a wedge strip to lock the mat in a glue-filled groove in the furniture piece. Sometimes the mat has to be partly unpicked and the cane strips fed through holes in the furniture and locked with pegs.

"We also do seagrassing and rush panels," Philip adds, "although these days the 'rushes' are actually made in Sweden from a type of paper and come as a roll of cord."

Any home handyman restoring antiques in a shed will find some of the jobs challenging, requiring patience and the development of new skills and techniques. After all, Philip still finds jobs challenging after 40 years in the game.

"You can never be 100-per-cent sure how a job is going to go," he says. "Sometimes it turns out to be very easy but some can be extraordinarily hard.

"Regardless of how it goes, the end result can be very satisfying," he adds. 📦

The dreaded borer

No matter whether you're an antique-furniture collector or restorer, the dreaded borer is likely to be the bane of your life. There are commercial treatments for borer, but most only guarantee their work for two years, which Philip says laughing "is the life cycle of the borer".

Once there's a borer hole in the wood, that means the little beast has flown away, but the holes are useful for providing channels into the wood for the introduction of poison to kill remaining larvae. Although proprietary borer-treatment chemicals are fine, Philip will flood the holes and sponge the surrounding wood with chemical-soaked cotton wool rather than inject the fluid.

The best process, he explains, is to strip, fix, and stain the piece of furniture then apply one coat of sealer before treating the borer. "Get the fluid as far into the wood as possible, then as soon as it's done, use wax crayons the same colour as the wood to plug the holes.

"This ensures that the solvent stays in the wood, it disguises the holes and, most importantly, makes it easy to detect any new holes after the borer have flown between November and February."

Borer tend to prefer some wood over others. It's rare to see much borer in mahogany and they stick to sap walnut. Oak and kauri come under frequent attack, but kahikatea is "like ice cream to borer," says Philip.

"Captain Cook remarked on the extensive kahikatea forests covering the Hauraki Plains," he says. "Now there's not a kahikatea house left. Because it is odourless and tasteless, it was used for butter boxes and ice-cream sticks, but you don't see them hanging around either."

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A MOTORBIKE ENTHUSIAST RELISHES THE CHALLENGES OF A REBUILD

By Sarah Beresford

Photographs: Adam Croy

Simon Dew has a thing for Italian and English bikes — think Ducatis, BSAs, and Royal Enfields. Over the years, he has spent hours in his shed labouring over rebuilds and his passion for restoring bikes has been undimmed by the sometimes tortuous process.

“It’s all a bit nonsensical really,” he admits. “It would be much easier to go out and buy a bike that’s up and running and hit the road, but for me it’s not about the bike itself but the process.”

Simon likens rebuilding bikes to herding cats. “Getting compliance so a bike can get back on the road is often long and arduous — and then you’ve got to keep it going. There are thousands of processes you have to consider and often the bikes will have been apart for so long that there’s no contiguous process for you to consider. Things like ignition systems, valve timing, and carburettors can have dramatic effects.

It’s not a linear process from the outside to the centre. Often problems that appear bizarre and insurmountable can be caused by something quite simple.”

But it’s the challenge of the build that Simon loves and has him coming back for more. Over the years, he has worked on a Ducati 860, a 1951 RE Bullet, a 1981 Moto Guzzi 500 Monza and a 1970 BSA B44 Shooting Star, or ‘B44SS’. He currently has two roadworthy bikes that he has rebuilt

and rides regularly — a Royal Enfield “Bitsa” that he built from a wrecked early ’90s standard Bullet 350 from Madras and a number of spares he had left over from a 1951 350 Redditch Bullet that he had restored; and a BSA B44SS that he bought sight unseen online — it had been changing hands as a project for more than 20 years before he got hold of it.

Minimal costs

Simon says that the key to doing the work on the bikes is that he can keep costs to a minimum by doing many jobs himself: “Almost nothing is outsourced, which keeps costs down considerably. If I

need jobs like some aluminium welding for a cylinder head or reborning, I get that sort of thing done, but I can do a lot myself in my shed.”

Although largely self-taught, he gives a nod to the years that he spent as a kid restoring cars

with his father. “We did a vintage-car restoration course at Manukau Tech which was really fabulous. I learnt to weld among other things and we worked together restoring an old Riley. My older brother Martin was into bikes in a big way and he had a big influence on me.”

He says that one of the most useful pieces of equipment he has in his workshop shed at the bottom of the garden of his central Auckland house is his Myford lathe.

“Often problems that appear bizarre and insurmountable can be caused by something quite simple”



Simon astride the Royal Enfield "Bitsa" that he built from a wrecked early '90s standard Bullet 350

"It's been an ongoing saga. The one thing I think I can rely on with it inevitably fails"

"I got it off an old boy in Epsom and it really takes what you can do in restoration to a whole new level. I've made things like nuts, bolts, and screws from steel stock. It really pumps you up a few levels in capability.

"I've used it as a jig for working on crank shafts. The possibilities of what you can do on it are amazing, considering [that] all it does is basically turn things in a circle. The great thing is that it's totally consuming when you work on it, as you have to give it your full attention — you can't think of anything else or you risk pranging the lathe.

"The other thing is that it works on Imperial measurements, so you get very good at converting thousands of an inch to millimetres and back. It's a great brain trainer," he says laughing.

Problem-solving

Simon says the BSA B44SS has been one bike that has presented him with plenty of opportunities to test his problem-solving powers: "It had been assembled just for the pictures on Trade Me but it was never going to run in that state. It's blown up four times and it's been an almost weekly disassembly trying to address the issues.



The B44 BSA



BSA power unit



Royal Enfield motor



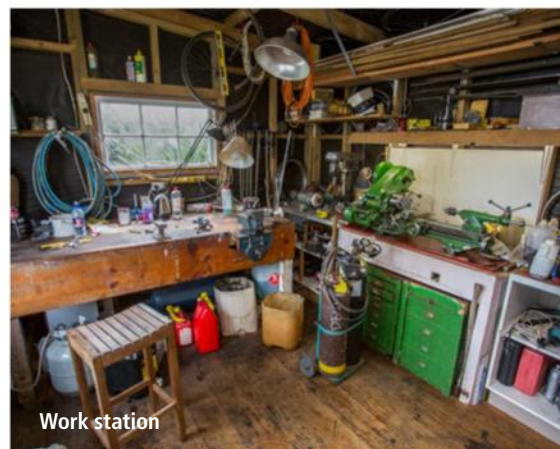
At work on the Myford lathe



Pool's mill



Oxyacetylene set



Work station

One of the problems was [that] the manual had confused the B25 with the B44 so that proved a bit of an issue.

"It's been an ongoing saga. The one thing I think I can rely on with it inevitably fails."

Simon is comfortable doing a range of jobs, from using his oxyacetylene gas welder to fix a crack in the BSA's gas tank to doing the finishing paint job. "I'm happy to strip everything off and use my spray gun compressor to do a paint job. Maybe that's where years of buying tired old cars and spraying them has paid off," he says laughing.

He's rebuilt instrument panels and

resealed them on the lathe, made clutch pullers and other service tools on the lathe, and set up crank shafts on the same indispensable piece of equipment.

Often what seems like a serious problem can end up being a quick fix: "The Enfield used to make an ominous clack-clack sound when it was idling, which had me really puzzled, but it turned out that it was the oil-pump spindle slipping due to my running slightly too heavy a grade of oil.

Simon says that it's the ongoing problem-solving that he finds so satisfying in a build, although there's nothing that can beat the thrill of hearing a motor

turn over for the first time: "Starting a bike [that] you've been working on is like music to your ears. Although you have to hope there's not going to be ongoing problems and you'll have to hear that tune over and over again. Still there's nothing quite like going on a ride on a summer's day on a bike you've rebuilt yourself."

Road trip

Simon recently got to have a taste of the proof of the pudding in terms of the troublesome rebuild of the BSA when he went on a return road trip to Wellington with a mate.

"I bought the bike in 2016, and

The B44SS rebuild *Photographs: Simon Dew*



Simon bought the bike sight unseen online and made a 700km return trip to pick it up



The new alloy clutch basket and plates



Making the screws on the Myford lathe



The quickly made clutch-removal tool



Should that be a hole?



Reducing the fire-lip



Crankshaft split



Truing the crank



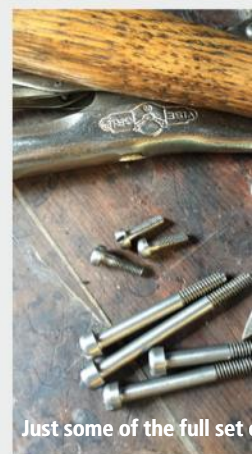
Worn gear pinions



The new homemade rocker nuts



The fork tool with a fetching manuka knob



Just some of the full set



The undercoat goes on



The top coat looking good



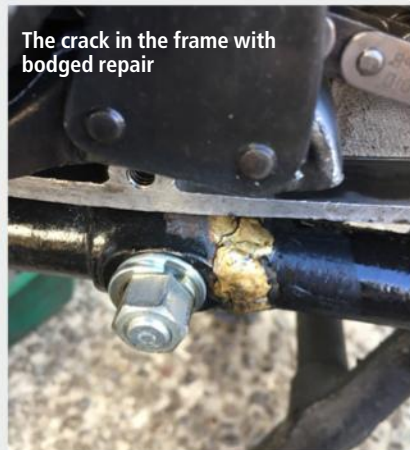
The engine back in the frame



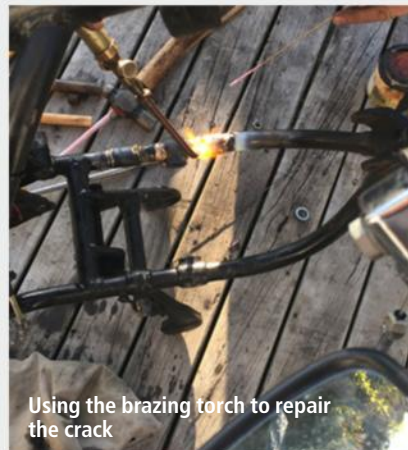
Disaster — barrel-sleeve slips



The NOS standard barrel off eBay



The crack in the frame with boded repair



Using the brazing torch to repair the crack

the rebuild has taken me about a year. The major work was done in three months or so, and then it was sorting out the rats and mice, which seemed to take forever. So doing a 1200km trip in two days was a great test.

“We had a couple of glitches on the way down — the condenser wire broke at one stage and the carb came loose — but on the way back it was faultless.

“It had plenty of pep, too. It managed to keep up with my mate who was riding his Velocette Venom, which is a pretty posh bike,” he says laughing.

But Simon isn’t content to stop with the latest rebuild.

“I’ve pretty much been bitten by the BSA bug”

“I’m looking for a BSA A10 Road Rocket or a Golden Flash to work on next,” he tells us. “I’ve pretty much been bitten by the BSA bug. Having done two rebuilds I’m pretty much in my comfort zone working on them. It’s good to be in zone and familiar with the various marks. The Golden Flash bikes have very successful motors and the great thing is that they are in a very accessible price bracket.

“They are perfect for home repair jobs and make for a pretty low-cost hobby. The BSAs were very popular in America so you can source lots of parts on eBay and even locally. It’ll be great to get started on a new bike project.”

To learn more about Simon’s bike rebuilds, visit: classicbikerestoration.wordpress.com/2017/06/25/first-blog-post/





A HELPING HAND

By Sue Allison Photographs: Juliet Nicholas

A FLOURISHING MEN'S SHED IS A BOON TO THE WHOLE COMMUNITY

The Halswell Menzshed is a bit different from other sheds. One of the most active in the Canterbury stable, it owes its flourishing nature to a mutually beneficial relationship with its landlord, St John of God. The shed has its premises on-site at the residential facility for people with physical and neurological disabilities, and the two organizations help each other out.

The shed's founder and co-ordinator, retired Baptist pastor Roger Spicer, saw the advantages of two groups that shared the same values working together. In 2013, he met Mark Anderson, facilities support manager at St John of God, and they talked about joining forces.

"It fitted well with the model of care we were developing at the time," says Mark. "Our mantra is 'do good for yourself by doing good for others', which is a good fit with Menzshed, which accepts everybody and anybody and operates by similar values."

There was even a venue ready and waiting in the form of a large steel barn that had been erected with a view to restoring the quake-damaged chapel, a project still on hold.

Helping out

Menzshed members help with maintenance around the facility, which has 60 residents. There's a

nice connection between the two organizations, says Roger: "Just this morning, one of our members fixed a phone holder for a guy in a wheelchair." When another resident mentioned that she couldn't water her pot plants from her wheelchair, a member built a raised stand for them.

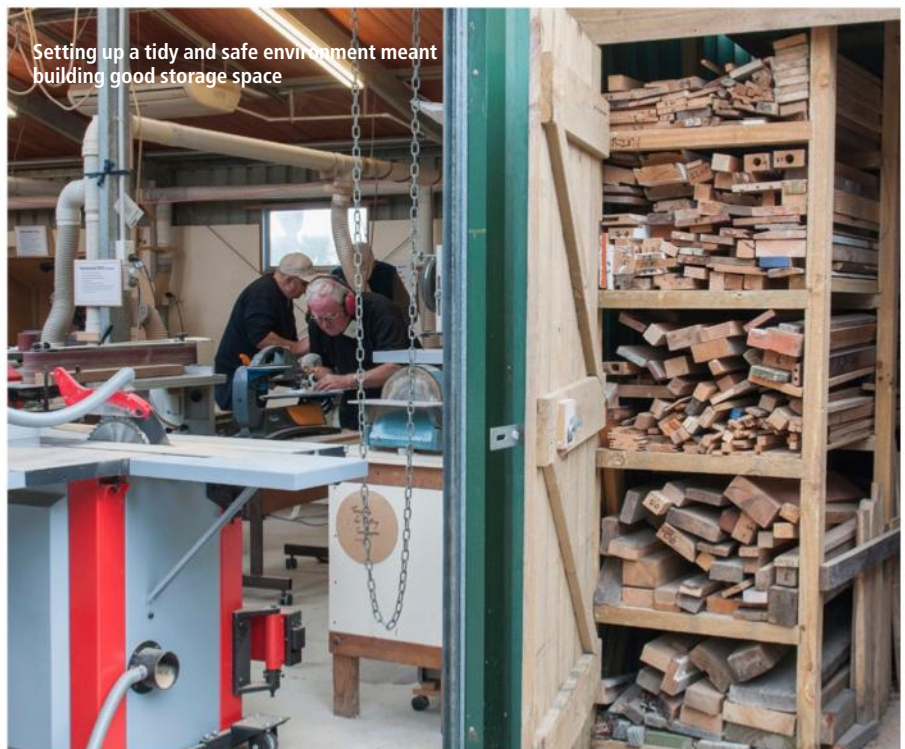
Some residents get involved in shed projects, while others just come to watch. On Thursdays after lunch, a small group comes for an hour to help with jobs like painting.

"Our residents are looking for things to do, and it adds to the quality of their lives," says Mark.

The shed collaborates with other



Working together at the shed makes it a place where men can meet others with similar interests



Setting up a tidy and safe environment meant building good storage space

“Our residents are looking for things to do, and it adds to the quality of their lives”

organizations supporting people with disabilities, such as Hohepa and Brackenridge, while sometimes men from the Hillmorton Hospital unit come with their carers. “It gives them a chance to be part of a community and helps their transition into work,” says Roger.

The shed opens every day except

Sundays and has nearly 140 members on its books, with about 100 regulars. The woodwork and metal shops are in separate buildings, the latter using modified containers with a heavy-duty canopy overhead.

Community projects

Members come from all walks of life and cover an array of trades, allowing them to tap into shared knowledge to solve problems, both to do with projects and life in general. “It’s a well-known fact that men communicate when they work shoulder-to-shoulder rather than face-to-face,” says Roger.

As well as working on personal

projects, shed members make things for people and organizations who are short of cash or labour, and also help out in the community. They have constructed garden planters for the Halswell Commons subdivision, a large wood and plastic moulded chess set for the Halswell Community Project, and seats for the local hall. They have built a henhouse for Oaklands School, made trays for a church café, wooden measuring scales for a local preschool, and a floor chair for a disabled child who can now “sit on the mat” with the rest of the class. Some jobs are done purely out of goodwill, others in return for donations.



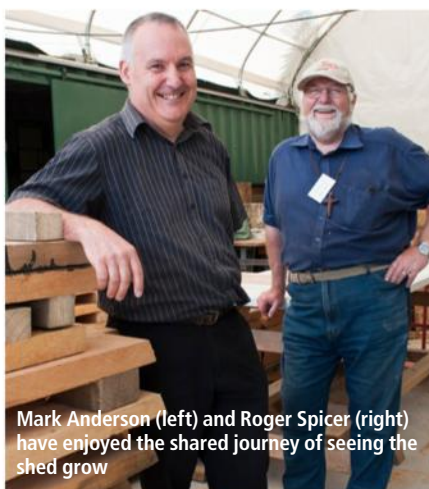
Ron Perry using a jigsaw to cut plywood for his radio-controlled motor-launch model



Above: Geoff Heyes putting an extractor fan on a bandsaw
Below: Ron Mainwaring making a handle for his percussion pistol out of oak



Supervisor for the day Dave Easterbrook watches Roger Spicer fit the legs on his table



Mark Anderson (left) and Roger Spicer (right) have enjoyed the shared journey of seeing the shed grow



"The mantra here is 'always put the people before the projects'. It's more important who we are with than what we are doing," says Roger. Nor do they put timelines on projects unless doing jobs for businesses with deadlines. "People haven't come here for pressure; a lot left that behind when they retired," he says.

Safety procedures

The shed has about 10 trained supervisors working on a roster system. As well as being accountable for opening, closing, and greeting visitors, they keep a close check on safety procedures. (They also

tend to make the tea and do the dishes, supervisor of the day Dave Easterbrook told us when we visited.)

Health and safety are paramount, so everyone was delighted when Des Thomson, a safety guru with international experience under his belt, turned up (see more about Des on page 6). As well as running courses on the subject, Des has put his hand to practical improvements, such as designing and, with the help of fellow sheddies, installing the shed's dust-extraction system.

There's continual development of the shed's equipment, with funding mainly

"People haven't come here for pressure; a lot left that behind when they retired"

coming from grants, which also cover Roger's small stipend. A lot of machinery and raw materials is donated, while local businesses chip in with sponsorships.

Despite the fact that his father made reproduction furniture, Roger says that he's just a novice sheddie but is keen to



Above: Malcolm Gordon working on a vacuum cleaner for future dust extraction
 Right: Ray de Dulin, Kevin Marsh, and Kevin Crossin working together to make large outdoor planter boxes for the Halswell Commons subdivision

learn and recently made a rustic table out of pallets. His forte is more as organizer extraordinaire, and the projects he dreams up for his flock aren't confined to the workshop.

Every year, the Halswell Menzshed gets involved in a community project, and this year Roger, a keen fisherman, organized for a van-load of members to go down to Twizel to help clean up the Pukaki–Ohau canal. Organized in conjunction with Meridian and the Twizel Development Association, the working bee drew an enthusiastic response from locals and finished with a communal barbecue. 📄







3D PRINTING

PART TWO

EXPERIMENTING WITH PROTOTYPES IS THE BEST WAY TO DISCOVER HIDDEN ISSUES AND THEN ENJOY THE IMPROVEMENTS

By Enrico Miglino

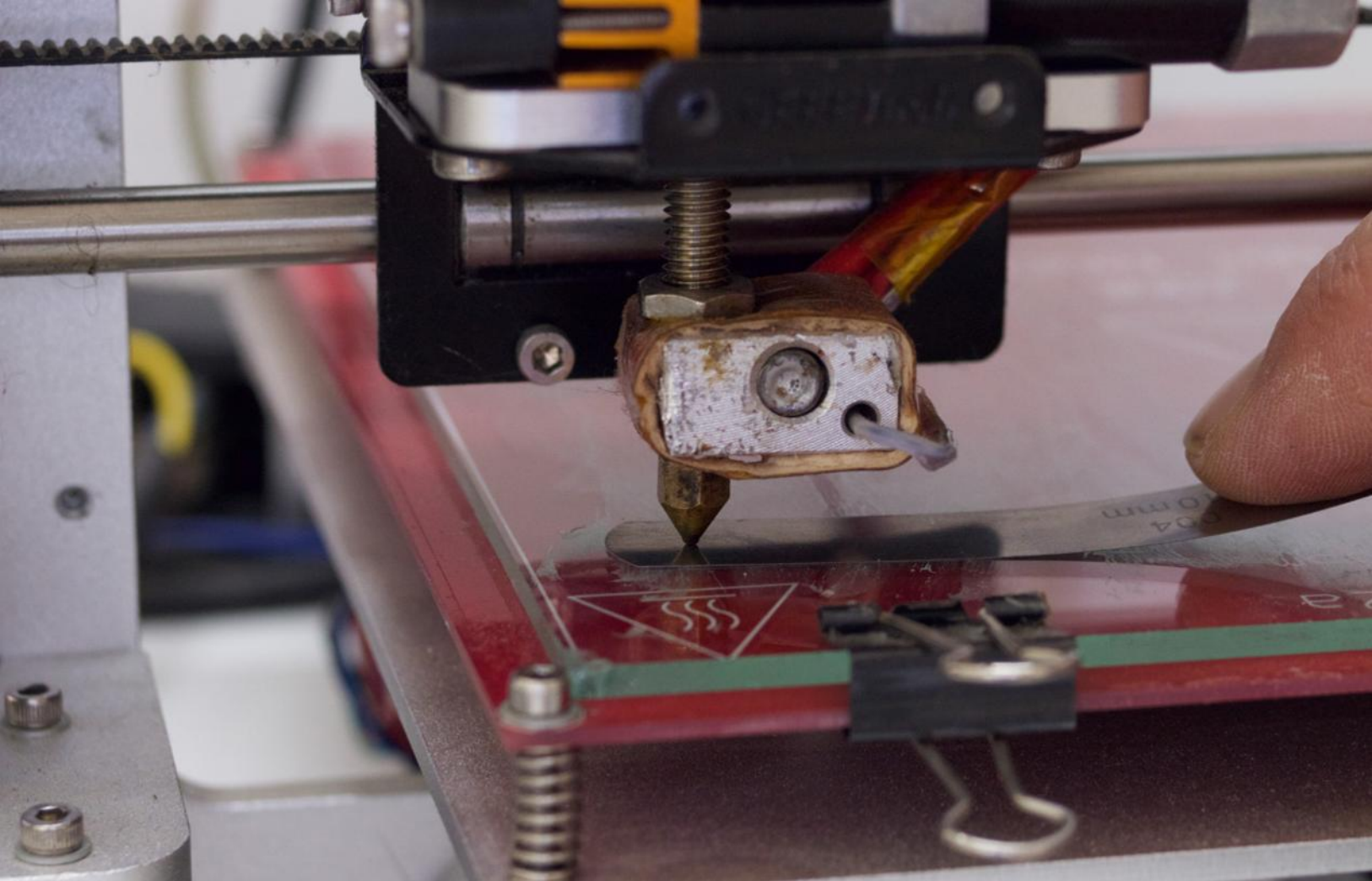
Photographs: Enrico Miglino

In the second part of our 3D printing series, we will analyse a project that evolves through three phases. This is a good way to see how several working prototypes can drive an idea until the final creation solves all the issues. It is not the first time I have needed to see a design in practice to realize how to upgrade it and improve it. Experimenting with prototypes is the best way to discover hidden issues and as a result enjoy the improvements.

We will use this same project later to demonstrate the advantages of making modular designs — a sensor and a microcontroller will be added to the 3D printer filament dispenser, as well as motion.

For now, we will assume that the 3D model CAD does well. We will discuss in detail the 3D CAD applications for 3D printing in a future article.

In this project, we will explore the main aspects of the 3D printing software settings applied to this use-case. A 3D-printed object follows two important phases: the design and the physical printing. In both phases there are aspects we should take into account to achieve the best result, depending on what our 3D printer can perform. Design and printer settings are related — a wrong approach to the CAD design will affect the printed result, as well as a wrong or incomplete setting of the 3D printing software.



Above and below: The mechanical feeler used in the bed calibration process



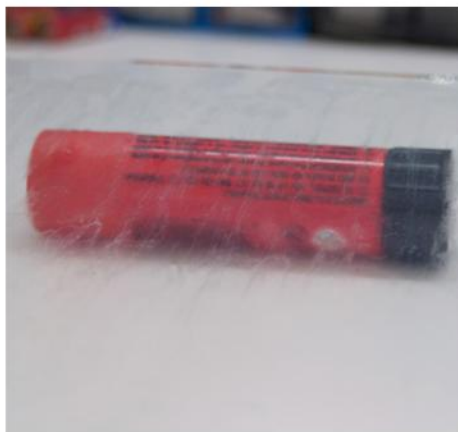
The project

To reduce the stress on the 3D printer extruder and the risk of breaking the filament, I designed a simple 3D spool filament dispenser — the first part of a modular system. This object consists of several components, as there are at least two distinct advantages to working with 3D-printed objects organized into parts.

The first advantage is that we can print single parts with different settings, like the internal fill percentage. This results in the optimization of the material and the components.

The second advantage is avoiding incredibly long printing times, eliminating the risk that the printing process could be interrupted for any reason.

Designing the object in parts also has the further advantage of creating reusable components for future projects. The early versions of the 3D printer filament dispenser were quite different to the current design. The rotating parts were 3D printed and while using it, I discovered that the plastic material tends to wear and



Far left: The solid glue stick used for the hot bed adhesion on the glass surface
Left: How the hot bed glass surface appears after the uniform glue distribution
Below: The base STL model and the same after slicing simulated in the virtual 3D printer space. Note in the second image the slicing process has also added the first layer brim support

The second advantage is avoiding incredibly long printing times, eliminating the risk that the printing process could be interrupted for any reason

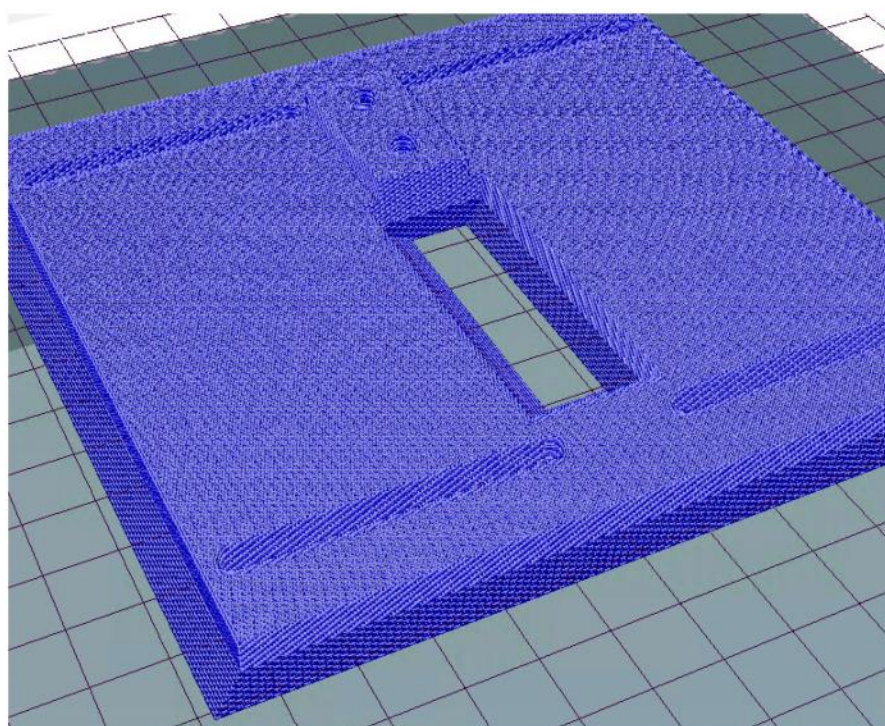
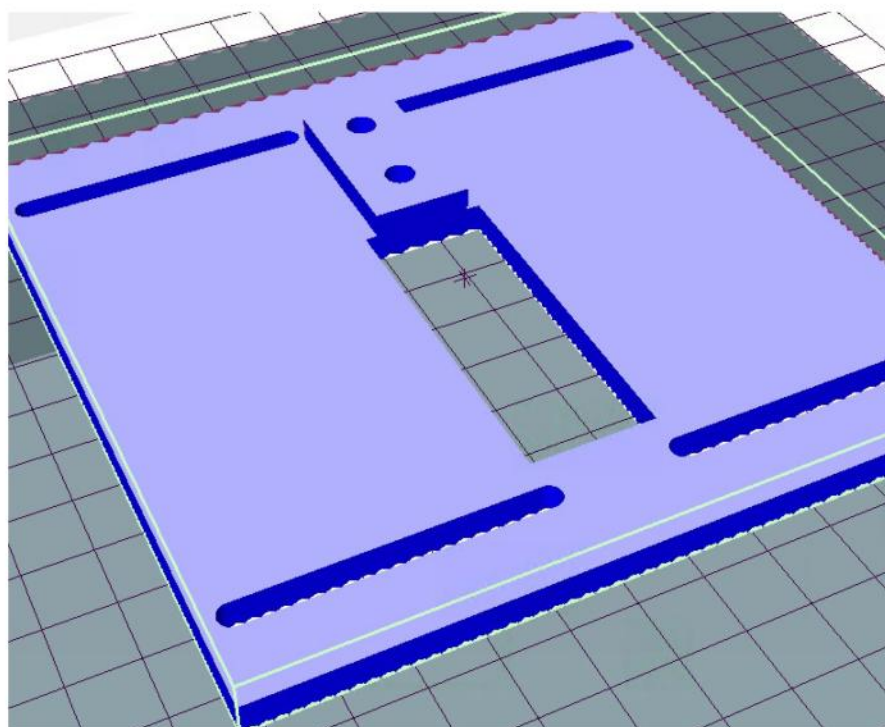
become noisy, so in the new version I used four bearings instead.

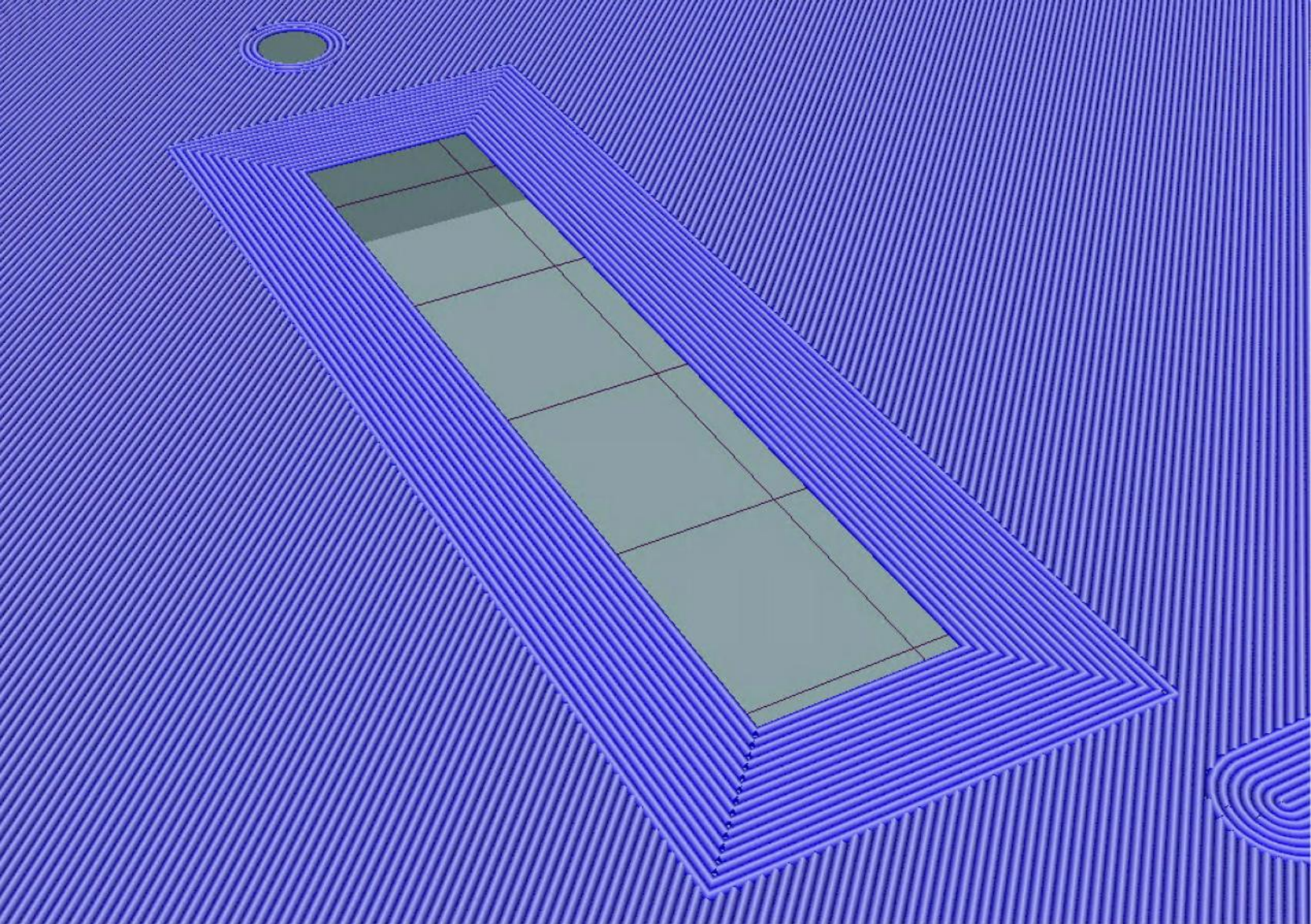
Building the dispenser

My original idea was to build a more reliable filament dispenser than the standard ones shipped with DIY 3D printers. The first attempt was very simple and the filament roll rotated on a base with four small wheels. That first model worked, but it was necessary to place the filament spool on a shelf higher than the 3D printer. One thing I neglected to design was a base. Not all users have the option to screw the dispenser over a shelf or a table.

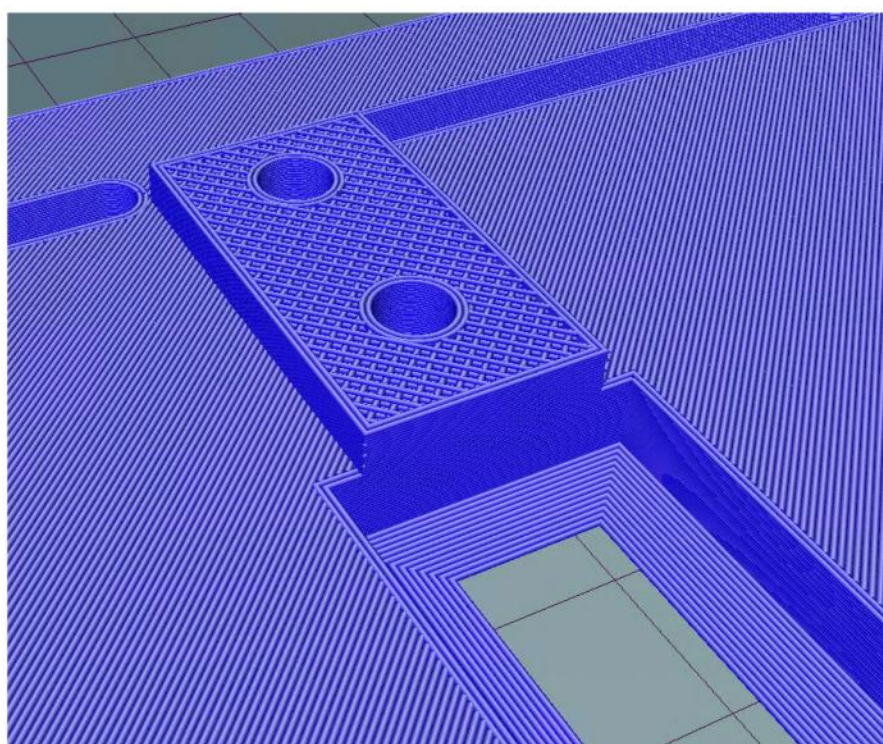
Recently, I decided to make a more complete design that also solved another issue — the variable width of the filament plastic spool depending on the producer, the weight, and the kind of material.

I still used the 3D-printed rotating components, but the unexpected friction that emerged caused issues, so I moved to the four-bearing version. The most relevant changes in the latest design are that fewer 3D-printed parts are required — earlier versions required every wheel to





Above: First layer with brim support simulated in the virtual 3D printer space
Below: Different fill quality: internal, brim, and finished surface with 5mm brim support, .4mm nozzle, and 40 per cent internal fill. Shell thickness is .8, corresponding to two perimeters of the nozzle



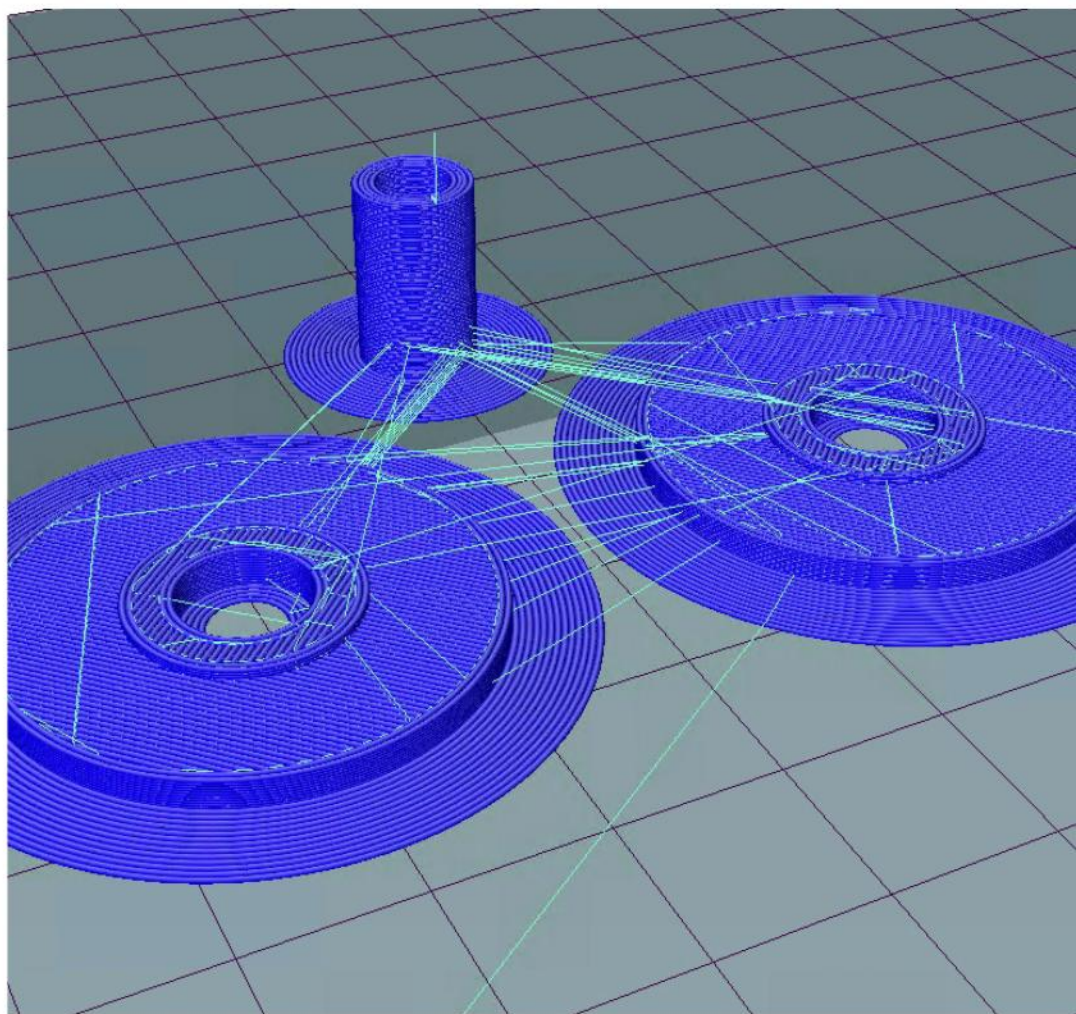
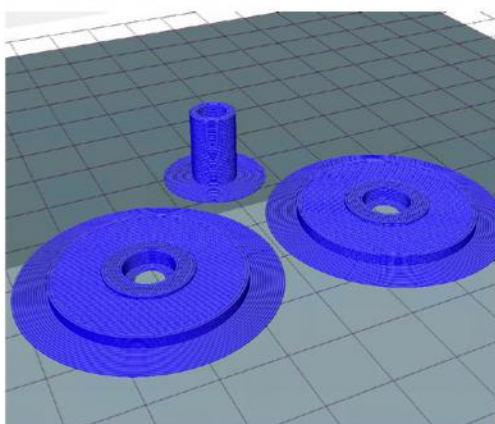
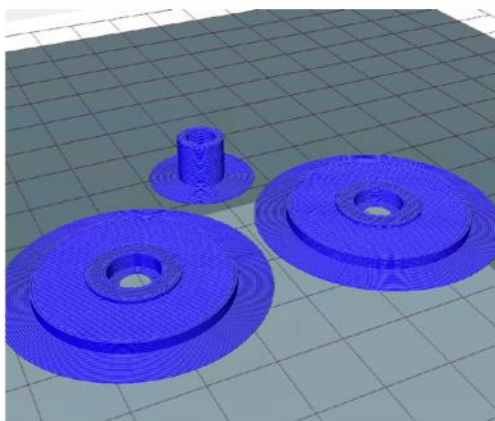
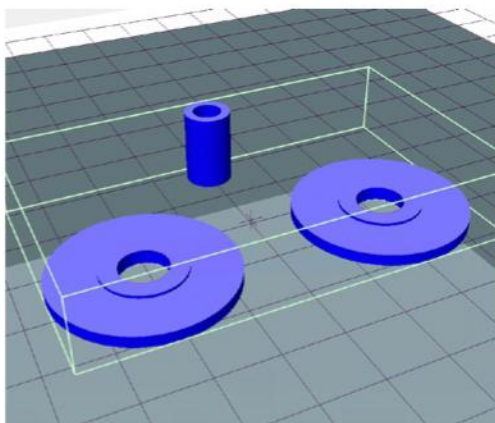
be made with three separate components — in the latest design, these have been replaced by one bearing; and the bearings' supports have been redesigned, resulting in some size changes.

No new issues emerged after intensive use and the filament flows very smoothly and silently.

As I have already mentioned, multiple-part projects mean optimization. In this case, there are three different kinds of components:

1. the dispenser base
2. the bearings' support
3. the bearings' axes.

The base is subject to a very small mechanical stress; it should support about 2.5kg (statically), so a 30- to 35-per-cent filling material is sufficient. Bearing supports and axes are the most mechanically stressed components and should be printed with a 50- to 75-per-cent fill. These are relatively small components, so the printing time remains acceptable. The side bearing guides are not subject to any stress, so



Small parts — STL file simulation and after slicing. In this case, the brim support is essential to grant adhesion of the small parts. Note in the above image how the 3D printing software can also simulate the path — the light blue vectors — followed when 3D printing

they can be printed with a 35-per-cent fill without any risks.

3D printing applications

Some commercial products provide their own 3D printing software, but most of the 3D printers can be interfaced with popular open-source applications. Open-source applications are more complete and reliable than most of the commercially developed programs. The biggest difference is that commercial programs are closed. The developers will have spent considerable effort creating easy-to-use applications where the user can just install and

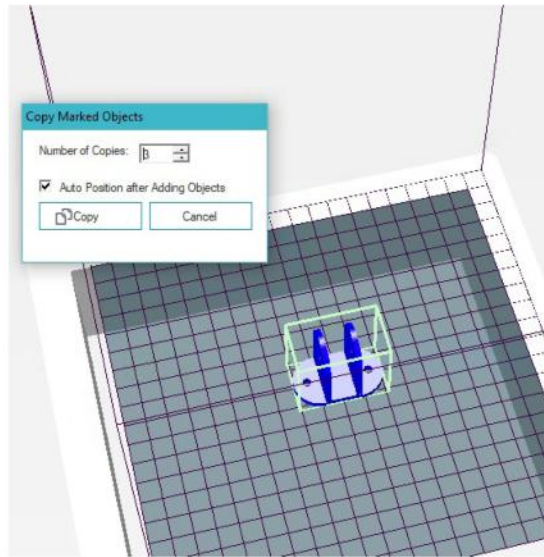
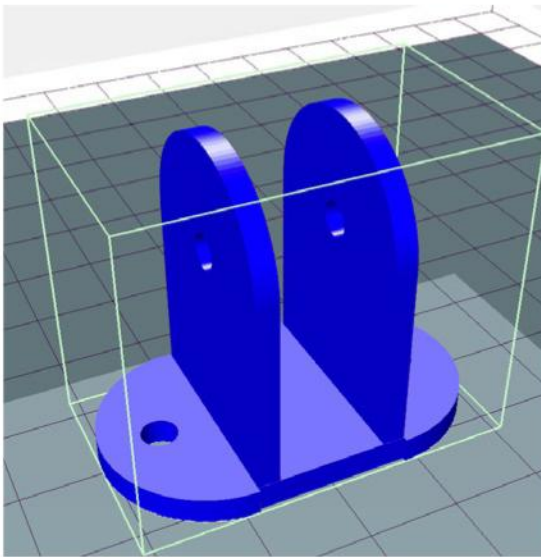
start printing. Unfortunately, this is not the best approach, as it restricts the many possibilities offered by 3D printing technology.

There are so many parameters that can change the way to print a model that it is almost impossible to make a 'just-press-a-button' system without compromising the result. It is better to learn how the parameters influence the final results — a few experiments will show you how to gain total control of the 3D printer. The most common open-source programs are Repetier (repetier.com) and Cura (ultimaker.com/en/products/ultimaker-cura).

The STL file format is the 3D representation of the CAD design model sliced by the 3D printing software. The STL file can be viewed and imported by many CAD applications, but it is no longer editable.

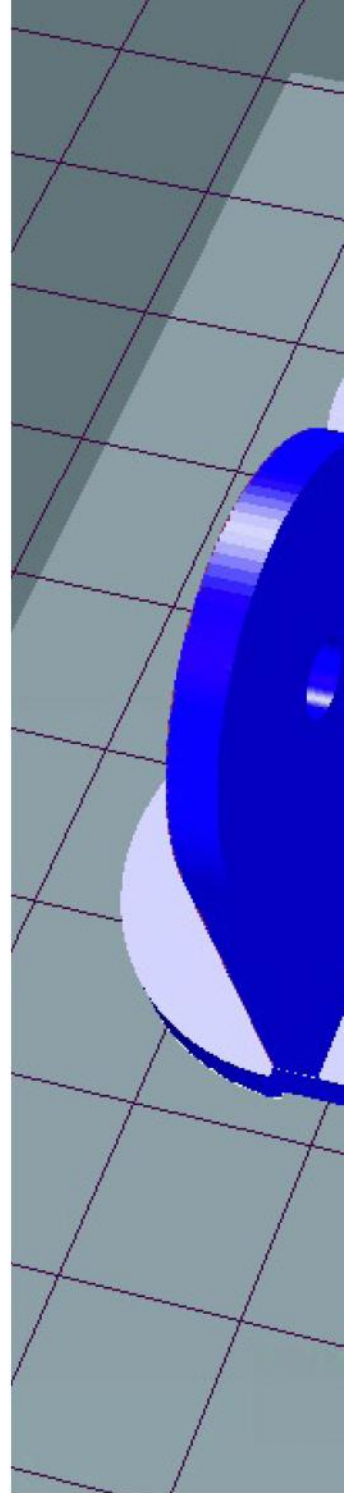
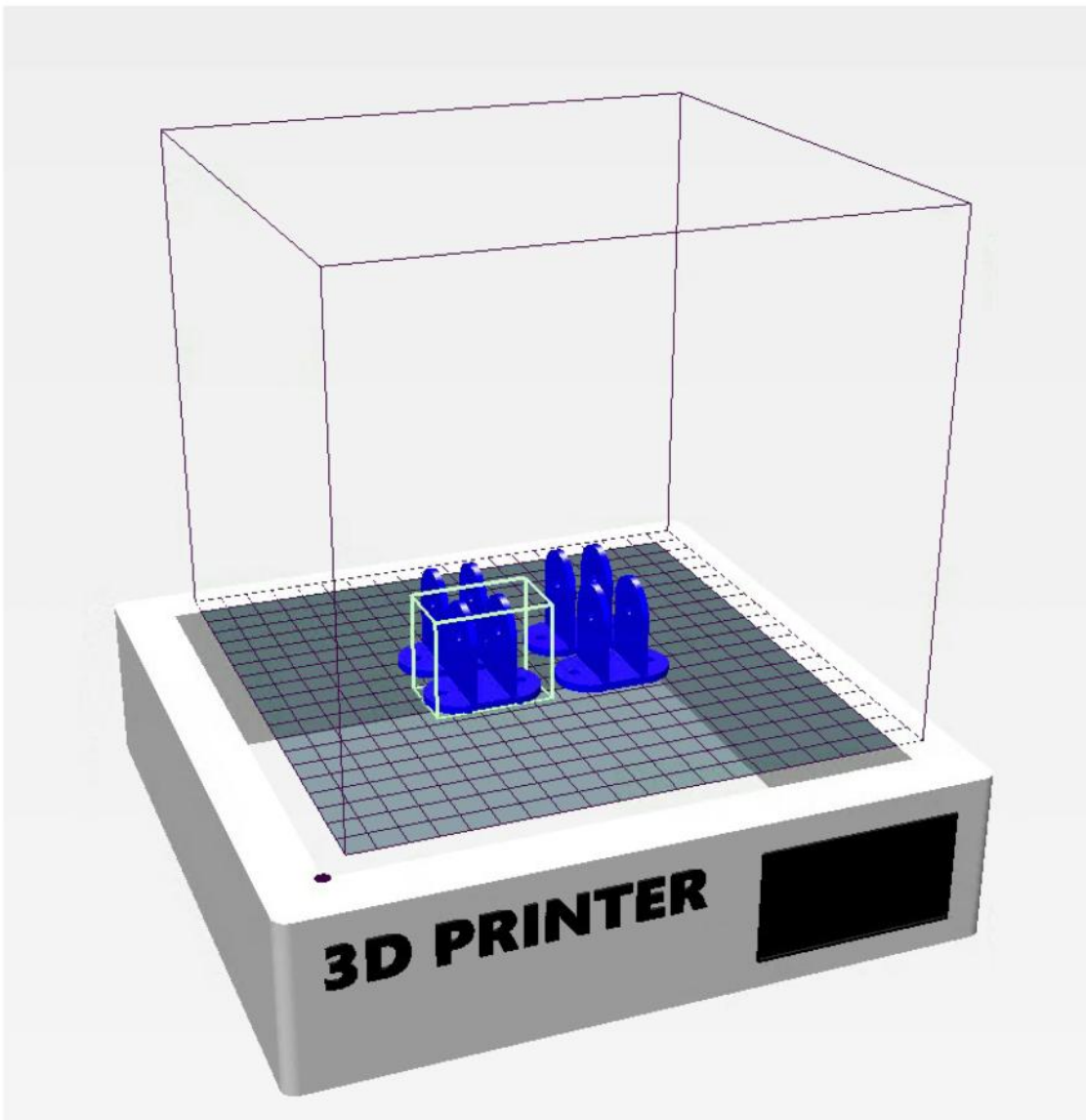
Software and parameters setting

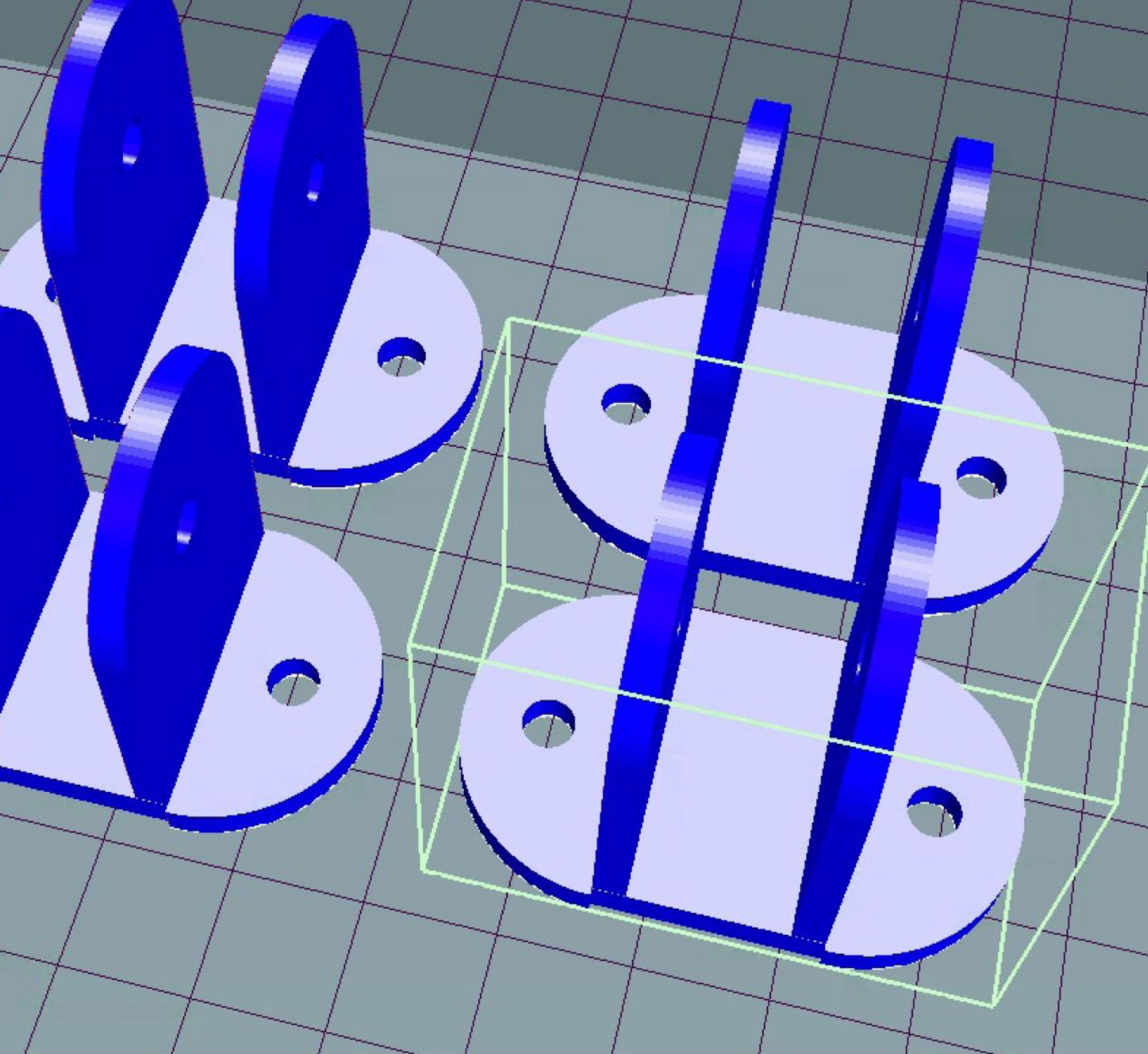
Setting the slicing process is the key step for a great 3D-printed object. The experience and ability of the user setting the slicing parameters can significantly improve the printing quality. It is essential to slice the STL model file correctly to get the best result based on



The sequence shows how a single STL file is copied (replicated) by the 3D printing program after it is loaded. In this case, we can print one of the four bearing supports. The parts can be selected by the user and

positioned automatically at a proper distance centred on the 3D printer bed. This is the reason it is important to configure a complete and correct printer profile in the 3D printing application





the capabilities of your 3D printer.

The G-code created by the slicer engine is a file. It is executed by the 3D printer sent by a computer or saved locally on an SD card, or a memory stick on the printer, or sent via the network.

The slice engine is not always identical in all programs; it is often a plug-in accepted by several 3D printing programs.

For example, the Cura slicing engine can run on its native software as well on the Repetier application, which also includes its own slicer module. In my everyday work, I prefer the user interface

of the Repetier software and the slicer engine of Cura.

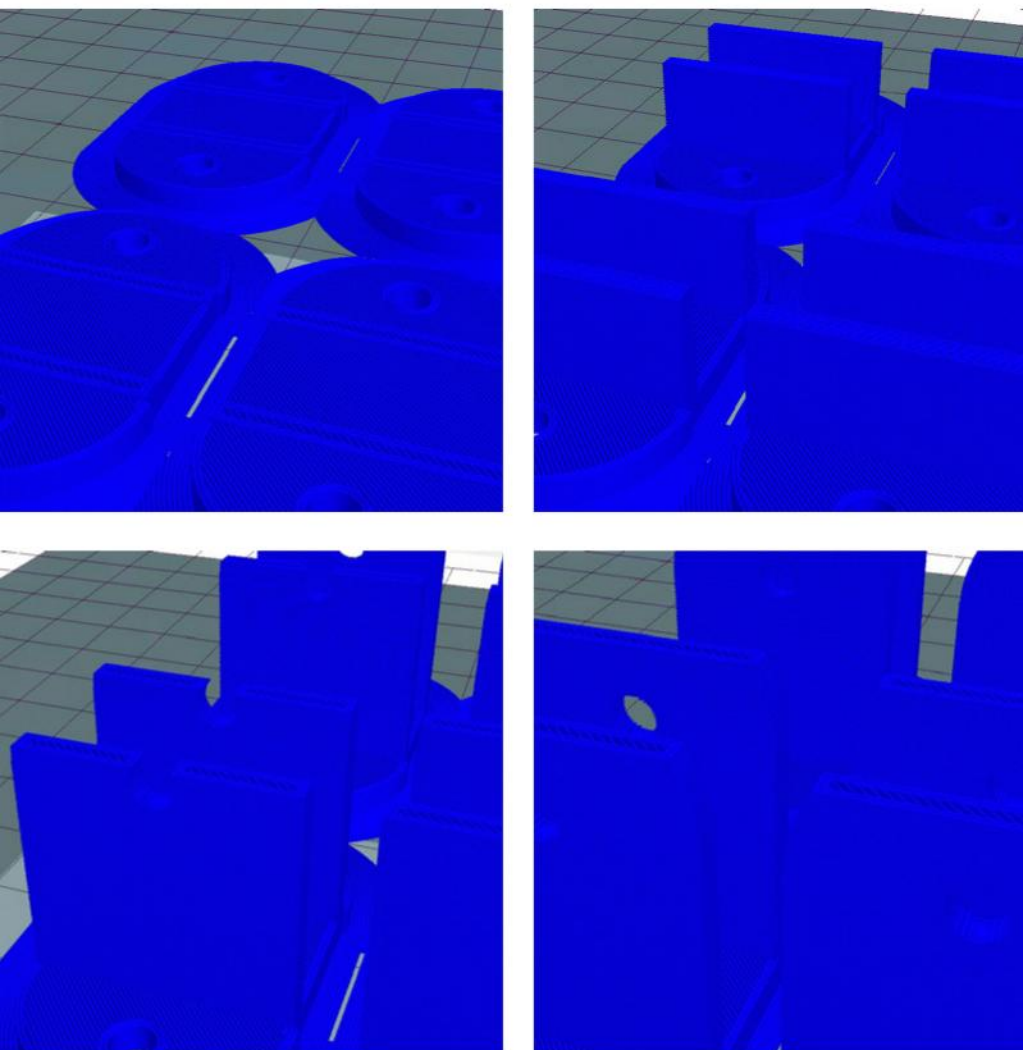
Some parameters directly influence

*“If moving too slowly,
the nozzle may coggle,
thus releasing too
much material into the
same surface area”*

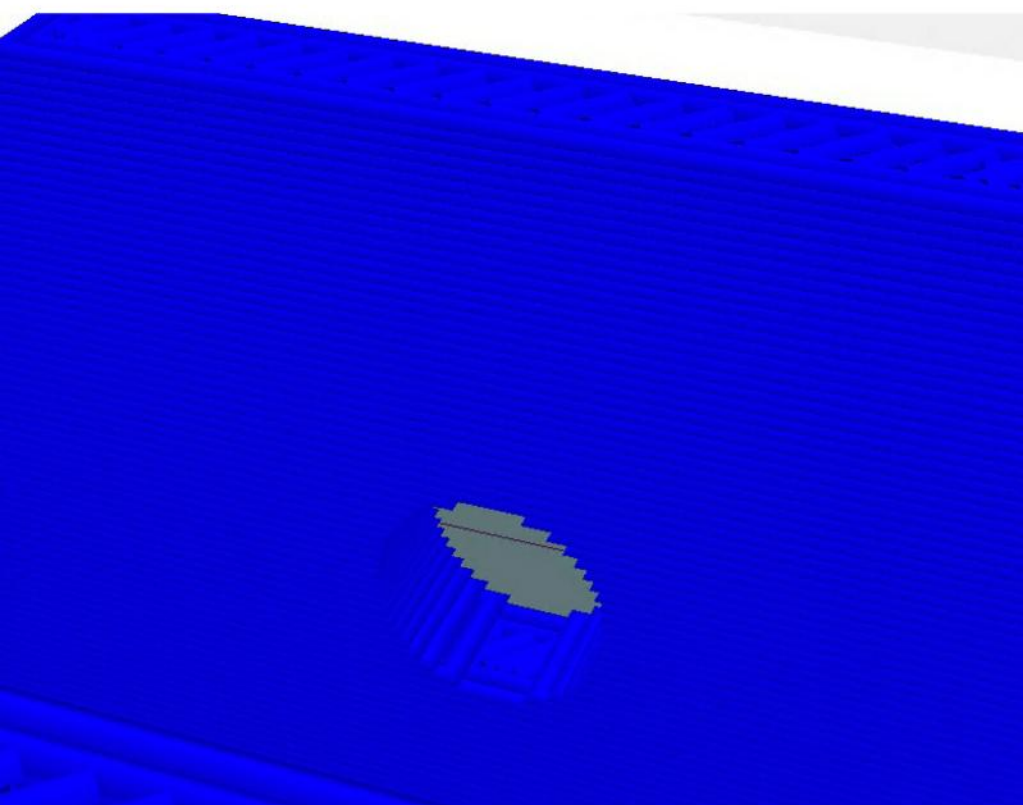
the 3D printer performances and characteristics regardless of what is printed.

X-Y axis speed

The speed parameter is one of the most complex settings as it is influenced by many device components. Setting the right printing speed is a key factor in reaching a good result as it influences the printing features in several ways. The print speed parameter depends on the reliability and precision of the X-Y axes' movements. This is not a fixed value but a range. It is not a good



Simulation of several phases of the bearing supports printing. Note that as no support has been defined for the holes, the curves can be printed vertically with precision without difficulty



idea to print at the maximum print speed, as that should be treated as the upper limit.

The speed value influences the printing features in several ways. Setting the right printing speed is a key factor in reaching a good result. We can move the extruder head faster along the non-printing area, thus reducing the speed when the filament is flowing. The speed parameter is one of the most complex settings, as it is influenced by many device components.

Printing quality

Using a .4mm extruder, we can print at an average speed of 50–60mm/min, factoring in that the faster the extruder moves, the more material flows in a unit of time. If moving too slowly, the nozzle may coggle, thus releasing too much material into the same surface area. If the extruder moves too fast, there is the risk of a poor printing quality.

The model accuracy, and in particular the quality of the vertical sides, is influenced by the axis speed. But we don't always need a perfectly refined model, so, depending on the desired quality, the printing speed should be set accordingly.

The 3D printing process follows three phases:

1. first layer printing
2. intermediate layers
3. top layers.

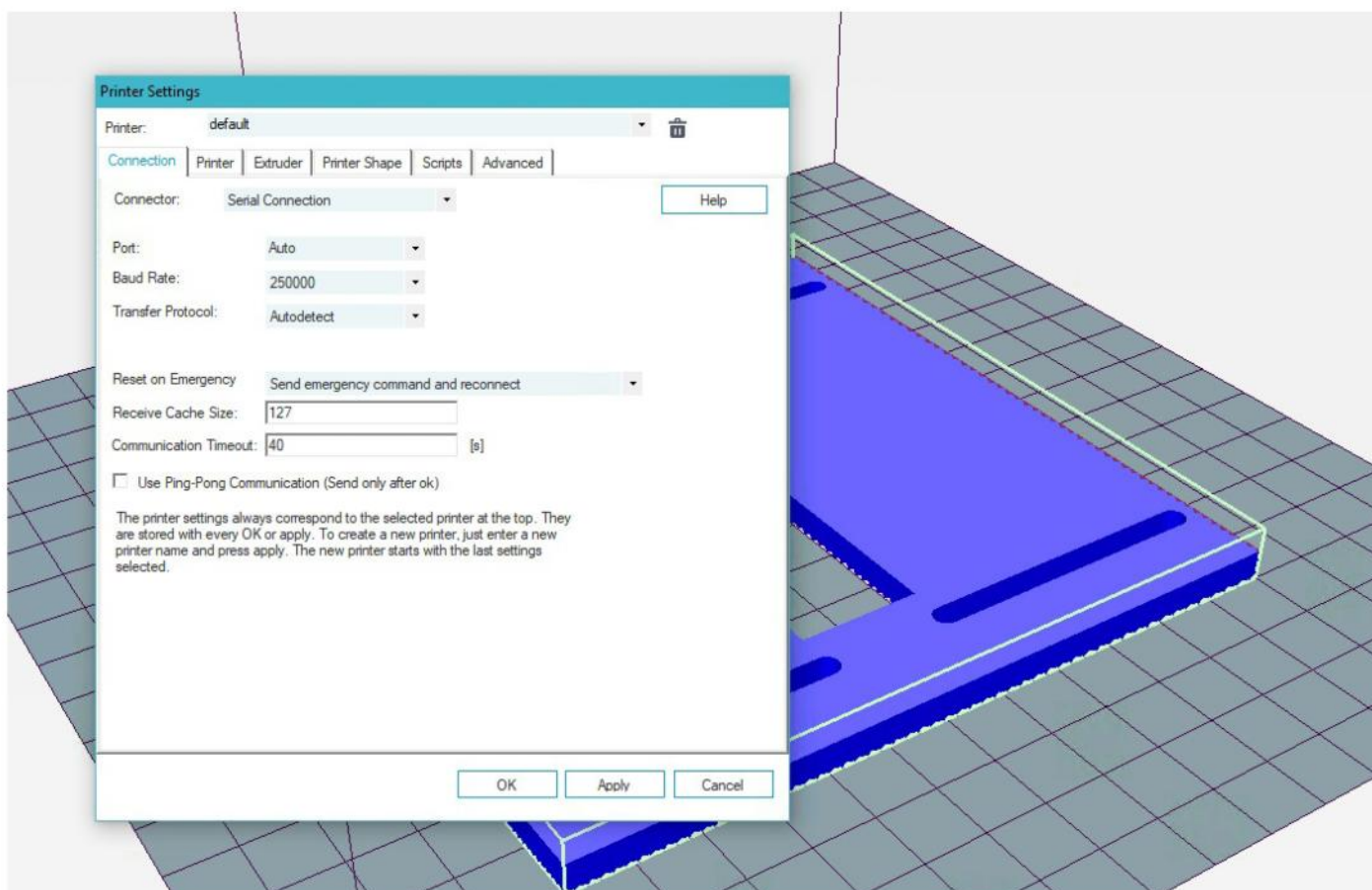
Good 3D printing software should enable you to set different axis speeds, at least for these three phases. The first layer should be (usually) printed slowly to gain a better adhesion over the printer bed surface. The same applies for the top layer that completes the model's finished surface.

The printing process of a single layer involves several parts that need different speeds:

- The external shell, that is, the compact external surface, is usually printed at about 60–80 per cent of the average selected speed.
- The support components — if

The full assembly kit with the bearings, Allen screws, washers and nuts to put the 3D-printed parts together





any — can be printed faster; up to 110–120 per cent (based on the printer).

- The fill area's print speed depends on the filling percentage set by the user. It is best practice to reduce the speed when the model is filled at a very low percentage (25–30 per cent).

The 3D printer bed area and volume is another setting related to the 3D printer and on most software bundled in with commercial 3D printers, these are fixed values. Instead, in 3D-printing open-source applications — compatible with many different 3D printer models — these values are part of the printer profile definition.

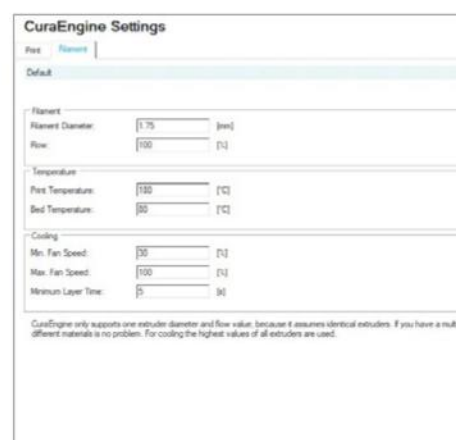
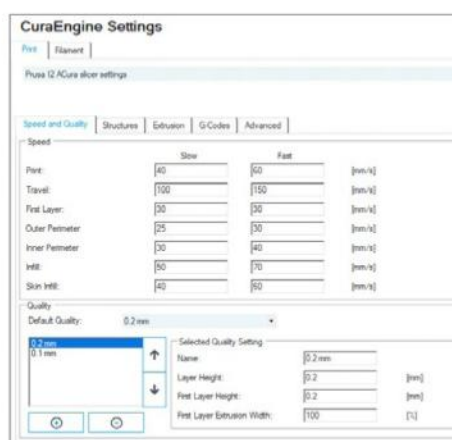
The most common axis orientation is the bottom leftmost corner of the 3D printer surface. You may need to change this set-up by moving the origins, for example, to the opposite corner.

Extruders

Good 3D printing software should be compatible with printers supporting multiple extruders (usually two) as well. To achieve the best print results, it is important to create a good printer profile. The mentioned parameters influence the behaviour of the slicer algorithm. For the

Above: Screenshot of the printer profile tabs. It includes all the parameters to virtually define the 3D printer model you are using. Most of the choices of the slicer algorithm (positioning, replication, area measuring, axis movements, etc.) are based on the 3D printer profile, as well as the way the computer will communicate with the peripheral

Below: The two tabs where the user can configure the printing features for a specific model. Every group of settings for the print and filament can be saved as a template for future use



same reason, it is possible that the G-code file created for a printer will not be reusable on a different model. By creating different printer profiles, it makes it easy to re-open an STL model file, re-slicing

it to adapt the G-code instructions to the new 3D printer profile.

For the software download of this series of articles, head to <https://github.com/aliceimirror/ShedMagazine>

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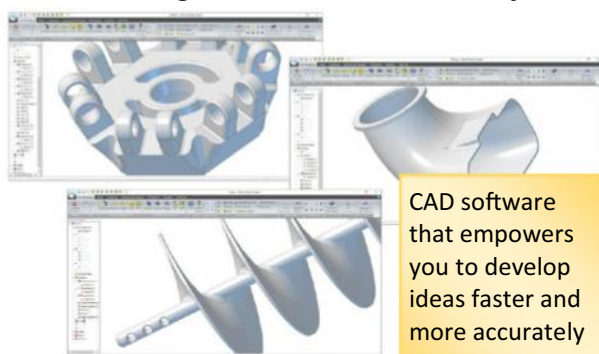
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size matters

SOCKET SETS, SPANNER SYSTEMS, AND SIZES EXPLAINED

By Ritchie Wilson and Jude Woodside
Photographs: Adam Croy

Over the years I have bought three universal sockets from second-hand tool dealers. Only one has a name and the manufacturer stamped on it, the American-made Ultra Socket, while another is obviously a close copy of the Gator-Grip that is advertised on the internet.

The Ultra Socket has three jaws, like a drill-chuck, which are adjusted for different-sized nuts by turning a knurled ring. The other two universal sockets have spring-loaded segments, or rods, that are depressed by the nut or bolt-head, which is then gripped on the flats by the remaining undeformed elements.

The mechanical ingenuity of the universal socket is very appealing, and their price would be similar to that of the minimum number of cheaper fixed-size sockets needed to work on modern cars. I have come across one person who has used a universal socket successfully on a rusted blade-retaining nut on his motor mower.

I think the real appeal of these

mechanical curiosities is that they can grip fasteners for which purpose-made sockets can't readily be purchased, and the reason for that is that the system of sizing nuts and bolt heads has changed more than once over the past 50 years.

After 1949, there were Unified threads (UNF and UNC), which standardized threads across Britain

Different standards explained

Whitworth

Up until 1941, British cars had Whitworth fasteners, then the closely related British Standard Fine. Whitworth bolt heads and nuts were named for the thread diameter to which they were

attached and British Standard Fine (BSF) heads were commonly one size smaller. British Standard heads were introduced during World War II as an economy measure. The head sizes of the older Whitworth bolts were reduced by one size so the old 1/4-inch Whitworth became the size for the 5/16 BSF. Thus, you will come across spanners marked '3/16 W 1/4 BSF' — both refer to the diameter of the bolt thread, and the actual size across the flats (AF) of the bolt will be 7/16. BSW bolts have a coarser thread suited to soft or crystalline materials such as the cast iron into which they often fitted. The BSF threads were finer (higher threads per inch [TPI]), providing for stronger fastening and better vibration resistance in high-tensile materials.

After 1949, there were Unified Thread Standards (UNF [Unified fine pitch] and UNC [Unified coarse pitch]), which standardized threads across Britain, America, Canada, and finally (after Britain joined the Common Market)





Whitworth spanners
— note the dual sizing — W and BS

metric or combinations of two or three of these. American cars have often used a combination of metric and SAE (see next page) threads due to parts being assembled offshore in areas where they commonly used metric standards. ▶

A Whitworth/British Standard spanner



A glossary of terms for screw- and bolt-system names

Whitworth (W or BSW)

Named after the British engineer Sir Joseph Whitworth, who developed the system in 1841, after which it was very widely adopted worldwide. Head size is roughly 1.5 times the fastener's thread diameter.

British Standard Fine (BSF)

Instituted in 1940 as a war-time economy measure; it is Whitworth sizes with heads reduced by one size.

British Association (BA)

A system standardized in 1903 by the venerable scientific society the British Association for the Advancement of Science. It was for small fasteners, the largest being 0; the smaller the fastener, the larger the number (like SWG [Standard Wire Gauge]). Head size is strictly 1.75 times the thread diameter. So BA has a 6mm thread diameter and a $6 \times 1.75 = 10.5\text{mm}$ head measurement.

BA fasteners used to be very widely used in electrical equipment.

AF Imperial (SAE)

An American system measuring across the flats (AF) of the fastener head in inches. In Britain this was generally introduced in about 1950. Head size increases with the thread diameter in a variable fashion.

Metric (M)

Measured across the flats of the fastener head in millimetres. A European system adopted in Britain, New Zealand, and Australia as part of the metrification starting in the 1960s. Head size increases with the thread diameter in a variable fashion. The socket sizes most often used on European vehicles are 8, 10, 11, 13, 17, 19, and 22mm. Most people buy sockets in sets as this is more economical than buying the necessary components separately.



Set of Metrinch sockets

Across the flats — AF

The metric system has always used the 'AF' specification, where the bolt head is measured across the flats rather than referring to the actual thread diameter. This convention was adopted by the Americans with the widespread adoption of the SAE system. It's often suggested, even by some manufacturers, that AF is a standard. It is not — it's a method of measurement. The Americans effectively use an imperial system that is measured

across the flats; however, it does distinguish this type of socket from the Whitworth or BSF standard. It is more correct to refer to the American standard as 'SAE', for the Society of Automotive Engineers, for which the standard was developed, or even 'AF Imperial'.

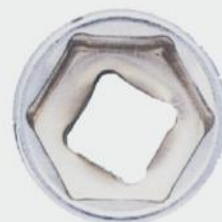
Metrinch

One result of this chaotic situation was the invention of the Metrinch type of sockets — spanners that grip the flats of a nut or



Flank Drive spanner

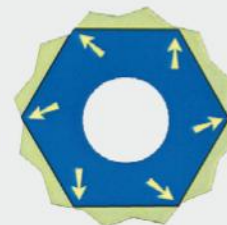
Wurth Powerdrive system



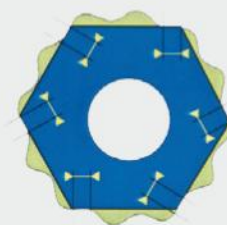
The force is applied over the entire surface, not just along the edge



Sharp angles, which are prone to form at zones of high load, no longer exist, translating into a longer service life and higher transmission of force



Without Powerdrive — stress in the corner

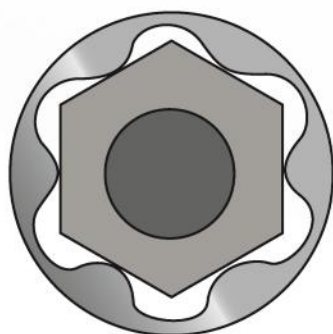


With Powerdrive — stress distributed on the surface

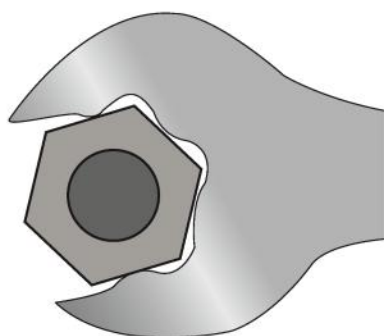
See The Shed website for a video on how the Wurth Powerdrive System works. theshedmag.co.nz/videos



Flank Drive socket



How the Flank Drive and Metrinch sockets and spanners work



bolt rather than the corners. They rely on a cam design to grip the flanks of the nut rather than exerting pressure on the corners. They are a comparatively loose fit and so a single spanner may be used on several slightly different-sized fasteners.

They are highly regarded by their users because even nuts rounded by previous abuse can be positively gripped and loosened. One user told me that he was only very rarely unable to undo a fastener with his Metrinch sockets. These are available on the internet, but because they have fallen out of fashion, are not currently for sale in my town. A similar technology called 'Flank Drive' was patented by Snap-on in the 1960s. It applied to sockets but a version was later developed called 'Flank Drive Plus' that added this to open-ended spanners. Since the patents have expired, this design is appearing on a number of spanner and socket sets. Like the Metrinch system it's designed to grip the flanks of the nut rather than the corners. ▶

Snap-on Flank Drive and Flank Drive Plus spanners

Socket substitution chart

While there are few exact fits in any system, there is always a degree of variation in spanner sizes. This is necessary so that the spanners can fit on bolts and nuts that may be out of spec, and to account for differences caused by heat, etc. So it is worth

trying spanners either side of the target size, especially if you are trying to find an alternative to the British sizes. For example the $1\frac{1}{16}$ W / $\frac{3}{4}$ BSF spanner is 30.48mm, which is exactly the maximum opening size of a 30mm metric socket.

Diameter of bolts		Width across flats	
Whitworth	British Standard	Inches	mm
8 BA	—	0.152	3.86
7 BA	—	0.172	4.37
6 BA	—	0.193	4.9
5 BA	—	0.22	5.59
4 BA	—	0.248	6.3
$\frac{1}{16}$ W	—	0.256	6.9
3 BA	—	0.282	7.16
$\frac{3}{32}$ W	—	0.297	7.54
2 BA	—	0.324	8.23
$\frac{1}{8}$ W	($\frac{3}{16}$)	0.34	8.64
1 BA	—	0.365	9.27
0 BA	($\frac{7}{32}$)	0.413	10.49
$\frac{3}{16}$ W	$\frac{1}{4}$	0.445	11.3
$\frac{1}{4}$ W	$\frac{5}{16}$	0.525	13.34
$\frac{5}{16}$ W	$\frac{3}{8}$	0.6	15.24
$\frac{3}{8}$ W	$\frac{7}{16}$	0.71	18.03
$\frac{7}{16}$ W	$\frac{1}{2}$	0.82	20.83
$\frac{1}{2}$ W	$\frac{9}{16}$	0.92	23.37
$\frac{9}{16}$ W	$\frac{5}{8}$	1.01	25.65
$\frac{5}{8}$ W	($1\frac{1}{16}$)	1.1	27.94
$1\frac{1}{16}$ W	$\frac{3}{4}$	1.2	30.48
$\frac{3}{4}$ W	$\frac{7}{8}$	1.3	33.02
$1\frac{3}{16}$ W	($1\frac{5}{16}$)	1.39	35.31
$\frac{7}{8}$ W	1	1.48	37.59
1. W	$1\frac{1}{8}$	1.67	42.42
$1\frac{1}{8}$ W	$1\frac{1}{4}$	1.86	47.24
$1\frac{1}{4}$ W	$1\frac{3}{8}$	2.05	52.07
$1\frac{3}{8}$ W	$1\frac{1}{2}$	2.22	56.39
$1\frac{1}{2}$ W	$1\frac{5}{8}$	2.41	61.21
$1\frac{5}{8}$ W	$1\frac{3}{4}$	2.58	65.35
$1\frac{3}{4}$ W	2	2.76	70.1



There are some sockets that can be used in more than one fastening system

► I have American and British cars from the 1930s and French and Japanese ones from the end of last century, so I have an Australian socket set containing Whitworth (marked 'BSW'), AF, and metric sockets. Even second-hand, the set cost a lot more than a Gator-Grip, so a robust universal socket might be worthwhile as an alternative for light work on older British machinery.

Interchangeability

While using an ill-fitting socket or spanner is inevitably ineffective, damaging, and possibly dangerous, there are some sockets that can be used in more than one fastening system. A small number of socket sizes from some manufacturers have both metric and imperial sizes actually marked on them, the size differences being relatively small — 10mm is very close to $\frac{3}{8}$ -inch AF, while 19mm is almost identical to $\frac{3}{4}$ -inch AF. Some imperial AF sizes such as $\frac{11}{32}$ inch and $\frac{25}{32}$ inch are thought to be direct replacements for BSW sizes.

If the difference between sockets is small they may be interchangeable. It is possible for some SAE spanners and sockets to be used on metric fasteners and some metric and SAE spanners and sockets on Whitworth ones, presuming there is an approximate fit (see table for the relative sizes of various bolt heads).

I remember once noticing a Citroën mechanic using a $\frac{1}{2}$ -inch imperial AF spanner on a 12mm nut and asking him why. His reply was: "Because it works".



Three universal sockets with the Ultra Socket in the middle and the Gator-Grip on the right

I remember once noticing a Citroën mechanic using a 1/2-inch imperial AF spanner on a 12mm nut and asking him why

Although the difference between the 1/2 inch AF at 12.7mm and the 12mm is a considerable 0.7mm, I suspect that, because the AF spanner he was using was short, it made working in the extremely restricted space under the hood of an old Citroën a little easier.

Bolt-head size systems

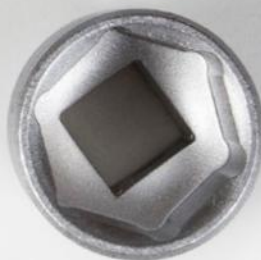
The size of the head of a bolt (and hence of nuts) is related to the diameter

of the bolt's thread, but not in a truly logical way. I was taught that there is a mathematical relationship between the head sizes of Whitworth bolts and their thread size, but it now appears that the size of the then-available hexagonal bar-stock determined the head size. As steels improved from Victorian times, it turned out that the Whitworth head size was over-large, and so it was reduced to give British Standard with a consequent saving of scarce metal during World War II.

A similar situation seems to be playing out in the present day with very small metric machine screws. Model makers complain that the heads of these tiny fasteners are relatively too large and look out of place on their models when compared with the older (also tiny) BA (British Association) types, which have relatively smaller heads.



Teng Tools version of Flank Drive



Thanks for helping with this article go out to:

Malcolm Clark, Bygone Autos,
Birkenhead, Auckland
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Teng Tools kindly loaned us these three sockets sets to illustrate this article and have offered one up as a prize to *Shed* readers.

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You can either email your entry to editor@theshedmag.co.nz, or post it to Teng Tools Competition, *The Shed*, PO Box 46020, Herne Bay, Auckland 1147. Good luck. Best story, best project wins.



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PART THREE THE

RIGHT STUFF

MAKING HOLES

MORE OF BOB'S TIPS FOR YOUR
METALWORKING WORKSHOP

By Bob Hulme

Photographs: Bob Hulme

In this third part of our series on metal workshop tips, I would like to concentrate on drilling holes in metal. Getting it right is not all that difficult, but it is a world apart from drilling wood, so here are some tips to make those jobs that involve drilling go smoothly.

Drills

Not all drill bits are created equal! You may already be aware that the prices of drill bits can vary by a huge amount. There is usually a good reason and it's not that the places selling the high-priced ones are ripping you off. Quality of manufacture has some significance, but the biggest factor is the material they are made from.

*A common error when
drilling metal is to run
the drill too fast*

The commonly called 'carbon-steel' drills are fine for drilling the odd hole in a wall at home to fit a shelf bracket; however, when drilling metals (particularly steel) drills made from high-speed steel (HSS) are the right ones for the job. Drills with a titanium nitride (TiN) coating can be even better for the first part of their life, but after the first sharpen that coating is gone from the cutting edge, so the type of steel under the coating is important.

TiN-coated HSS drills are very good where hundreds of holes are to be drilled on automated machinery. The number of holes that can be drilled before the first sharpen is important to reduce machine downtime. In fact, in that situation it is likely that the drill is then discarded and

another new one fitted rather than being resharpened, and therefore having the coating ground off.

For the home workshop the best drills for metal in terms of performance and cost are uncoated HSS drills. Sharpening drills is a whole subject on its own and perhaps we will cover that in the future. It is a great skill to learn.

For drilling sheet metal there are double-ended stub drills, which are used particularly when drilling holes for pop riveting. By being short and stubby they are less prone to breaking and by being double-ended they can simply be turned around when the first end loses sharpness. Unfortunately, they tend to be only available in the pop-rivet sizes and not a broad range. If using normal 'jobber' drills in sheet metal, it is useful to sharpen them with a less acutely pointed end. The objective is to have the drill cutting at its full diameter before the tip breaks through the sheet metal.

Making drills last

A common error when drilling metal is to run the drill too fast. If the rpm is too high the drill will heat up and this softens it. Consequently, the sharp cutting edge dulls a bit and the friction increases so the drill gets even hotter. The cutting edge then gets very blunt and the rubbing action can cause the steel being drilled to work harden (especially stainless steel).

You can see how too high a speed can have a snowball effect. With variable-speed drills now being the norm rather than a novelty, it is easy to set the drill to run at whatever speed is right. On a drill press it's easy to change to the rpm recommended for the size of drill and the type of metal being drilled, because there will be a chart on the drill press showing what rpm you are setting up. However, with a pistol drill you will need to judge where to set the trigger stop (good variable-speed drills have these) so some guesswork is needed. If you have a drill press then you can set it to the right speed and this will help you to judge the right trigger position on the pistol drill. The appropriate speeds can be found in reference books such as the *Engineers Black Book* (see details for purchasing these in our



Uncoated and tin-coated HSS drills

Bookcase advertisement near the back of this magazine).

Cutting oil also prolongs drill life, as it soaks away some of the heat, as well as preventing some of the heat by reducing friction. There are cutting oils for specific

*“Well, it is a nice drill
and I expect the
batteries will last some
years, but the chuck
is awful”*



Depth stop on pistol drill

Adjustable speed stop on drill



Scoring on a drill shank





Use a white marker to indicate drilling depth

metals, but for the home workshop there are some light cutting oils available in aerosol cans that are convenient to use and quite good for all-round use. For aluminium and brass you can use kerosene to good effect. However, cast iron is best drilled dry.

Drill chuck

Drills can be ruined by scoring on the shank caused by them slipping in the chuck. If a drill grabs in the metal item being drilled then I suppose it is better that it slips in the chuck rather than break, but clearly it is best to avoid that happening in the first place. However, while we take care to ease back on the pressure when a drill is about to break through the other side, it is inevitable that it will grab sometimes. The better the quality the chuck, the better it will hold the drill and be less likely to slip.

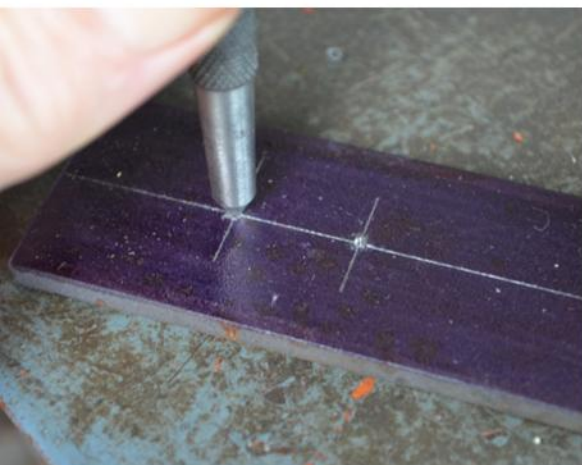
I bought a new cordless drill from a major hardware store last year that I was advised by the shop 'expert' would be the best buy because the battery technology was newer than that used in the one I had gone there to purchase. He seemed to have the background and experience to know, so I took his advice. Well, it is a nice drill and I expect the batteries will last some years, but the chuck is awful. In hindsight I should have taken it back straight away and got my money back, then bought the one I wanted in the first place. I will stick to my guns in future. Now I only use that pistol drill for wood-boring drills that have flats on the shank for a positive drive. It's hugely frustrating to use for any other drilling.

Drill shanks can be filed, as that end of the drill is usually softer than the cutting end — they are tough and

less likely to snap — so it is possible to carefully file any lumps off that are the result of scoring. Also, drills can tend to 'mushroom' at the end of the shank. This is caused by pressure on their end by the inside of the chuck. If the downward pressure on a drill is applied by the bottom face inside a chuck rather than transmitted through the grip of its jaws then this mushrooming can occur. This needs to be chamfered off by filing or grinding, otherwise the chuck jaws will ride up on the enlarged end and not grip all the way along the drill shank.

Blind holes

If you want to make a hole of a specific depth, it is easy to set the depth stop on a drill press. When using a pistol drill, it is easiest to mark the drill bit somehow to indicate how far to drill the hole.



Above: Centre punching the hole position

Right: The job is held against a bolt put in the drill-press-table slot

Below: Using a drill vice



There are a couple of different ways to accomplish this. You can either wrap a piece of tape (e.g., masking tape or insulation tape) around the drill, or you can use a marker pen (the white ones are good for this) to put a line on the drill. I like the second way myself, as I have found that tape can slip without being noticed, especially if the drill is a bit oily. Some pistol drills have an adjustable depth rod to the side of the chuck that can be handy.

Accuracy

Always centre punch the position where you want the hole to be unless you are using a milling machine to accurately position the hole and are going to use a centring drill first. As I am talking about home workshop jobs then I assume that hole positions will be marked out and centre punched. If the desired hole is to be

“Always centre punch the position where you want the hole to be unless you are using a milling machine”

bigger than, say, 6mm diameter, then it is good to use a smaller-size drill first, as you can locate it over the centre punch mark more easily and it will make a pilot hole for the larger drill to follow. Remember to use the larger drill at a slower speed than normal when opening out a hole like this — probably about half of its recommended speed. Using this method will give a more accurately positioned hole and the drill will be also unlikely to cut oversize.

Reaming

To make a hole to a size and finish suitable for, say, fitting a bronze bush or for a close fit with an axle, you can drill the hole about .2–.3mm smaller for holes up to 12mm diameter, and .3–.8mm for holes above 12mm diameter. Then use a reamer to open it to the nominal size.

The amount to drill smaller will depend on the actual finished-size hole (again, refer to a reference such as the *Engineers Black Book* for specifics). You can't use a machine reamer in a pistol drill successfully, but there are hand reamers available that can be used with a tap wrench. When using a machine reamer in a drill press of a mill/drill machine, the rule of thumb is 'half the speed and twice the feed' of a drill the same size. So, if the recommended drilling speed for the size is 500rpm



A hole saw in the drill chuck

then set the speed to around 250rpm for the reamer, and feed it down the hole at about twice the rate you would expect a drill to feed. Also, it is vital to use lots of cutting oil. Withdraw the reamer at the same rate as you fed it down the hole to avoid binding and scoring.

Safety

Any rotating machinery has the potential to grab and snatch any loose clothing or hair. This means that if it happens, it is going to hurt. I have personally witnessed one occasion of about 25 per cent of a person's hair being pulled out by a drill press. It was all over in an instant. No chance to react or do anything once the spinning chuck had wrapped the hair around itself. It seems obvious to say that any long hair, loose clothing, or jewellery should be kept well clear, and yet it happens if we don't pause and think for a moment before using tools and machinery. It's common sense, but we need to actually think about it each time.

I wear glasses all the time now to see clearly, so I always have eye protection, but if I did not then I would wear safety glasses when drilling simply because drills can snap and fragments can fly off in unexpected directions. If someone is watching you, then make sure they have eye protection too.

Holding the job

Small vices for use on a drill press are quite inexpensive and make it easy to hold small items for drilling securely (and safely). You can even clamp the vice to a drill table for more rigidity and to prevent the drill lifting up the job as the drill is being withdrawn. This can happen if there is some swarf tightly packed around the drill in the hole. Don't keep drilling continually until the hole is finished. Withdraw the drill several times during the drilling to clear swarf and to squirt a little more cutting oil down the partly drilled hole. In fact, lifting the drill often will keep the swarf pieces short. Long swarf spinning around the drill can cut the hand that is holding the machine vice.

If the job you are working on is too big for the drill vice then the alternatives are to hold it in a bench vice and use a pistol drill or to position it on the drill press table so that the column is used to prevent the job from rotating. Just relying on your own strength to hold on to the job is not a good idea. Another way to prevent the job rotating is to put it against a bolt dropped through one of the drill-press-table slots. One way to hold the job is G-clamping onto the table, but it's not as positive as an unmovable stop like a bolt or the drill-press column.

On a mill/drill machine it is helpful to make special jaws for holding jobs so that centring is repeatable for times when you have several parts to make that are the

same. An example of some I have made have dowel pins for round jobs to sit on. You could also machine V-shaped jaws to hold round material better, or extended jaws to improve stability.

Hole saws

These are an effective way of creating larger size holes or even holes down to about 12mm diameter in sheet metal. Again, select hole saws like drills. The cheap ones will blunt off quickly and become useless. Use the bimetal type that has a bonded, toothed edge of HSS on the shell of the hole saw. They are tough as well as hard wearing. Keep the rpm quite low, be patient, and they will last well.

Finishing

Once the hole is drilled, remove the sharp edges with a countersinking bit or a deburring tool of the Noga type. This makes the job look professional too, but is also important if a bolt is going to be put through the finished hole. Bolt heads have a small radius where the bolt shank meets the bolt head. This is important for the bolt's strength. So if the hole has a sharp edge and when the bolt is tightened it cuts into that radius, then the bolt's strength is compromised by that notch.

While I am sure much of the discussed not new to you, I hope you have gained some ideas to make those projects in metal go smoother and require less strong language. 📁



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CHRISTMAS GIFT GUIDE



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To purchase, head to www.activeplastics.co.nz or email sales@activeplastics.co.nz.



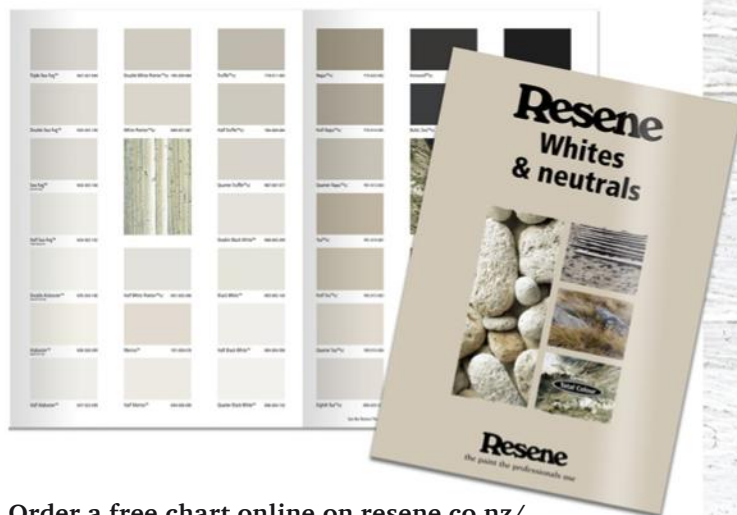
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Courses are run most days. For more information visit albaknives.nz or contact John on 021 236 7639.

NEW NEUTRALS

The ubiquitous summer experience — White is never 'just' white. Resene knows this only too well, and their ever-popular Whites & Neutrals collection continues to reflect the latest trends and design developments. There's a move away from straight beiges towards blackened whites, greyed-off tones, and deeper greys and blacks, with popular neutrals including Resene All Black, Baltic Sea, Double Black White and Double White Pointer featuring in the new collection. Ideal for projects inside and out.



Order a free chart online on resene.co.nz/ordercharts, or find your local Resene ColorShop or reseller at resene.co.nz/colorshops.com.

ONE HELL OF A LAMP

Power outlets aren't always handy when you need a decent light. HELLA's Uni Max LED work lamp is rechargeable via a USB power bank, which will also charge your phone or other device, so it's perfect for DIY enthusiasts, tradesmen, and for camping. Featuring the latest LED technology, it produces an extremely high light output in a uniform and even illumination. The adjustable 180°-rotating stand is made from die-cast aluminium, meaning that it's lightweight and sturdy enough to take almost anywhere.

For more information go to www.hella.co.nz.



NO MORE SLAMMING DOORS

The ubiquitous summer experience — you're enjoying the cool breeze when your door slams, disturbing your peace and quiet. It's time to replace that plastic doorstop, rock, plant pot, or whatever else you have propping your door open. Slamclunk Doorstops are unique in that you simply push your door open onto the doorstop to secure your door, and release it by pressing the lever with your foot. Made of non-corrosive UV-stabilized nylon and stainless steel, with fixings for wood and masonry included, these doorstops will safely catch your door if blown open in New Zealand's windy summer environment — and your cat's tail will remain safe from slamming doors.

Visit www.slamclunk.co.nz for more information and to purchase or call 07 849 5947 or email sales@slamclunk.com.



WHEN YOU'RE NOT IN YOUR WORK BOOTS ...

Red Band footwear are well known for their sturdy gumboots and workboots, and now you can have the same comfort and quality — but perhaps not protection! Red Bandals from Skellerup are made from high-quality rubber and feature red detailing. Available in adult's sizes 3–14, children's sizes 10–12 and 1–3, and junior sizes 5/6, 7/8, and 9/10 — you can kit out the whole family for summer.

Priced between \$19.95 and \$24.95. Visit redband.co.nz to discover the range.



CURRENT TOOLS NOT CUTTING IT?

Japanese blades have long been held up as the embodiment of good design and craftsmanship, and they aren't just for your kitchen. The Kakuri Universal Saw Set contains four saw blades — 270mm, 250mm, 210mm, and 100mm — and one red oak handle, which is interchangeable with every blade in the Kakuri Fine Cut Saw Series. These are great for carpentry and cabinetry tasks such as cross-cutting, diagonal cuts, and fine finishing cuts. The set also comes with a heavy duty canvas bag to protect your knives.

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Visit gubbagardensheds.co.nz, or check out the wide variety of display sheds at 4 Parkhead Place, Albany, Auckland, or contact 0508 448 222.

ALL ABOARD!

They don't make them like this anymore — you can still catch a direct train from London to Edinburgh, but not quite as it was in the summer seasons of the 1930s. The popular Hornby Flying Scotsman Train Set recreates that golden period with its classic teak coaches. The set includes the Starter Oval track plus extension Track Pack A, providing a layout with a siding, and when you want to explore further afield, more Track Packs are available for purchase.



Priced at \$399. Visit mackstrack.co.nz, call 04 233 8555 or email sales@mackstrack.co.nz, or check out the Mack's Track store at Plimmerton Railway Station in Wellington.

CHRISTMAS GIFT GUIDE



YOUR VERY OWN MICROBREWERY

There's nothing more satisfying than having a cold beer after a long day's work, except when that cold beer is one you've crafted yourself! The Coopers DIY Beer Brew Kit has everything you need to handcraft 30 bottles of great-tasting beer, just "Mix, Brew, Bottle and Enjoy". Once you've mastered the lager that comes included with the kit, you can move on to the rest of the Coopers DIY Beer range — you'll be brewing a wide variety of beers to suit all tastes in no time. It's the perfect Christmas pressie for Dad or just for yourself.

Available at selected Pak'nSave and Bin Inn stores or check out www.diybeer.com



DIRECT DRIVE — NO BELTS

If you're serious about your workshop, you've got to be serious about your gear. The Nova Voyager DVR Drill Press is the most versatile drill press on the market, built to handle wood, metal, plastics, and glass. It combines proven technology — variable speed, constant torque, and DVR Direct Drive with no belts or pulleys — with some great new features, including intelligent Adaptive Control software that allows you to produce optimum conditions for your specific projects.

With no belts to change, you just dial up the speed you want. It makes a conventional belt-change drill press look vintage!

The Nova Voyager DVR Drill Press goes for \$2799 at Carba-Tec — visit carbatec.co.nz or call 0800 444 329.



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. New to the range are custom colour options in green, blue or stunning rose.

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



TOUGH TROUSERS

If you're the type to take shortcuts through the gorse or matagouri and carry the occasional handful of nails around in your pocket, you're also probably replacing your pants on a fairly regular basis — unless you've already got yourself a pair of Cactus Supertrousers, that is. Made right here in NZ, these pants are extremely hard-wearing and feature lots of handy pockets — even hammer loops on the Trade style! They also come in a few different styles, so you'll feel just as comfortable grabbing that coffee at your local as you do working on site.

Priced between \$219 and \$239. Check out cactusoutdoor.co.nz.

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The largest model railway in the world is in Hamburg and consists of 15,400m of track and takes up 1500m², complete with miniature Alps. Now, we're not suggesting you embark on anything of that scale, but if you find creating your own little world enchanting, 040 Trains n Models is the place to go, with an enormous range of high quality trains and accessories by manufacturers such as Bachmann, Hornby, and Dapol; scenery by Scenic Textures, Preiser figures, and Noch; and diecast models by Britains/ERTL, Siku and Universal Hobbies.

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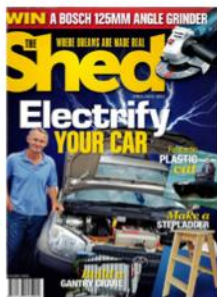
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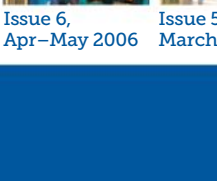
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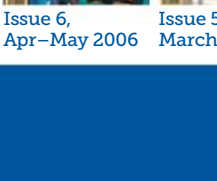
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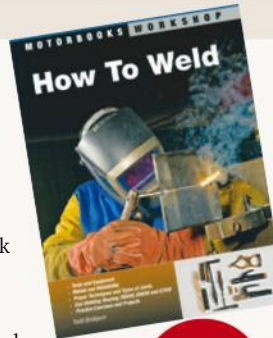
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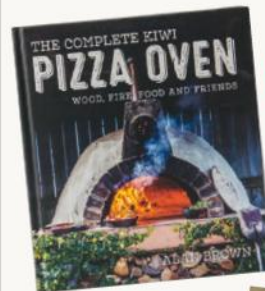
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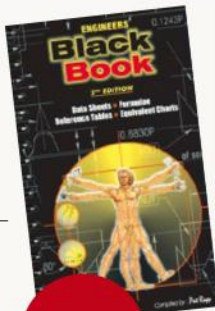
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Let's have a year of positivity!

By Jim Hopkins

Gadzooks! 'Tis upon us again. Ready or not, our own strangely schizoid, half Coke, half Dickens, winter in summerland, summer in wonderland, jingle bells, juggle bills Santafest is back, indecently quickly, for another round of chimney invasions and *Radiata* erections.

Prudently pruned in these hypersensitive times of any reference to its religious origins and significance, lest those of other faiths are offended, our annual spendarama has filled that spiritual void by turning the chubby chap with the cotton-wool beard into a demigod for the kiddies, irrespective of the fact that his name is an anagram of Satan and his sleigh full of sacks is an ozone-shredding symbol of rampant materialism with a carbon footprint bigger than a brontosaurus' Y-fronts.

But enough of this humbuggery. There are upsides to Christmas. For starters, at its mythological heart you'll find that rarest of things in the modern world — something genuinely bloke-friendly, even pro-patriarchal, namely, the fabled North Pole workshop, crammed full of industrious elves and ruddy reindeer, with Mr Ho Ho Ho on the go go go, overseeing production 24/7. If that isn't the ultimate shed of sheds, a resin-scented man-cave supreme where good times are had and good things are made and handmade joy is brought to all the world, then I'll eat my \$20 Bunnings gift voucher — assuming Santa makes me one!

And if he doesn't, well, there's another Christmas gift we get every year and it surely must be the season's best. For a few glorious weeks, the news implodes. The movers and shakers head for the hills or the beach or some favoured foreign fleshpot, taking their disasters, scandals, calamities, and crises with them. Suddenly, the fourth estate's misery maggots and glum runners have nothing nasty to report. Family photos and happy campers are all that's left. It is a blissful time. If only it could last all year.

Well, it can. You see, it turns out that the media only feeds us bad news because we're hard-wired to believe it. Apparently, we have a 'negativity bias' that predisposes us to pessimism. The boffins think this was an evolutionary asset in the primeval days when sabretoothed aardvarks roamed the plains and volcanoes erupted whenever a meteor hit. In such perilous times it was only fools (or Neanderthals) who rushed into the unknown, while the fearful and fretting, the wimps and worriers hung back and avoided extinction, thereby passing their genes on and cursing us with a modern version of their ancient apprehensions — that being our insatiable appetite for sackcloth and ashes, end-of-the-world stories about climate change, Ebola, and similar harbingers of catastrophe.

All of which is totally unnecessary. Because the facts don't fit the fears. Bad

news is fake news. We can be optimistic. In fact, we'd be fools to be anything else. Global poverty is declining. So is warfare. 3D printers are making replacement body parts. Natural disasters are killing less people now than in years gone by. In 1947, the UN said nearly 50 per cent of humanity was "chronically malnourished". Today, it's 13 per cent. We're living longer, getting smarter, and should be a helluva lot more positive!*

To be fair, you could be forgiven for being a tad negative, with the boofheads in Wellington deciding to spend billions on a light rail system from Auckland's CBD to the airport. Apologies for upsetting bush rail, steam train, and railcar enthusiasts throughout the land, but this is a total waste of money. The modern train is actually a driverless car, and they're no more than a decade away. Light rail is yesterday's solution; it'll be obsolete before it's finished.

But such idiocies are the exception, not the rule. Put them aside. Kick the negativity habit. Give the gift that will keeps on giving. Give yourself — and everyone else in your shed and your world — the gift of positivity. Heck, if a fat guy can go hypersonic with nothing but eight reindeer bums in front of him then anything's possible. No, everything's possible. So don't say "Happy New Year"; say "Happy ALL Year!"

*Google Future Crunch for more optimistic thinking about the future or read Progress by Johan Norberg. 📖

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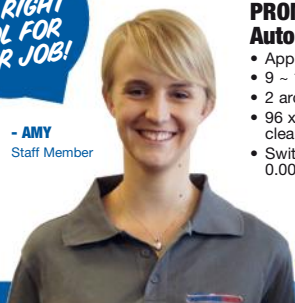
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