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THE **Shed**

WHERE DREAMS ARE MADE REAL

SEPTEMBER—OCTOBER 2021

ISSUE 98

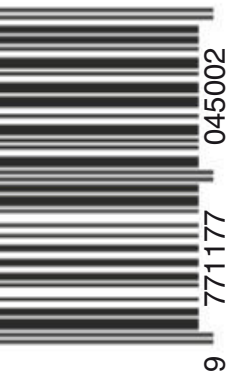
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THE DIAMOND DOGS

The stresses and strains of daily life are many, of that we can all be very certain.

Throw into that daily life what we are all going through nowadays, with Covid, flooding, fires, and storms, and you certainly could be forgiven for feeling some anxiety and depression.

Some friends have commented to me that they are going stir-crazy not being able to travel safely these days. In the scheme of things, that stress is probably way down the list of what to feel anxious about but, nevertheless, it's a worry for some and therefore valid.

There will be many *Shed* readers who had been planning some years of regularly travelling or cruising and that is on the back-burner till who knows when. In fact, one of our *Shed* team members was in that first quarantine group from a cruise ship that was placed in the army camp at the end of Whangaparaoa Peninsula at the very start of the pandemic in early 2020.

I was thinking about how many of our readers' plans will have changed this past 18 months and it occurred to me how lucky we are that we have our workshops and the security of our sheds in which to keep being creative and active.

On almost the same day as I was thinking

that, I opened an email from Mark Seek, a mental-health specialist, with the offer of a column relating to mental-health issues. Stress is everywhere and some of us, especially males, are not good about talking about it or even acknowledging a stress-related condition. So, we welcome Mike to the magazine and urge you to read his light-hearted article, *The Shed Shrink*, on page 70. Many Kiwis are going through a lot currently so let's make sure we consistently offer our support.

If you were wondering about that Diamond Dogs heading at the top of the page, here's why it's there.

I have just binged-watched a comedy series online called *Ted Lasso*, which I thoroughly enjoyed; I was sad the series ended. It's very funny, with great actors and a fantastic script, plus good always triumphs over evil. It's about an American managing a London football team. Anyway, when any of the guys have a problem that's really troubling them, they call their group together to discuss, share the problem, and seek a solution. "They call them[selves] the Diamond Dogs".

Thanks, David. 🐕

Greg Vincent
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THE WHERE DREAMS ARE MADE REAL
Shed

the-shed.nz

ISSN 1177-0457

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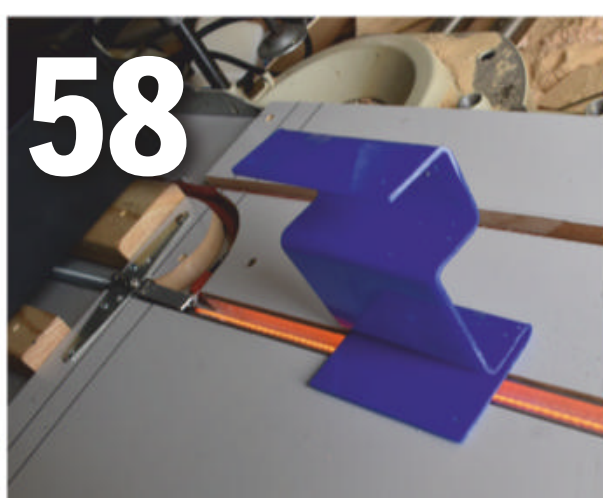
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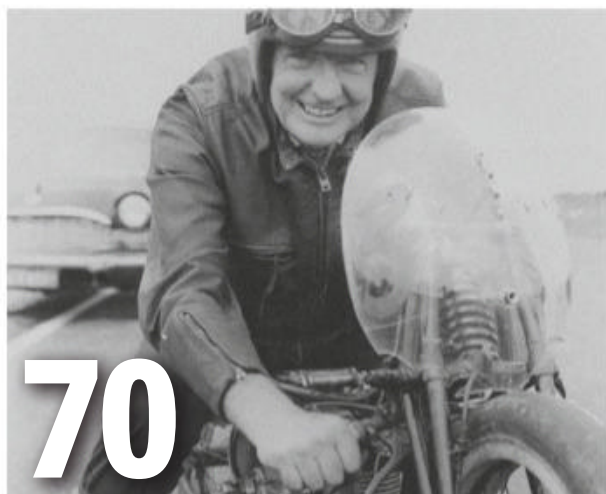
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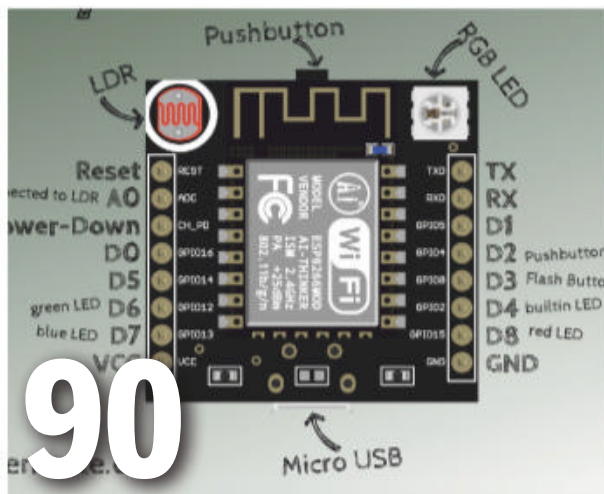
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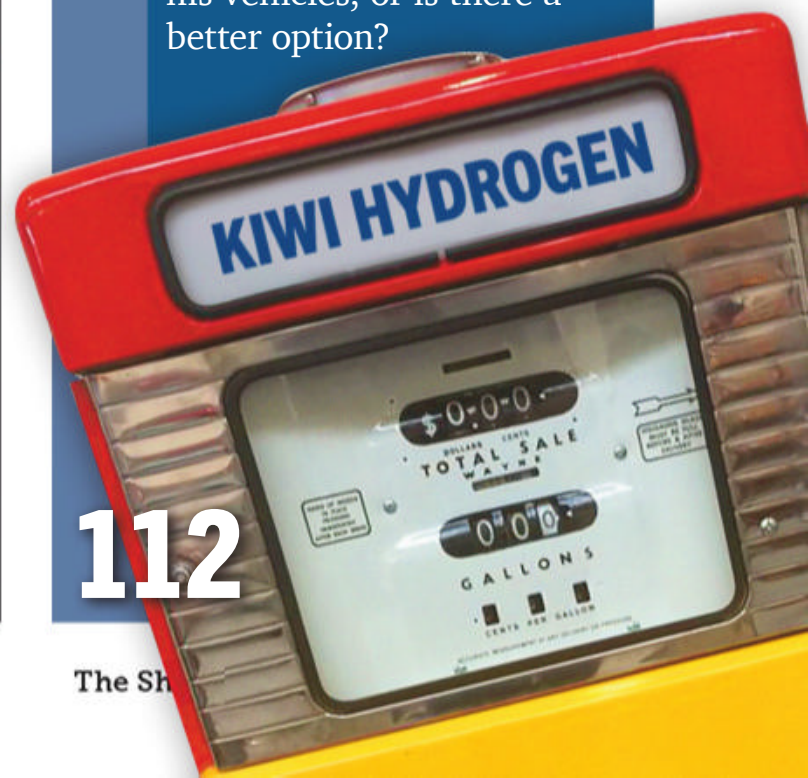


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The Sh

MODERN METHOD FOR ANCIENT CRAFT

“Pictures are great but there is no substitute for seeing an animal move” — an artist’s sense of wonder at nature has inspired him to create bronze sculptures and unique art

*By Helen Frances
Photographs: Tracey Grant*



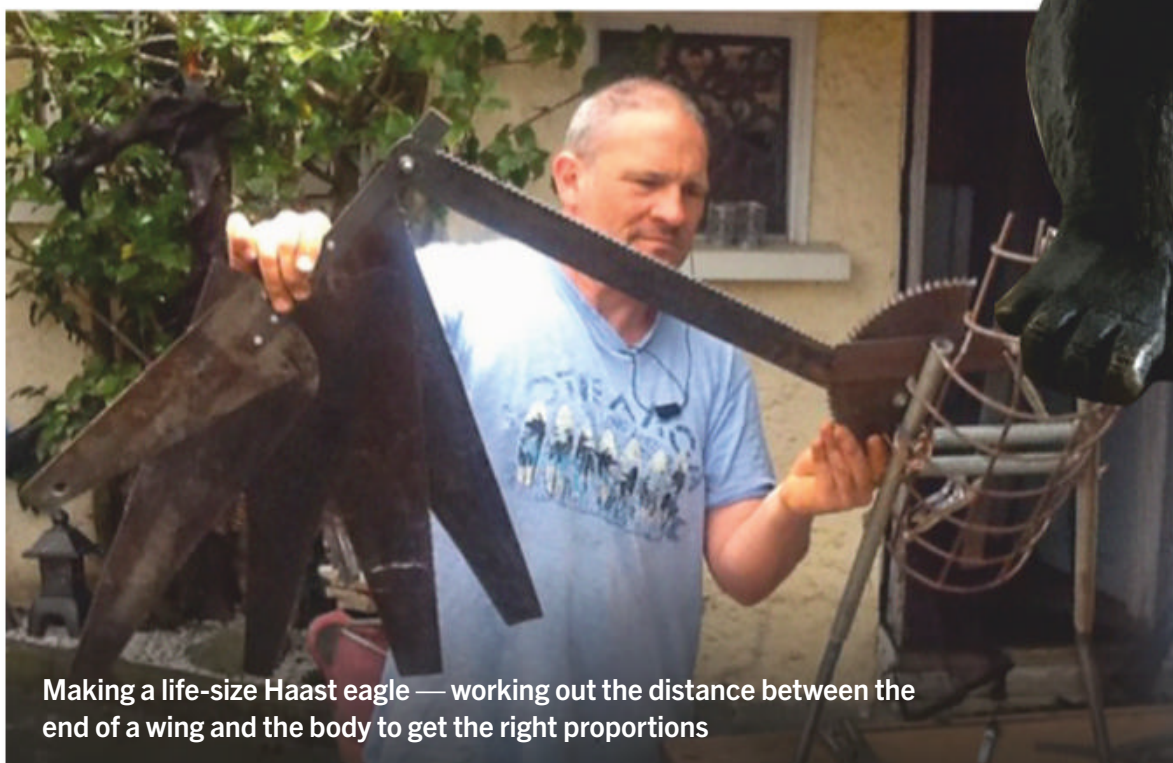
Bronze frog with warty detail. Much of Glen's inspiration comes from nature

A gigantic moa made entirely from lawn-mower parts; a life-size Haast eagle with a 2.7m wingspan made from saw blades; and, at the other end of the size spectrum, solid bronze frogs and lizards, an octopus, and a chunky little gorilla give an idea of Glen Macmillan's artistry and range of skills. To date the Whanganui junk artist and bronze caster has been working across two sheds: a very large garage in Waverley that he owned with his former partner and a much smaller, rustic affair

at his current home in Castlecliff.

In the large shed he has the basic tools: a decent drill, an angle grinder, a bunch of hammers, large multi-grips that he uses to grip steel so as not to get vibrations in his muscles when he hits it with a hammer — “very unpleasant” — and an anvil made out of railway track. The gas kit he uses mostly for heating and bending; he has a MIG welder and an oxyacetylene torch. ►

Chunky bronze gorilla



Making a life-size Haast eagle — working out the distance between the end of a wing and the body to get the right proportions

The Waverley shed has allowed Glen to make his recycled sculptures more easily, to lay out the various possible components and put them together with a minimum of alteration. His junk of choice is gardening tools, landscaping equipment, and farming equipment — particularly the older kind of hand tools that were made to last and had a bit of styling; “beautiful curves, beautiful profiles, beautiful textures,” Glen enthuses.

A real connection with the work

Making junk sculpture is a communication between all the different components and their creator, Glen says.

“To get good at lots of creative endeavours, you have to work the material,” he explains. “You can’t think of something and enact it on the material; you have to play with the material. It speaks to you, and you react to that feedback to be able to make progress. It was all buried in the little shed [at Castlecliff] and was hard

to play in my mind. Now it can speak to me nice and loudly.”

On the bench some red metal flowers Glen calls ‘Archimedes’ flowers sit atop auger stems. The flowers are toby tap heads, and from there the story sprouts. Glen’s choice of components has meaning beyond the suggestive floral shape: “There is a reason I have made them out of certain pieces of junk; it says something, reveals something. It’s alive, has a voice, and might make you question or think of something in a different way. The flowers are a tribute to running water — we take it for granted that we can turn on a tap and out comes water that is safe.”

He says an auger looks very much like an Archimedes screw, which was used to move water uphill.

“That’s why I call them ‘Archimedes’ flowers — there is a tap on top. And that is what the flower stem does: it brings water up from the ground to feed the whole plant. So it’s not just a simple flower,” he says. ▶

“Beautiful curves, beautiful profiles, beautiful textures”



Welding an Archimedes flower

Laying out an Archimedes flower practising 'chalk-assisted design', or manual CAD!





“That’s the fun part — the two roaring blowtorches sound like jet engines taking off with all the heat and the urgency”

Using his shed-made anvil to heat a component with the blow torch

The history of mowing

The moa, which is in pieces at the time of our visit, contains the history of mowing. The neck is the blade of an old scythe, grim-reaper style, that Glen found around the back of a second-hand shop in a drum full of water.

“It was so old; instead of being a piece of sheet steel wrapped around a spine of bar, and the sheet steel making the blade, this one actually had the bar, which forms the spine, beaten so thin that it became the blade,” he recalls. “It was an actual smith’s reaper blade. So that would be one

of the first tools used in this country.”

Along with cylinders from cylinder mowers, the body is a catcher. Wheels became joints.

A crocodile is currently in the design process — the body is the chute from a garbage shredder and mulcher; its feet are the pedals for controlling a tractor, with a hoe and a garden fork for its foot; its jaw will be made out of shovels and spades. The croc teeth will be made from a mix of industrial and domestic rakes. The bumps and scales along its back will be pieces of hedge trimmers.



Inspiration from nature

Glen draws inspiration from a passionate interest in nature and experiences snorkelling, kayaking, and birdwatching, as well as reading about the natural world.

“I have a lifelong sense of wonder at nature. Pictures are great but there is no substitute for seeing an animal move,” he says.

His first piece of junk art was a praying mantis, almost the size of a small car, made entirely out of garden tools.

“Insects are amazing creatures that people don’t really notice; they take them for granted like our running water,” Glen says. “It’s hard to ignore a praying mantis this size.”

While making the praying mantis, he realised that, taken out of context, garden

tools can look like a medieval armoury: “Everything has spikes and blades so it became a very scary-looking thing.”

Inside the house, Glen hooks a bronze octopus off the top of his fridge. The suckered arms curl in different directions and give the lively-looking creature purchase on the whiteware. A mini statue of King Kong glows stumpily from a shelf. The creatures are solid bronze, cast in Glen’s backyard furnaces.

Backyard bronze art

Originally a bone carver, Glen had also learned some greenstone carving techniques, quickly discovering that he wasn’t skilled at drawing designs but preferred working directly in 3D.

He found that wax was harder and kept its form better than clay, so he’d make a maquette or model of whatever he was ►

Bronze casting

This article is not intended as a ‘how to’ instruction. Glen insists that a course with a master, such as David Reid, is the best way to learn — because of both the expert tuition and feedback, and the learning from one’s own and other students’ mistakes and successes. Like the alchemists of old, foundry folk like to keep secret the finer details of the process.



Welding an Allen key toe back on a fully articulated junk-art rat

going to carve — things he saw in nature or characters from video games.

“In the end, I just fell in love with working the wax so, at the same time, I started teaching myself to make silicon pit moulds,” he says.

Glen poured epoxy resin into the moulds to make the final, solid object, adding colour or other decoration such as shells to the resin as he poured it into the mould.

He started bronze sculpture after doing a course in Auckland with David Reid, a master foundryman and sculptor, and, Glen says, the inventor of the modern ceramic shell casting process.

Wax model

Glen skips making a silicone mould as he prefers working directly in wax. This means the casting model will be a one-off. He makes a solid wax model of the piece that he wants to cast in bronze, carving the details, which will leave an impression on the ceramic shell — the next step in the process.

He also makes a ‘sprue’, or wax rod,

of the right size and length through which the molten bronze will be fed, and a cup shape above the rod. Sprues become hollow when the wax is burned out of the shell — the next stage — and are like ceramic pipelines for the metal.

“The size depends on the size of your work,” he explains. “You put a cup on the end of the sprue rod and when you ceramic shell, you ceramic shell all of that except the inside of the cup.”

For example, when Glen made the hand-sized octopus, he needed just one wax sprue rod to feed through underneath the sculpture. From there, the molten bronze was able to run throughout the shell to the furthest, quite curly and suckered, extremities.

Larger sculptures can have what looks like a sprue tree — lots of rods that connect to the cup and carry the molten metal to parts that are furthest from the pouring site.

Glen says that he uses a moulding foundry wax. Morris and Watson in Auckland has quite a range of waxes.

David Reid — a master founder

David Reid began his casting career in a Dunedin steel foundry in the late 1960s. An interest in sculpture led to developing ceramic shell lost wax casting as an improvement on the established methods.

He ran the Elam art school foundry for a few years before being awarded an Arts Council travel grant in 1979. During his travels overseas he saw and studied a good selection of the world’s art foundries then returned to New Zealand where he and partners founded Artworks, a foundry and art studio dedicated to making fine art.

David started teaching courses in New Zealand and then in Europe in the mid 1980s. He gained a British patent for the accessible foundry based on Reid Technique inversion casting.

“In ’92, I was granted a Research Fellowship for four years at Central Saint Martins, London where microwave melting of metals was one major outcome, and have continued teaching as guest lecturer at many art schools around the world. I’m presently working on rapid super-accurate methods for converting 3D prints into metal and playing with semi-permanent concrete moulds for sword casting,” David says.

David lives on the Coromandel and has a workspace at Sandy Bay, as part of Moehau Community, which has a pottery and small foundry, from which David says he will probably run courses.



Using the angle grinder to remove rust and paint before welding





Pouring ceramic slurry over a wax model of a frog. The cup, which serves two frog models, is visible. The black frog is the as-yet-not-coated wax model

Ceramic shell

To make a refractory ceramic shell Glen first applies a coating to the wax model that is like a very runny plaster or slurry, either dipping the model into the slurry or brushing the slurry on. He then applies a fine sand. He says the first two coats capture most of the detail. Subsequent coats consist of slurry stuccoed with small ceramic particles that resemble kitty litter.

“This is a very simple explanation,” he warns. “Between the first few coats it can take half a day or overnight to dry with a fan on to vent the fumes. The same with the second one, so it could take a couple of days just to get the first two coats on. After that the coats dry quicker as there are fewer volatiles to fume off. It can take four days to a week just to get the ceramic shell on, allowing drying between each coat.”

When Glen makes small pieces he does several at once, using several cups or even doing two or more on the same cup — such as with the two frogs pictured here. A larger piece will have one pouring cup attached to the sprue.

Drying the layers

The layers form a ceramic shell that vents the gases. The encased wax sculpture is unrecognisable at this stage. When Glen burns out the wax from the shell using a blowtorch, he notices any leaks or cracks.

“At this stage the ceramic shell is bisque fired, so you may have to reapply the coating to do repairs. Thicken up the slurry and put it where the crack is. You may have to put fibreglass in as well, then more slurry, then more dry mix,” he says.

Each layer is allowed to dry and another applied until the shell is strong enough for the molten bronze to be poured into it. The process of making a ceramic shell strong enough can take up to a week for the small sculptures that Glen makes.

He says that the advantage of the ceramic shell is that it can be heated from room temperature to 900°C or 1000°C “as fast as you want and it won’t explode. And you could cool it down just as quickly. Theoretically, it’s very durable”.

The ceramic shell is fragile, but it stays intact throughout the process until it has to be broken off to release the sculpture inside. ►

“In the end, I just fell in love with working the wax so, at the same time, I started teaching myself to make silicon pit moulds”

The wax melts and flows out, leaving the pattern of the sculpture inside



Firing up the crucible furnace to melt the bronze. Two furnaces run simultaneously, one for the bronze, the other for the ceramic shells

Dewaxing the ceramic shell

Glen removes the wax by heating up the ceramic shell, which he has placed upside down in the furnace. The wax melts and flows out, leaving the pattern of the sculpture inside. On casting day the ceramic shells are preheated in one of the two furnaces at around 850°C.

Glen says that he chills the wax-filled shell in the fridge, heats it underneath first, then heats it all around with the blowtorch until it's red-hot. The wax expands when heated, so the cup and sprue rod have to be dewaxed first to make a clear way for the wax inside to flow out. This part can be tricky, as the shell could crack if the wax can't flow out.

Nothing can be left inside the shell —

every bit of soot has to be burnt out, any loose pieces of ceramic shell removed, and the edge of the cup has to be rounded and solid to avoid any gritty bits falling in, all of which would affect the final piece. Paraffin wax leaves no residue, but it is quite brittle, so it is better used combined with other waxes such as beeswax, which is more malleable, and microcrystalline wax. Less refined waxes, such as candle wax, will leave soot. Many foundrymen/sculptors have their own recipe.

Furnaces

Glen uses two furnaces. One he acquired second-hand; the other he made himself out of just over half a steel drum cut lengthways.

“There is a refractory material like Pink Batts inside. I lower it onto a foundation ring made with firebricks. Basically, there is a hole at either end. At one end I'm using a blowtorch to blow a flame in and the other end is where all that is escaping. What's in the furnace are the shells that I had already burnt the wax out of, so they are totally clean inside,” he says.

Glen melts the bronze in a crucible inside one of the furnaces using silicon bronze offcuts — sprues, flues, and the like — that he buys from a large commercial foundry. He says that they can't reuse their offcuts, as different batches may have colour variation.



Butterfly made with garden tools — pitch-fork antenna, water-sprinkler-stand body, rake-segment legs, plus bits of augur and hoe

Casting in bronze — investment casting

When the ceramic shell is ready and there are no cracks, Glen gets the two furnaces going with the bronze in one and the shells in the other. While the shells are heating/curing, he puts the bronze into a crucible and brings it up to its melting point inside the furnace (850°C to 1000°C).

“That’s the fun part — the two roaring blowtorches sound like jet engines taking off with all the heat and the urgency,” Glen says. “You pour the bronze into the [ceramic] cup, trying to fill the cup and

keeping it full. All the bronze feeds in and chases the air out through the shell itself.”

As long as the ceramic shell remains hot enough — white-hot — the bronze continues to pour through to every part of the shell to create the sculpture.

To pick up the crucible of molten bronze, Glen has custom made his own tools.

“It’s heavy; even a little one is very heavy — it’s full of bronze,” he says. “And then you’re pouring that into the shells and you want to pour it fast at the same time. It’s a very, very heavy liquid and runs like water.” ►

“It’s heavy; even a little one is very heavy — it’s full of bronze”



Accurately detailed bronze turtle



Curly octopus

Old versus newer method

Glen says that, in the old lost-wax method, the wax sculpture was encased in a non-porous solid shell that did not let the gases out as the ceramic shell does.

“So, to get bronze to areas further out from the main part, you had to have the sprues to get the bronze to the highest or furthest points. Then the gas had to come out. So, in all the high points and further away areas, you had to have flues to let the gases out because if there’s a pocket of air the bronze won’t run up it and so you’ll have an area of nothing,” he says.

If he used the older method, Glen would have had to make separate feeders for the bronze and separate vents for the gases in all his creatures’ little toes, antennae, tails, and mini octopus arms — a complex and potentially more problematic process that would have involved a forest of sprues and flues, not to mention the amount of tidying up required.

Every shell is different

Glen explains that it is important to be careful and very deliberate with the pouring, to have the shells set up the right way and positioned so as to feed the bronze through the cup properly and avoid breaking the shell. Every shell poses its own challenge, to do with its positioning on the cup and how it is fed. Many things can go wrong, such as air bubbles or oxidation trapped inside.

“Casting is a very difficult thing,” Glen says. “It’s like baking cakes, multiplied,

so you have to follow the recipe, the ingredients, and the technique properly — sort of in a scientific way. But you also have to have a feel for it, because ambient temperature, moisture, different ovens, different cake tins — everything — will affect it and change it. You have to be a really good bronze welder to weld up voids or good at carving to get an area out.”

Finishing off

When the sculptures have cooled, Glen breaks open the shells to reveal the

bronze sculpture. He uses an angle grinder to cut off the running system (sprue) and pouring cup then refines the sculpture through the process of ‘fettling’ — tidying up by grinding and filing.

“You have to be able to put the sprue somewhere where you can cut it off and do whatever you can to tidy it up where it won’t be noticed,” he explains. “If you can’t, then you’re going to have to be really good at carving the bronze or doing whatever you’re going to do to it, beating it and chiselling it to make it blend in.” ►

“Casting is a very difficult thing. It’s like baking cakes, multiplied, so you have to follow the recipe, the ingredients, and the technique properly”



Octopus hiding in its driftwood home — specially cast for its niche



Glen with Archimedes
flowers in his Waverley
property garden

Many skills and interests

Glen has honed his skills through quite a range of jobs — from fishing and forestry to mental health and rehabilitation for people with brain and spinal injuries.

He retrained as a welder fabricator, wanting to use his hands and to create things. He gained a certificate through Unitec then went on to work on barns, boats, and trucks. When a wheelchair-technician job came up, he saw it as a chance to combine the caregiving with using his hands and problem-solving skills.

“I thought, It’s like a combination of my two careers. I call it being a ‘caring engineer’. The main things were you had to be a creative problem-solver, which is using Kiwi ingenuity, and you had to deal with people with lots of complex needs. Every job was different. They couldn’t really train you for it; they just had to pick the right people and give them support. It’s one of the most rewarding jobs I’ve ever had,” he says.

A lengthy wait for wheelchair parts to arrive from overseas meant creatively problem-

solving a way to keep people’s wheelchairs operating.

Glen’s carving and engineering problem-solving skills underpin his sculpture making, enabling him to make real his creative dreams. His junk-art and bronze sculpture work show at Red Door Gallery in Whanganui and at the annual Artists Open Studios, and will be displayed at a soon-to-be-opened gallery in Waverley.

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Patination

Glen says patina is a major reason for using bronze as a casting material. Bronze is very reactive and many different effects and colours can be achieved, depending on the chemicals used. ‘Patination’ is an ageing technique using salts or chemicals along with heat to accelerate what is a natural process. A microcrystalline wax polish gives a finishing touch and helps conserve the patina effect.

“You could almost say it’s alive — aluminium, cast iron, even silver, gold, and most of the brasses don’t react as much,” Glen says. “There’s all sorts of greens and blues, there’s purples, straw yellows, all sorts of lovely things. It’s much harder now because a lot of them are strong chemicals, but you can still get hold of some.”

Making the bronze pop

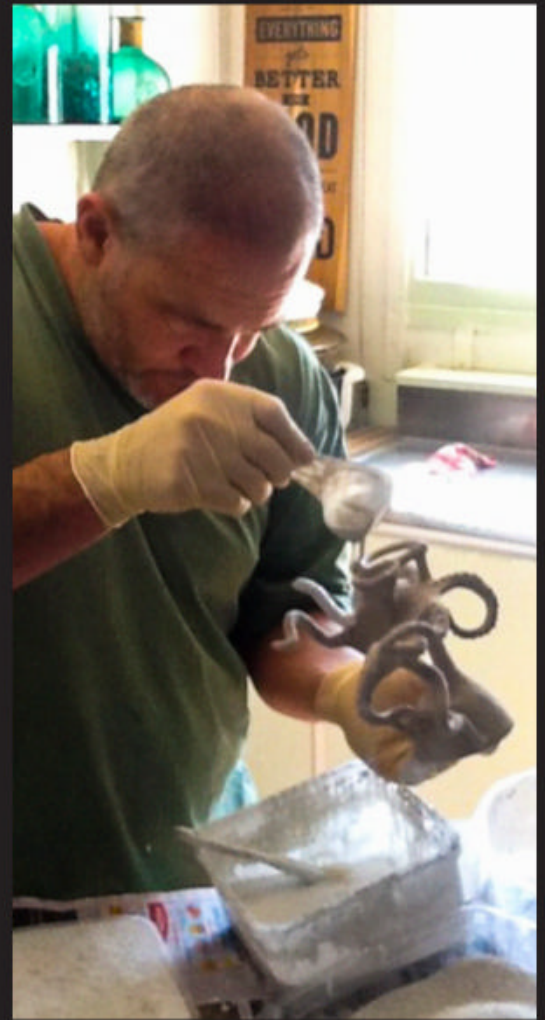
Glen says one recipe for a blue-green patina uses a garden chemical — liver of sulphur or potassium sulphide.

“If you burn that, it goes black then you rub it all off, but it will stay in all the little recesses and that’s what really brings a bronze to life. Until then, it looks so dead. The patina gives [the piece] a three-dimensional quality, makes it pop. It’s been used for centuries.”

The bronze has to be heated to warm before the chemical is brushed on.

“There might be some smoke, and it’ll stink like rotten eggs, so you don’t want to get it on anything, but that gives you a lot of the bluey green sort of patina.” 🏠

Bronze is very reactive and many different effects and colours can be achieved, depending on the chemicals used



Ceramic shell?

“For those who aren’t too familiar with the term ‘ceramic shell’, it’s a moulding system that replaces the lost-wax method, which was used for about 8000 to 10,000 years, [because] we’ve got much better glues these days. Instead of having to use clay to bind our stuff together, or plaster — which is not very heat resistant — we’ve got colloidal silica, which will take much higher heat. This will bind up tightly so that we can actually have a thin shell.

“To cast a piece traditionally in lost wax, there would be a solid cylinder around it. In this case, the shell is about an eighth of an inch thick, maybe a quarter. It’s a thing I’ve worked with quite a bit over the time and developed in all sorts of new ways. So, we actually get a very thin sharp mould, which has a very, very good surface when you cast — much better than you’d get off the plaster,” explains Glen.

Additional references

<https://morrisandwatson.com/casting/>

Build a simple casting furnace:
the-shed.nz/home/2017/7/4/build-a-simple-casting-furnace

Read Chirag Mahimkar’s master’s thesis on ceramic shells: scholarsmine.mst.edu/cgi/viewcontent.cgi?article=6014&context=masters_theses



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By Ritchie Wilson
Photographs: Ritchie Wilson

The Men's Sheds movement started in Australia in 1998 in Tongala, Victoria, and in Lane Cove, New South Wales, as a consequence of concern about the health of men — and particularly of retired men.

There are now just over 1000 in Australia and more in other countries. The Australian Men's Shed Association was established in 2007 with the overall aim of improving men's health. It receives funding from the federal government.

One shed that I visited in Tasmania had been given A\$50K by the association for start-up costs. In New Zealand the concept has proved equally popular, although the association here receives no government funding, but is generously supported by sponsors and local communities.

St Martins Community Menzshed

The 154th New Zealand Men's Shed was opened at the beginning of the year in Saint Martins, a suburb in the

south of Christchurch, made possible by substantial support from the local community. It now has 40 members, who each pay a yearly subscription of \$40.

The shed has a woodworking shop equipped with a saw bench, jointer, thicknesser, wood lathe, drill press, several drop saws, and a jig saw, as well as a large range of hand tools — almost all donated by the local community. Equally important is a well-equipped electronics workshop. A 20-foot shipping container is planned to be converted into a metal-working space.

Laing was demolishing an unwanted but structurally sound school classroom and would deliver the building to the Saint Martins site for no cost

Real demand for a Men's Shed

The origin of the St Martins Community Menzshed can be traced back to the 2011–'12 Christchurch earthquakes. The hall of the St Martins Presbyterian Church ended up being demolished and the church community investigated possible alternative uses for the land, such as a community garden. The Church's minister, Dugald Wilson, organised a survey of the local area and the majority view was that a Men's Shed was the best use of the land. Dugald



Colin Wilmshurst in the electronics workshop

advertised a community meeting to explore the project, expecting 10 or so locals to attend, but more than 30 men turned up.

A great opportunity

A steering team was established that approached the Laing building-relocation company about purchasing a suitable used building. The company came back with an alternative suggestion — it was demolishing an unwanted but structurally sound school classroom at Rangiora Primary School and would deliver the building to the Saint Martins site for no cost. Planning permission was quite a drawn-out process and almost two years were to pass between the building being so generously offered by Laing and the shed opening. In the meantime an incorporated society was set up; a committee was elected, chaired by Gary Payne; and a constitution adopted that was closely modelled on those of other Men's Sheds.

The relocated classroom houses the woodworking equipment. The pint-sized old Sunday School building now houses the tea room, toilet, and the electronics workshop.

Community projects

The Menzshed is open on Wednesday and Saturday mornings and the projects currently being worked on include a moveable bench for an op shop in nearby Opawa and a notice board for the tea room. The neighbouring Beckenham Loop area, bounded by the Heathcote River, has been awarded \$200K (and perhaps much more) for temporary street improvements by the NZ Transport Authority and it is hoped that the Menzshed will be involved in making such things as planter boxes and benches when the plans for spending the money are finalised. 📄



Morning break in the tea room. Dugald Wilson (left) and Mark Atherton in the foreground

PAINTING TIPS FROM THE RESENE EXPERTS

A paint job done well is very satisfying. To help you get your paint job done right first time every time, we've asked the Resene experts to share some of their top tips:

Always plan the order of painting, top down

When you're planning to paint, start from the top and work down – ceiling first, then walls then floor. That way if you do have a paint spill you won't be damaging work you have already finished. When it comes to hanging a Resene wallpaper, paint the ceiling and trims first, then hang your wallpaper so you don't risk fresh paint being dripped onto your new wallpaper.

You need to check a colour is right. How do you do it? Paint the wall, right? Wrong!

Painting the wall means that your new colour will pick up the old colour. The best way to test your new colour is to paint it onto A2 cardboard in two coats using a Resene testpot. Once dry move it around from wall to wall and during the day and at night to see how it looks. Then roll the painted sample up so the colour is facing inwards and look down into it – this will give you an idea how the Resene colour will look if painted on all four walls.

Yes, you can paint over winter.

Just because it is cold, doesn't mean you can't finish off that summer painting job you have been putting off. Add Resene Wintergrade Additive to your acrylic Resene paint and it will help it cure down to 3°C. Surfaces tend to heat up slower than the air so give the surface time to warm up a little and make sure you stop painting well before nightfall to give your paint time to cure before there is dew or frost overnight.

Did you know?

If you need help with your painting or wallpaper project Resene has free expert advice available – simply use the free Ask a Tech Expert service online, resene.co.nz/techexpert, visit your local Resene ColorShop or call 0800 RESENE (737 363).



the paint the professionals use

LETTER OF THE
MONTH



LIBREOFFICE IS THE ONE TO GET

Hi Greg,

On page 56 of the No. 97 of *The Shed* you say, “The free and open-source version of Microsoft Office” when referring to LibreOffice. It would be far more correct to say, “Microsoft Office is a closed version of LibreOffice”. LibreOffice is an open-source office suite, historically before MS Office. Note lowercase ‘o’ in office.

StarOffice was released in 1985. It became OpenOffice in 2000 and then became LibreOffice in 2010. MS Office originated in 1990.

LibreOffice is far more powerful than MS Office as it has a drawing package and can edit PDFs. It also can do all of the things MS Office can do. It is *free*.

It has a wide range of formats for opening or saving work in. It can be run on all platforms, i.e. Android, Apple, Linux, OpenBSD, Windows.

LibreOffice has Write for documents, Calc for spreadsheets, Impress for presentation as per PowerPoint, Draw for graphic editing, Math for mathematical formulae, and Base for database management.

Equivalents of some proprietary MS fonts have been written by Google and can be installed and used when a document with the MS fonts is opened.

Google has done free equivalents for the commonly used MS Calibri and Cambria.

Carlito (Google) = Calibri (WORD)

Caladea (Google) = Cambria (WORD)

As far as sheds and computers go, the Rolleston Men’s Shed [RMS] is one that especially works on computers, upgrading older ones to make them faster, more efficient, more powerful, and easier to use than a computer with Windows on it. All of the software used is genuinely free. The operating system used is Linux Mint, the one found to be easiest for a user to change to from Windows, as nearly 30 users have found.

There is also an electronics newsletter produced each quarter and distributed to interested sheds and available on the RMS website:

rollestonshed.wordpress.com/newsletters-3/

Sandy Ferguson

Rolleston Men’s Shed IT

Hi Sandy,

I find your explanation around LibreOffice v. MS Office very useful.

As a Mac user, I use Pages, Numbers, and Keynote, yet I have LibreOffice installed in case I need to check an MS Office document.

As a small business, I keep looking at LibreOffice to see if I should be using it — particularly given its cross-platform capabilities — yet I keep coming back to the Apple apps. They do some things better, some things uniquely, and some things not at all — which can be frustrating.

The issue of a decent database is one that got reformed from the old ClarisWorks into FileMaker Pro — a programme I think is great; it’s just not in the budget at the moment.

I wasn’t aware of the Rolleston Men’s Shed’s speciality in computers, etc. and would love to come and visit and see what is happening. I don’t suppose you’ve done a Steve Jobs/Wozniak and made a computer out of wood by any chance? That would make a cool article.

Cheers,

Nigel Young

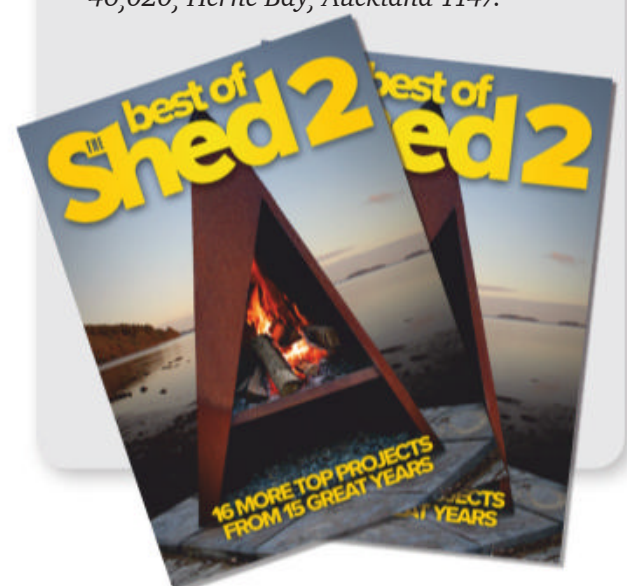
[Author of the Project Home Server series of articles in Issue No. 96 and No. 97 of *The Shed*]

LETTER OF THE MONTH PRIZE

Every issue, our Letter of the Month winner will receive a copy of *Best of The Shed 2*.

More top projects from 15 great years of *The Shed* magazine

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



HELP WITH A SMALL POWER HAMMER

Dear Sir,

Have any or your readers built a small-size power hammer for blacksmith forging? I am keen to build one for small work, mainly knife making. I do not need a heavy machine that would typically be used for heady forming.

I'd appreciate any contact via *The Shed* editor or via a possible future magazine article — even a photo would help.

Your magazine is amazing, and it seems to get better as the years roll by.

Yours thankfully,
Mr RK Panckhurst
Christchurch

Thank you for your kind words, Roy; our entire team appreciates comments like that — cheers. If anyone can help Roy with shots of their small power hammer, please send them to us and we will publish them here. Better still, let us know if you have made or are making one and we will visit you and write an article for The Shed readers.
Ed.



THOSE HONDAS WERE A GREAT WORK TOOL

Hi,

Looking for a read at Wellington airport I was delighted to find Hayden Tasker's article on the Honda Police Specials.

As an ex-MOT T/O in Hastings [I know] we welcomed the Hondas, as they started on a frosty morning, didn't leak oil, and had radios that worked. They were a great work tool and raised enforcement to a new level.

Congratulations to Hayden and Stu for keeping history alive for those who proudly served.

Lance Lillas

WHAT'S HAPPENING ONLINE AT THE-SHED.NZ?

Every week we upload new content onto *The Shed* website to add to the hundreds of articles and videos already on the site for readers to discover, learn from, and enjoy. The uploads of the past few months include:

Using 3D printing to do a modern twist on lost wax casting



Building a simple sand trolley for a small dinghy



Using a lathe to turn out a stylish crescent clock made from native timber



The making of 'Gloribelle' — a replica of a 300-year-old steam engine





WARNING

This project involves work on 230V AC mains power. You must consult with, and be guided by, an electrician with a current practising licence. Do not at any time work on the saw or this brake while it is live! Always turn it off and unplug the mains supply before carrying out any work on this project.

SAFETY RULES ARE YOUR BEST TOOLS

One simple electrical modification may have preserved a number of sheddie fingers

*By Gavin Melville
Photographs: Gavin Melville*

Recently, the Menzshed in Halswell, Christchurch, purchased a new bandsaw. The saw worked well, but had one alarming feature. When it was turned off, the blade continued running for approximately 20 seconds. During this time it was almost silent, and that was seen as a real danger to both the operator and anybody else nearby.

The motor on the saw was a 2hp single-

phase AC induction motor (Image 1). Single-phase induction motors generally have one or more starting capacitors — these are the tubular objects mounted on the motor. There was clearly a need to bring the motor to a halt quickly. All sorts of electrically and mechanically operated brakes were considered, and just as quickly rejected. A quick internet search found a method of braking called ‘DC injection’ (Image 2).

**That was
seen as a
real danger
to both the
operator and
anybody else
nearby**

DC-injection method

A DC voltage is 'injected' into the stationary winding of the AC motor after the AC voltage is disconnected, providing braking force to the rotor. The stator effectively turns into an electromagnet and 'grips' the rotor (Image 3).

A quick test with a 24V DC 10A power supply showed this works well. The test was done by unplugging the saw while it was running and quickly placing the two pins of the saw mains plug across the 24V DC terminals of the power supply. I screwed the two 24V DC terminals to a block of wood, spaced about 15mm apart.

One possible complexity is that the switch on your saw may be an electromagnetic switch, and the moment the power is turned off, the switch disconnects and does not reconnect when power is reapplied. If you have this kind of switch, you will need to bypass the on-off switch temporarily to run the test (seek qualified assistance). It doesn't matter how long you connect the DC power for, but the motor should come to a halt within one to two seconds. If it does, it's OK to proceed with this project. If you don't have a power supply handy, two 12V gel-cell batteries connected in series will work perfectly. ►

A DC voltage is 'injected' into the stationary winding of the AC motor after the AC voltage is disconnected

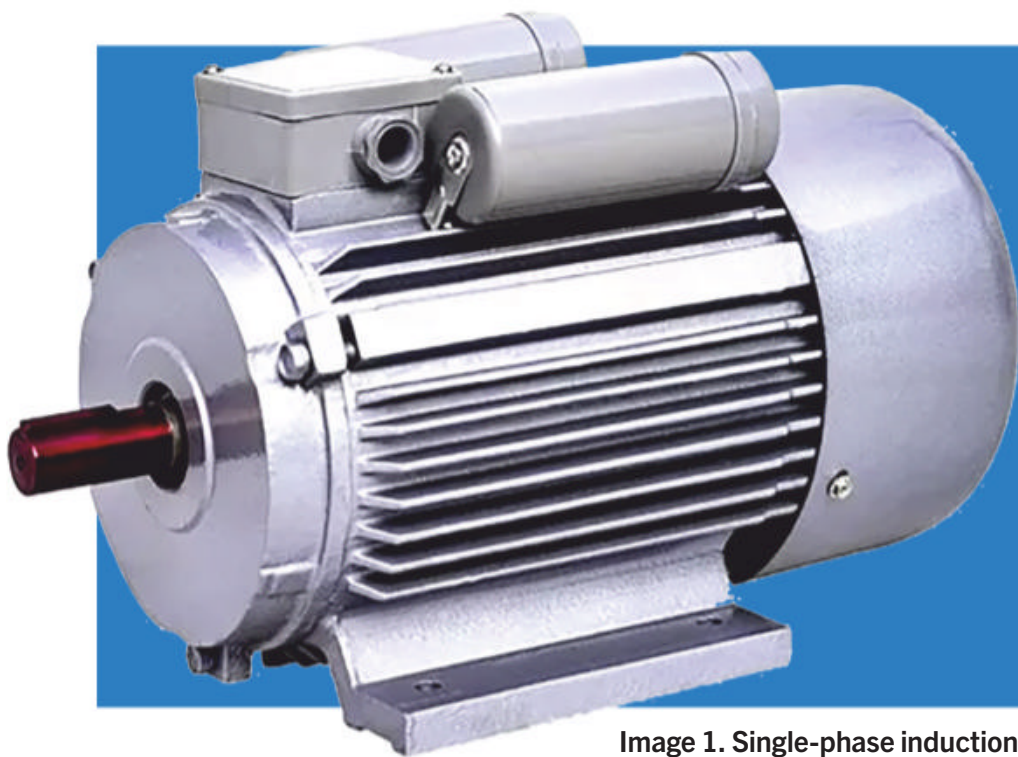


Image 1. Single-phase induction motor

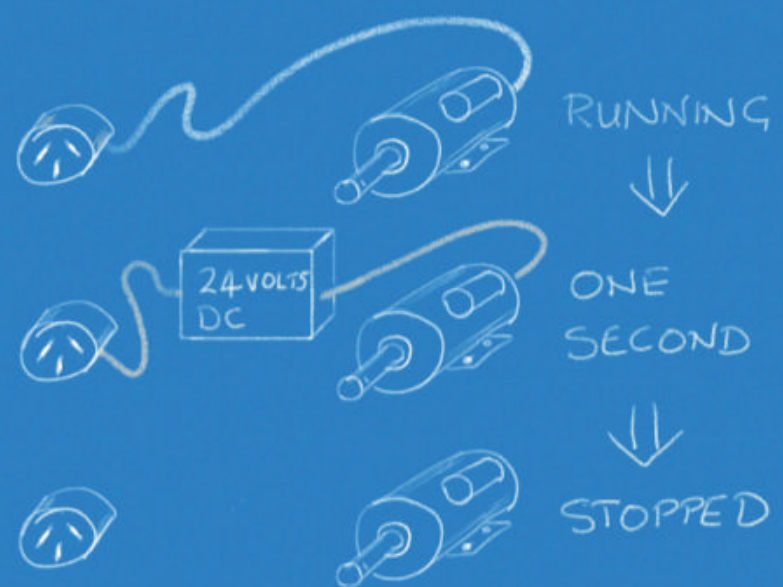


Image 2. The process of stopping the motor

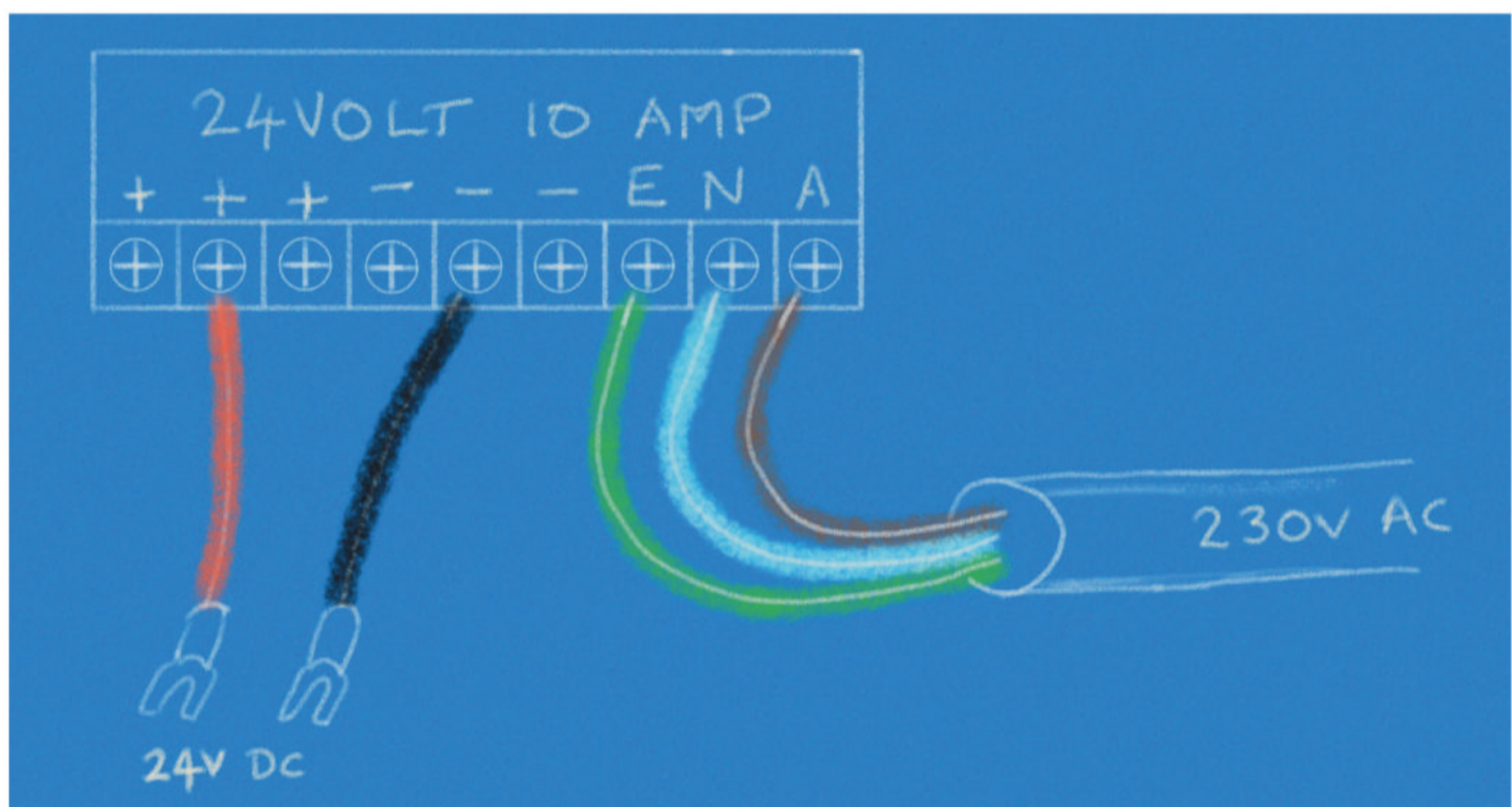


Image 3. Quick test using a power supply or a battery

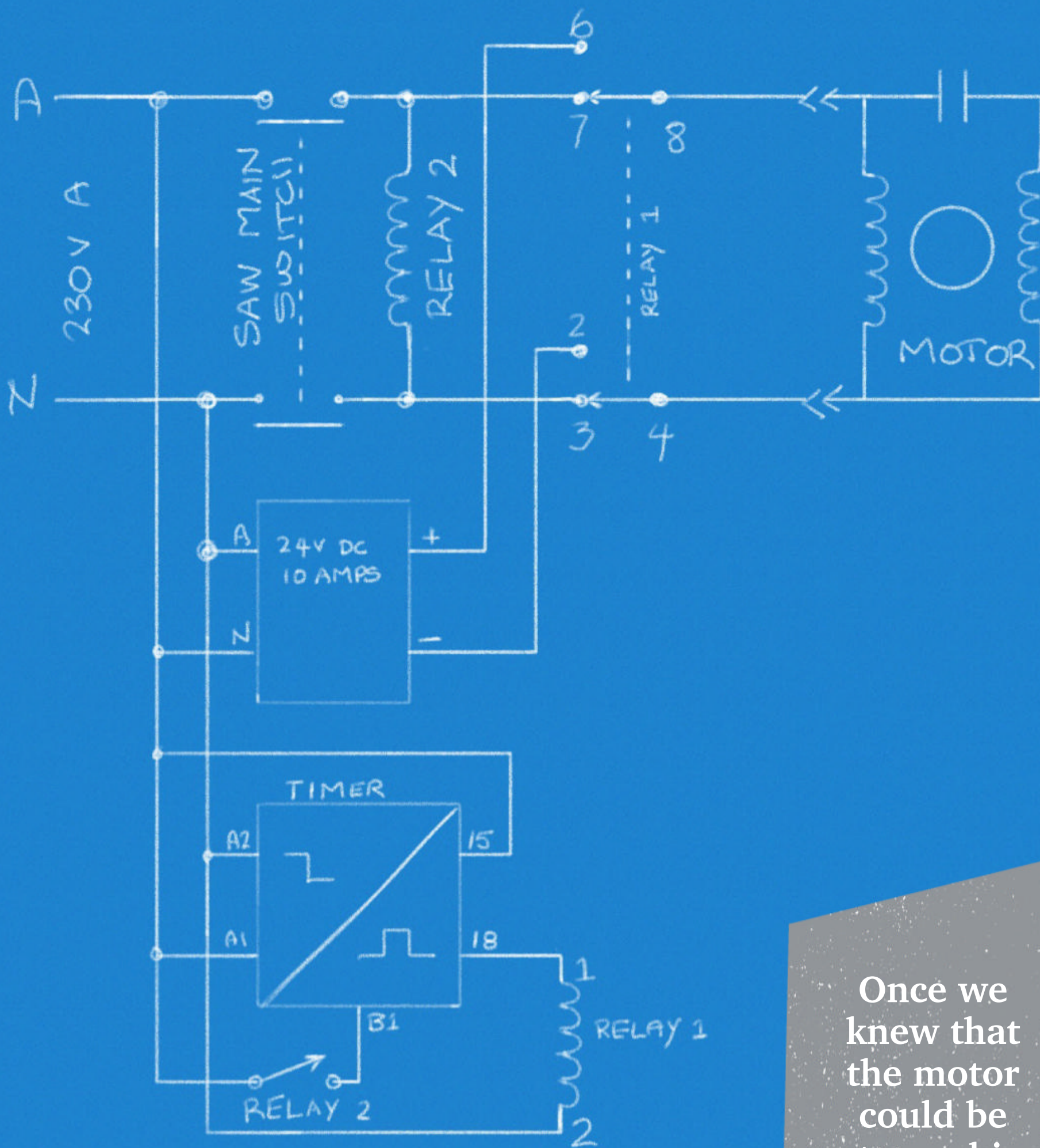


Image 4. The wiring diagram of the brake

Design

The next step was to design the brake. We needed to turn the power off, disconnect the motor from the AC mains, apply 24V DC to the motor for a few seconds, then put things back the way they were (Image 4). Once we knew that the motor could be stopped in this way, a breadboard version was made so that the idea could be tested on real hardware.

Parts

The following parts were used:

- 24V DC power supply — in this case rated at 25A. Our bandsaw draws 7.1A for 0.75 seconds, so 10A is more than sufficient
- a 40A double-pole double-throw relay — this needs to be a quality relay that can handle AC and DC. In particular, it needs to handle 10A DC, which a lot of relays won't do

Once we knew that the motor could be stopped in this way, a breadboard version was made so that the idea could be tested on real hardware



Image 5. A suitable power supply



Image 6. Cheap power supplies



Image 7. A suitable relay from Potter and Brumfield, a 40A relay

- a timer that can be set in the range of one–five seconds or so
- a small pilot relay with a 230V AC coil, and a base if it needs one
- some terminals and wire.

For the 24V power supply, I used a Delta 24V DC 25A power supply, simply because I had one. I have also tried a Mean Well HEP-240-24A (element14 part number 2815943). Any 24V DC power supply able to supply 10A would work. It will generally look like the one in Image 5. AliExpress has power supplies like this beyond count; however, be careful — \$3 power supplies may not be what you expect (Image 6).

My chosen supplies

- Power relay: I used a Potter and Brumfield T92P11A22-240 power relay DPDT, 240 VAC, 30 A, T92 Series, panel mount, non-latching, from element14 (element14 part number 270362),

costing about \$37 (Image 7).

- Timer: I used a GIC V0DDTS DIN Rail Digital Timer, Eliro Series, multifunction (element14 part number 1895458), costing about \$66. The timer is used in Mode E (for this timer), and set to 1.0 seconds (Image 8).
- Small pilot relay: I used an Omron G2 series relay (Image 9) — specifically, a G2RS Series, non-latching, SPDT, 230 VAC, 10A, which plugs into a DIN rail base. Image 9 is of a 110 VAC relay; I used a 230V AC one (Omron part number G2R-1-SN 230AC; element14 part number 4375178). You don't need to use this relay; any small 230V AC coil relay with a single changeover contact will do.
- DIN rail: Maybe 200mm needed. Either a 10-way DIN rail terminal block or 10 off 2.5mm blocks (Image 10) plus an earth DIN rail block, 4 or 6mm (Image 11).
- Wire: Faston 6.3mm terminals, open end lugs for the power-supply terminals. ►

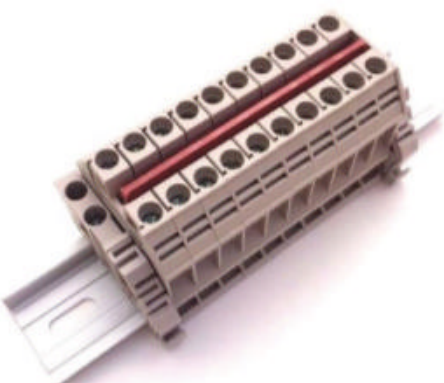


Image 10. Ten-way DIN rail block



Image 11. DIN rail earth block



Image 9. A suitable small relay



Image 8. Multi-purpose timer from GIC

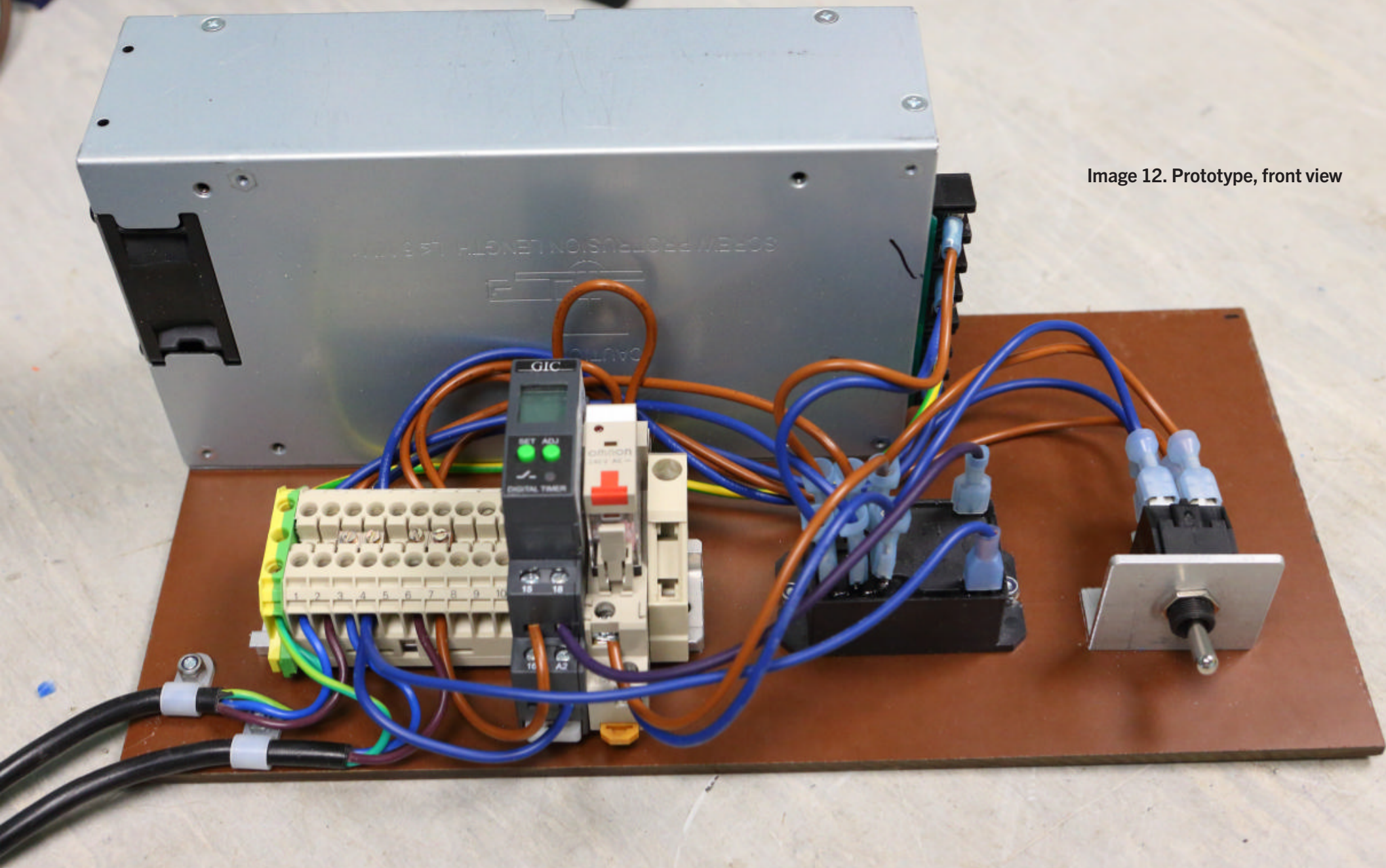


Image 12. Prototype, front view

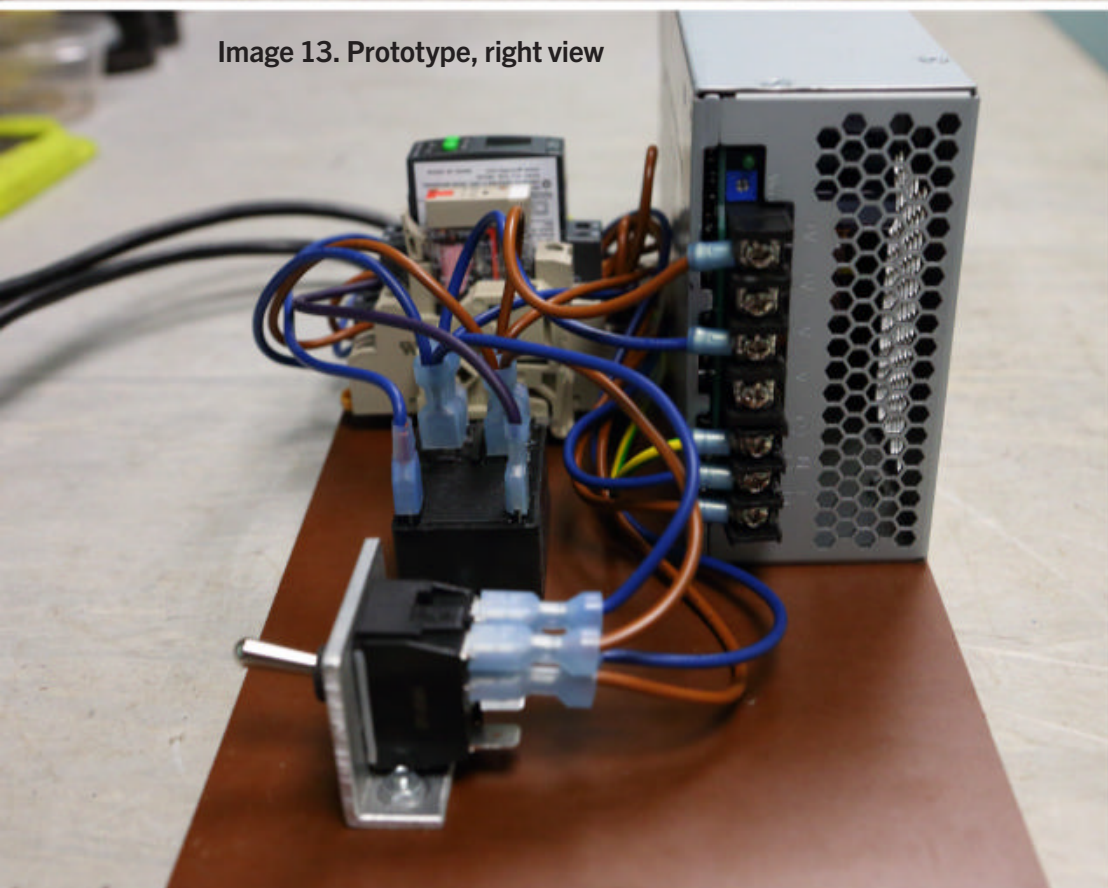


Image 13. Prototype, right view



Image 14. Prototype, left view

Test model

At this point, a prototype was built on a small panel of Formica. This allowed minor changes to be tried (Images 12–14). The switch to the right is a test switch to replace the push-button switch on the bandsaw while testing. No changes were needed; the entire circuit worked first time. The timer was set to mode E and the time to one second — the timer has a good user manual.

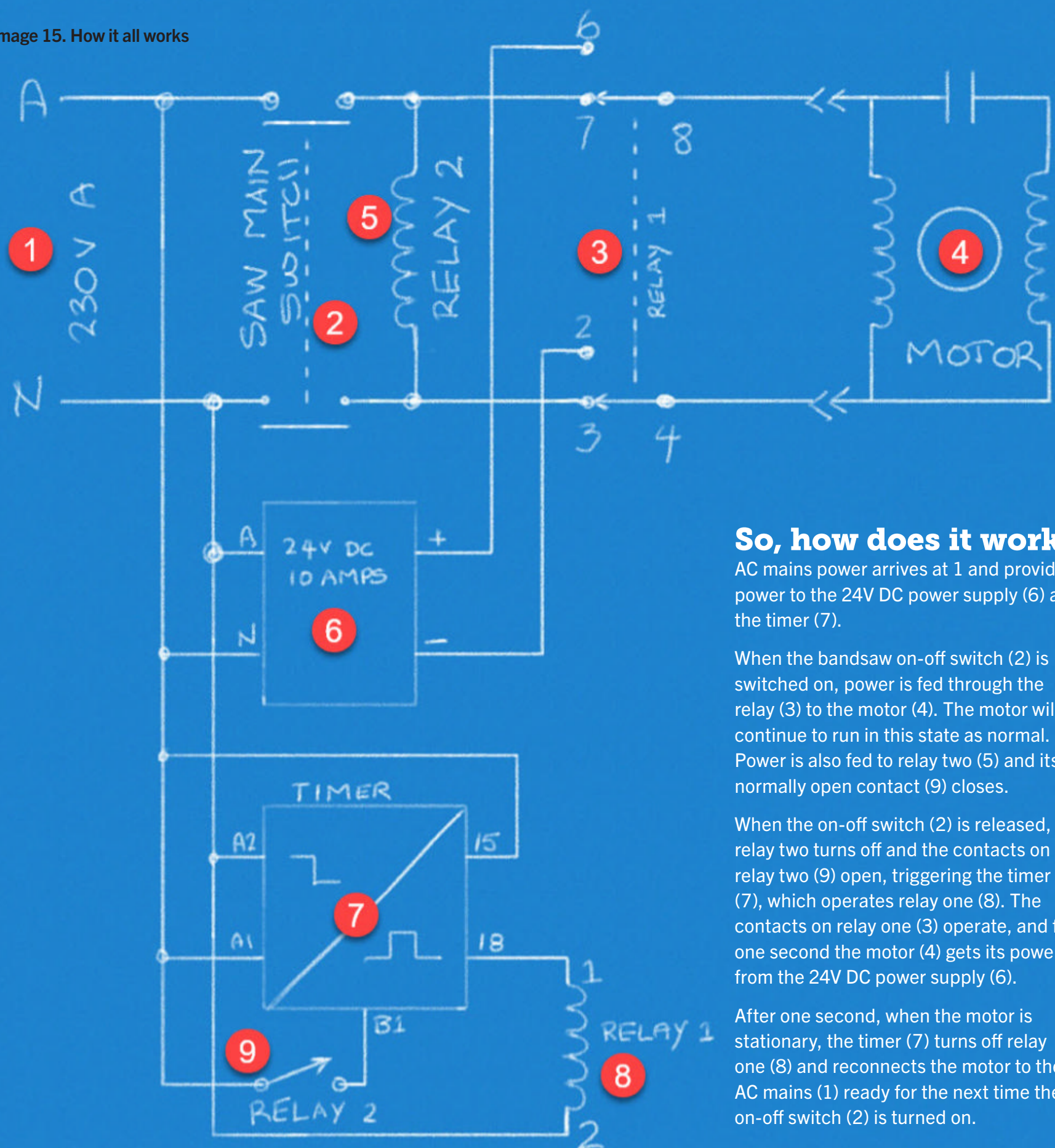
Building the brake

A simple metal box was folded up out of zinc-plated steel by the shed's metalwork guys, and rivnuts were used liberally (Image 16).

The switch shown is an electromagnet switch, which does not turn back on if the power fails and is then reconnected. The 24V DC power supply is fan cooled; this is not necessary — it's just one that was to hand. The box was made to fit

A simple metal box was folded up out of zinc-plated steel

Image 15. How it all works



So, how does it work?

AC mains power arrives at 1 and provides power to the 24V DC power supply (6) and the timer (7).

When the bandsaw on-off switch (2) is switched on, power is fed through the relay (3) to the motor (4). The motor will continue to run in this state as normal. Power is also fed to relay two (5) and its normally open contact (9) closes.

When the on-off switch (2) is released, relay two turns off and the contacts on relay two (9) open, triggering the timer (7), which operates relay one (8). The contacts on relay one (3) operate, and for one second the motor (4) gets its power from the 24V DC power supply (6).

After one second, when the motor is stationary, the timer (7) turns off relay one (8) and reconnects the motor to the AC mains (1) ready for the next time the on-off switch (2) is turned on.

Image 16. Final build



Image 17. Drilling guide

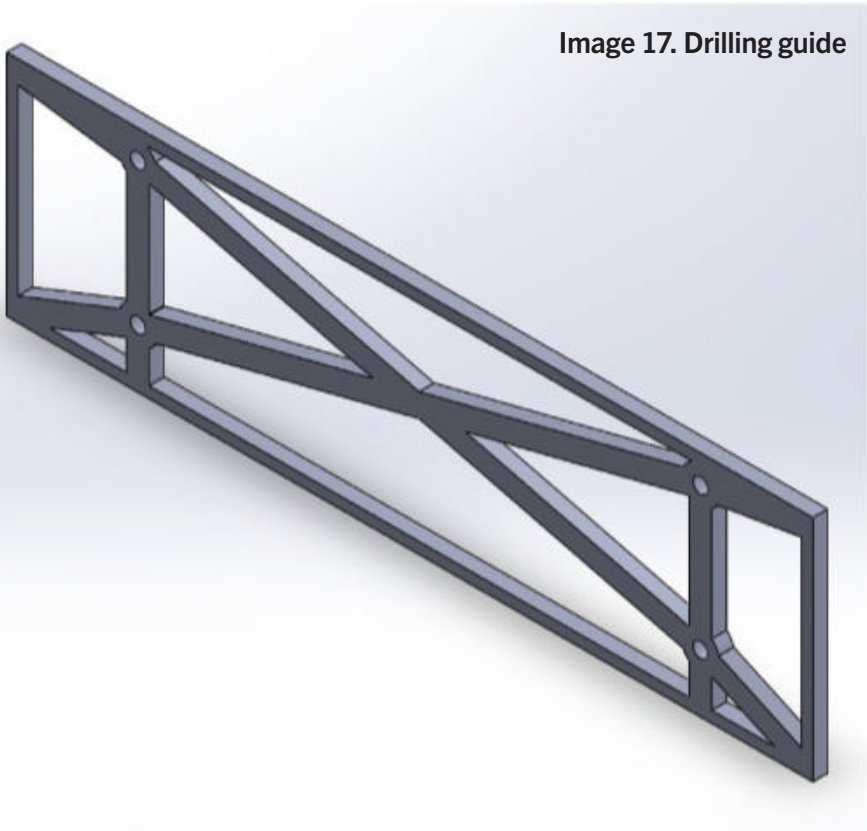
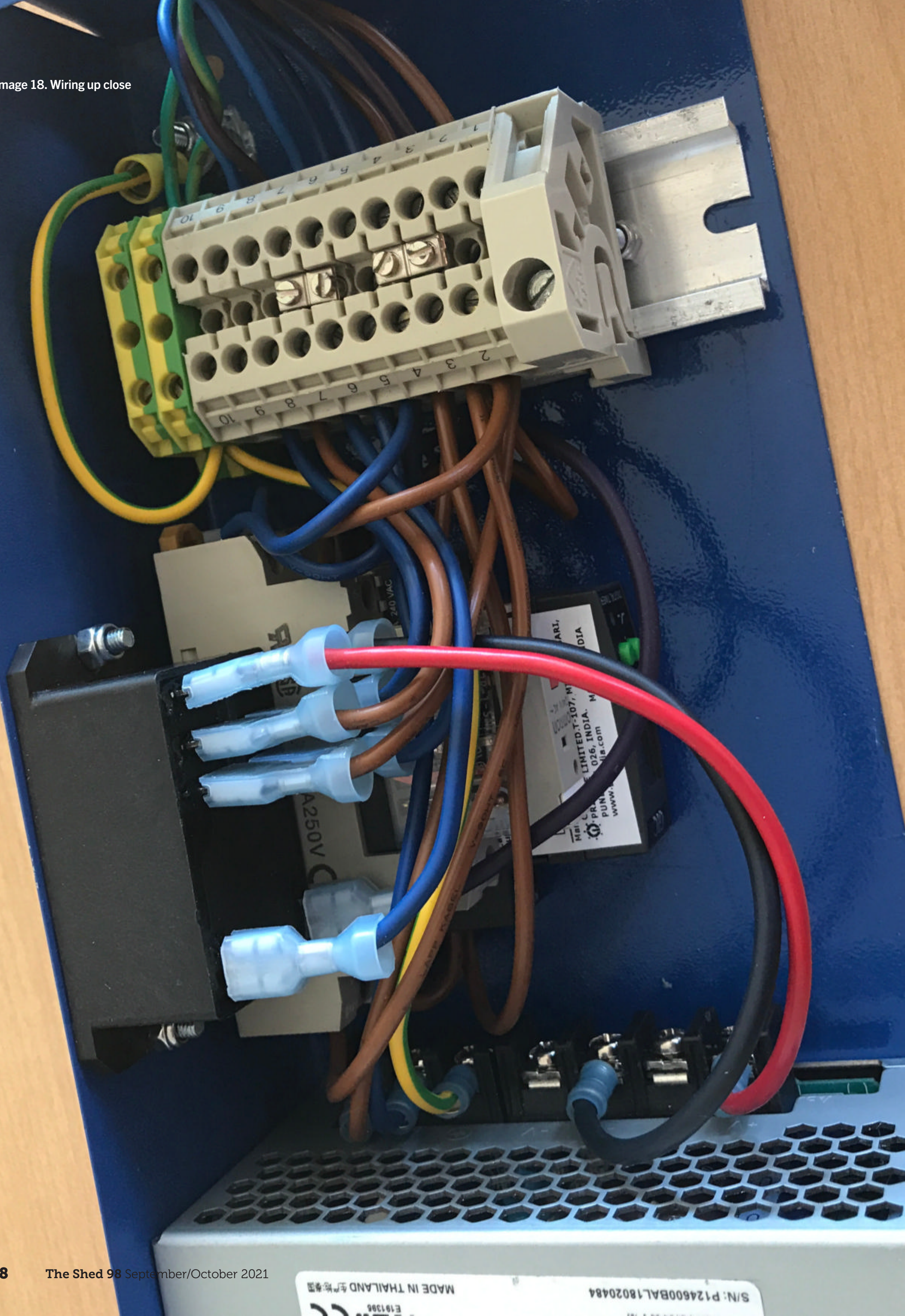


Image 18. Wiring up close



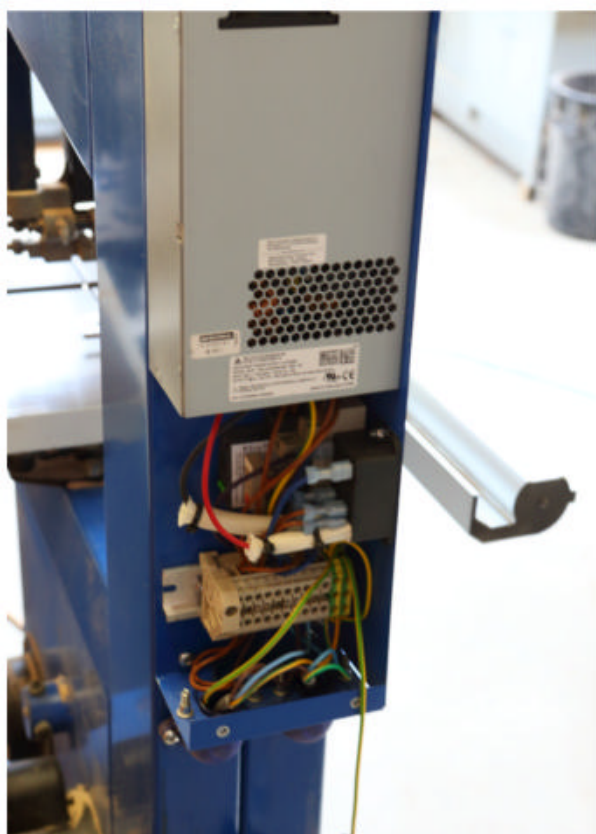


Image 19. Mounted on the bandsaw frame

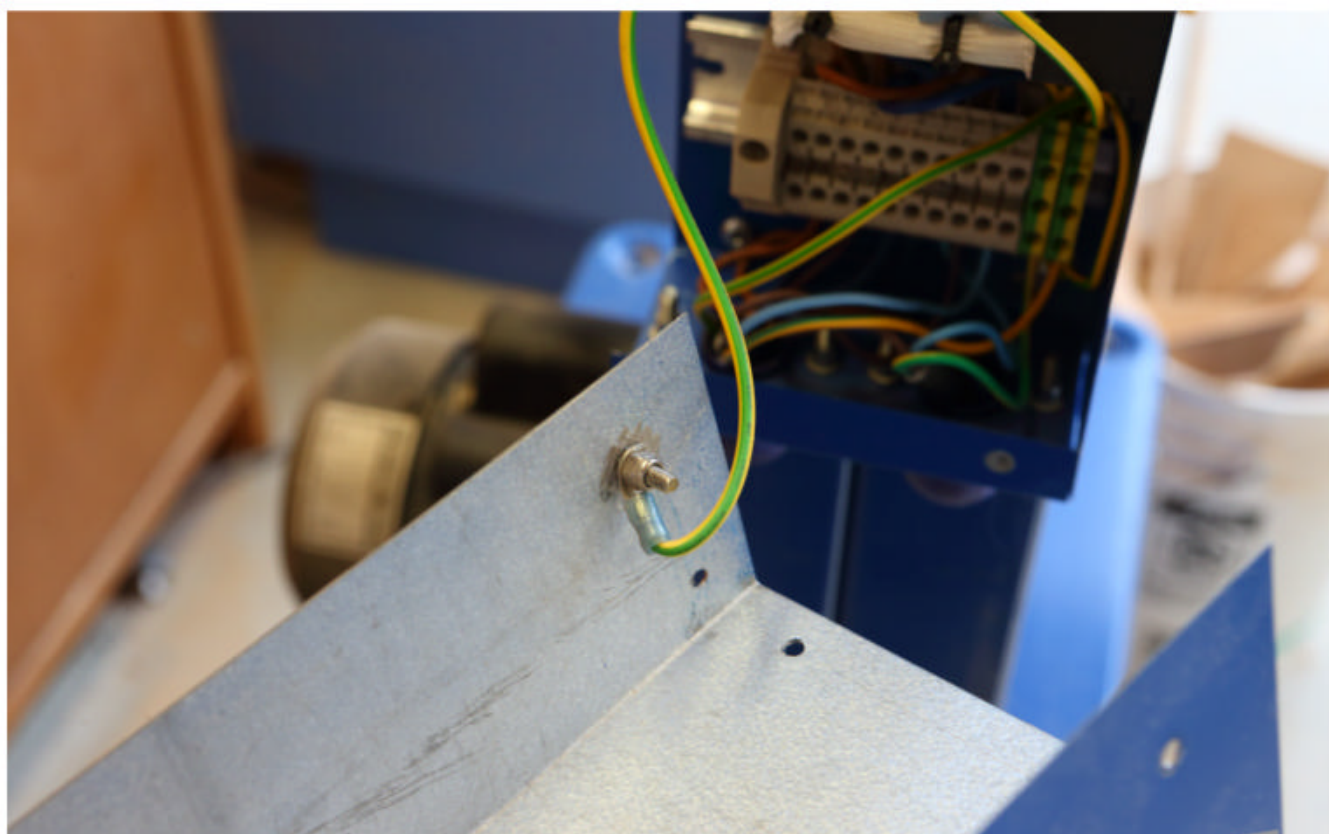


Image 20. The lid showing its earth bond

the power supply and is about 450mm tall and 120mm wide.

Power supplies like this are hard to mount, with multiple mounting holes at odd dimensions. The simplest solution is to 3D print a hole-drilling guide and throw it away after use (Image 17).

The pilot relay and the timer are mounted on a short piece of DIN rail, the same as the terminal block.

The wiring is simple. Note the bridging strips on the terminal block (Image 18) — this is not strictly necessary but saves wire links. One is for ‘active’, one for ‘neutral’ (Image 19).

The case bolts to the vertical frame of the bandsaw near the on-off switch. All metal parts were earth bonded, including the lid (Image 20).

Extra fibreglass sleeving was applied to the DC wiring where it was near the relay terminals.

A small problem

When it came time to wire it into the bandsaw, I encountered a small hitch; I needed some very short elbows. Simple: 3D print them (Image 21).

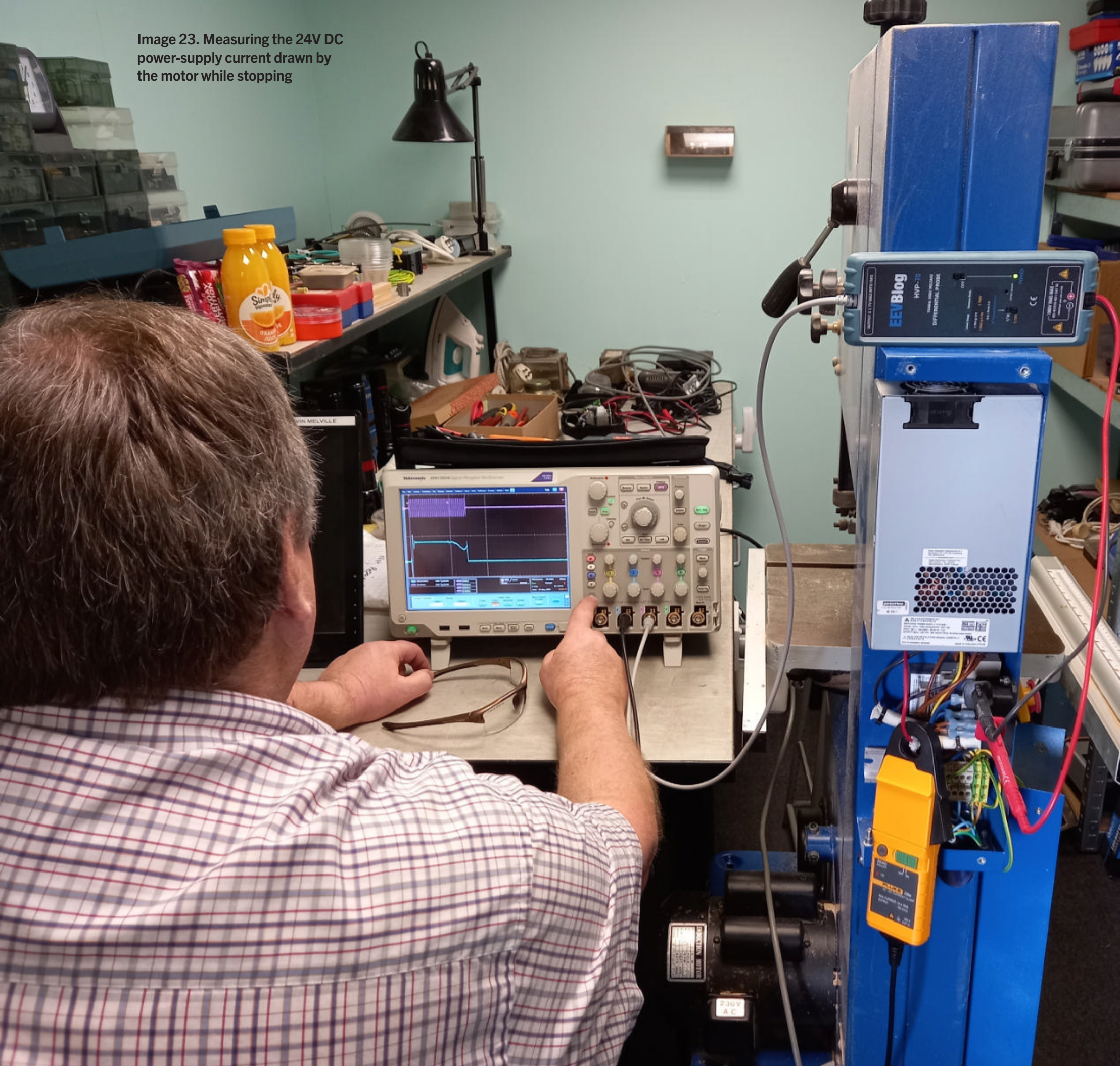
The brake has been running for three months without any problems (Image 22). ▶

When it came time to wire it into the bandsaw, I encountered a small hitch



Image 21. 3D-printed short elbows

Image 23. Measuring the 24V DC power-supply current drawn by the motor while stopping



Nearly all parts can be substituted, but think about using the suggested relay. In hindsight, I might have made the metal box a little differently, as it tends to let some sawdust inside (Image 23).

Design files are available on request.

WARNING

Before commissioning this brake, you must ensure that the case is fully earthed, all live wiring is enclosed, and it has been checked by an electrician with a current practising licence. 📄

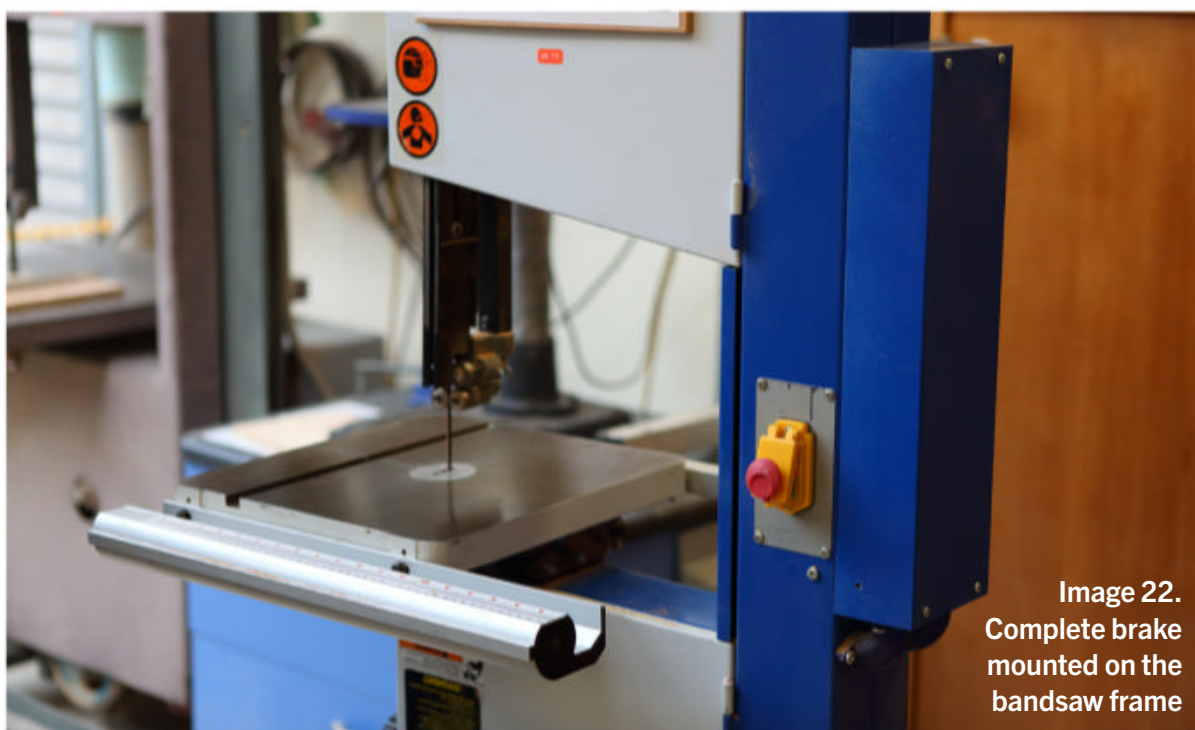


Image 22. Complete brake mounted on the bandsaw frame



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It's a gas

Use industrial gas for your shed projects? Chances are you're paying ongoing cylinder rental fees whether you're using the gas or not.

Eziswap Gas works differently. It operates a cylinder-swap system. Customers initially buy a full cylinder of their required gas or gas mix, use the gas, then swap the empty cylinder for a full one, paying only for the gas used. This way, customers avoid paying any ongoing cylinder rental fees.

Worried about the initial cost? You can buy a cylinder of your choice from the Eziswap Gas website (eziswapgas.co.nz) and check out with Afterpay. Using Afterpay, you can spread the cost over eight weeks (conditions apply).

With more than 55 swap centres nationwide, Eziswap Gas is a better way to purchase industrial gas. It's also New Zealand's only 100 per cent Kiwi-owned, nationwide industrial gas provider. Win-win!



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SHOW YOUR SHED TO THE WORLD!

HURRY, ENTRIES
CLOSE AUGUST 22



We are now calling for entries for your shed to be featured in our 2022 The Shed Calendar. The calendar will accompany the Jan/Feb Issue 100 of the magazine, on sale November 29.

We can use our shed photos of course but we would rather use yours.

For more information and to enter your shed shots visit [facebook-square /theshedmag](https://facebook-square.com/theshedmag)

The prize for getting your shed photo chosen for the calendar is a one-year subscription to The Shed magazine or extension to your existing subscription and, best of all, bragging rights for all of 2022!

THE WHERE DREAMS ARE MADE REAL
Shed



MASTERING THE LATHE 6

A boring bar is more versatile than its name suggests

By Bob Hulme

Photographs: Gerald Shacklock

We can use drills and reamers to make holes but a boring bar allows us to make a hole any size we want. We are not confined to a standard drill size. The lathe was invented to produce perfectly round objects, and we think in terms of cylindrical objects such as shafts or axles. However, the other side of the coin is making perfectly round holes

for the axles to run in. This is where being able to bore holes comes into play.

A boring bar is held in the tool post in a similar way to turning and facing tools. A hole in a cylinder is roughed out first using a drill, leaving enough material under the finished size. This ensures that finishing by using a boring bar will achieve the desired accuracy and surface finish.

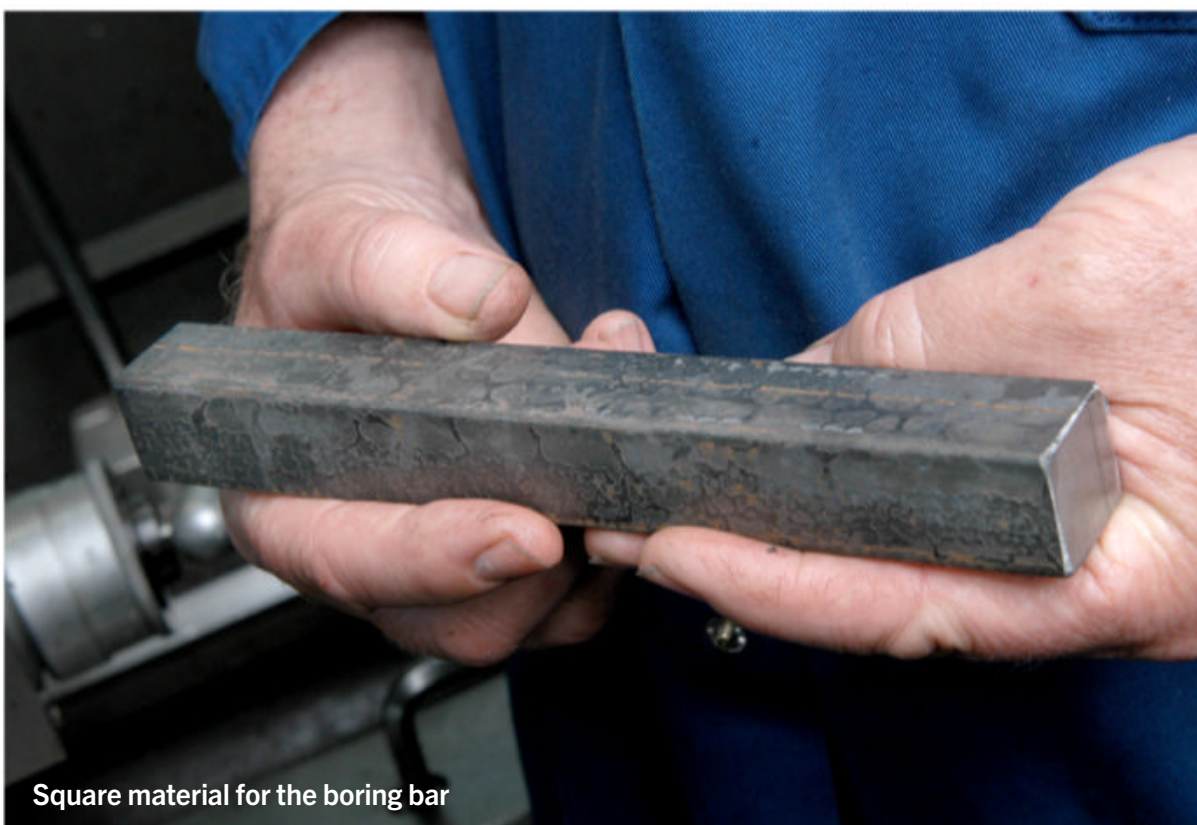
Buy?

Several brands of boring bars tipped with tungsten carbide are available, with sizes to suit different diameters and the depths of the hole you need to make. Advanced designs even include built-in damping to minimise ‘chatter’ — the high-pitched noise and the movement that mars the surface finish with tiny corrugations. Replaceable cutting tips for these boring bars have shapes and hardnesses for different materials such as cast iron, high-tensile steels, aluminium, etc. Commercially available boring bars are mostly excellent tools but their cost may not be justifiable for a home workshop.

Make your own

My pick is that you are reading this magazine because you are a DIY type of person, so let’s look at how to make a boring bar for your lathe. We will use high-speed tool bits rather than ready-shaped tungsten-carbide inserts, and after some trial and error you should achieve good results.

There are three steps in the approach for the best results: ►



Square material for the boring bar



This ensures that finishing by using a boring bar will achieve the desired accuracy and surface finish



Commercial boring bars

1. Establish what you need. Look closely at the tool post in your lathe. The first limiting factor is the maximum size that can be clamped. Ideally, there should be room to use packing strips to adjust for tool cutting height, as this will vary when the tool is reground. How big is your lathe and what size holes do you expect to bore? Boring bars need to be as big as possible for rigidity and small enough to produce holes in the range that you need. One solution is to make a set of, say, three boring bars to suit most situations.
2. Decide on cutting bits, essentially round or square. Round cutting-tool bits are the easiest to make bars for because you really only need to drill the hole. Square bits obviously need a square hole where they are held in

the boring bar. It's best to call around your local engineering businesses to find one with square broaches to do the hole for you. It will add a little to the cost, but means lining the tool up after regrinding is easier and there is more rigidity because the tool bit has no chance of rotating. Filing the hole to make it square would take skill and patience, so opting for a round cutting bit is a lot less hassle.

3. Choose a design. If you are making more than one you can make one of each sort. The first basic consideration is whether to make the tool-bit hole at right angles to the bar or at 45 degrees (see diagram).

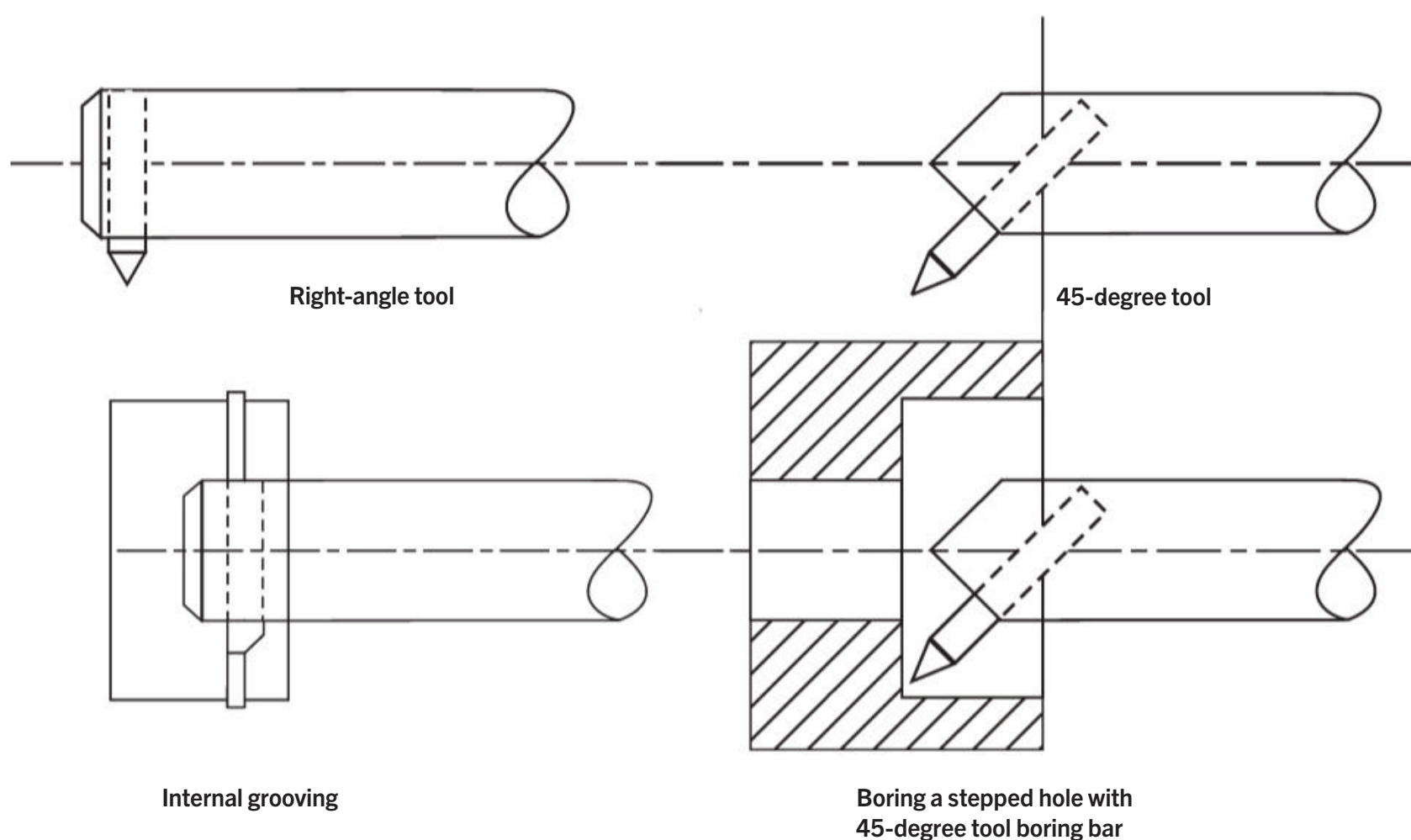
The advantage of the 45-degree setting is that you can use the boring bar to make stepped holes or blind holes.

With the right-angle setting, this is not possible because the end of the boring bar will rub on the step. However, the right-angle setting is slightly more rigid and can be used to make grooves such as internal circlip grooves.

Starting

To make the boring bar in this project, I have chosen to use square bar as a starting material because it is easier to clamp in the tool post. I usually use tools with 25mm square shanks, so I start with that-sized material. You can use round bar quite successfully, but more care must be taken when clamping it in the tool post.

Use a four-jaw chuck to hold the square material in the lathe and turn it to make a cylindrical shape. Leave enough of the square section for tool-post clamping. The



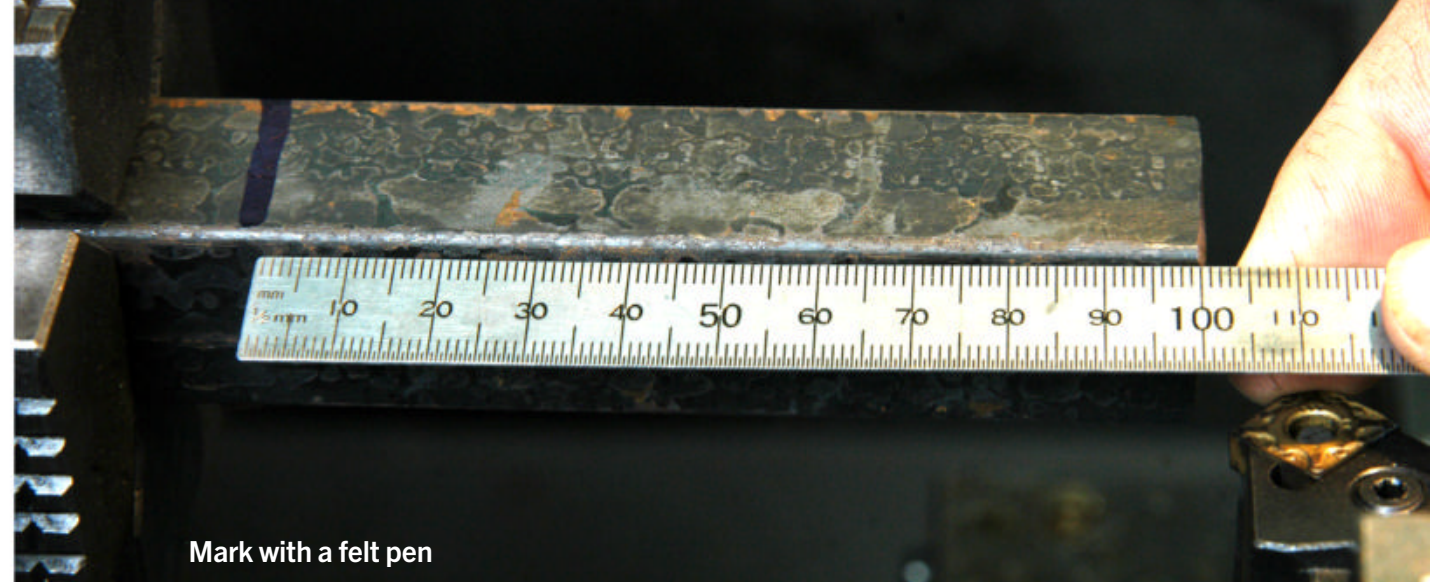
diameter of the cylindrical section should be approximately 75 per cent of the size of the smallest hole you want to bore. This is not the finished hole size but the size of the drilled hole that you start with.

Use a turning tool with a square-shaped tungsten-carbide insert if you are using that type of tool. This will give an angled shoulder where the cylindrical shape meets the square shape, stronger than a shoulder at right angles. This 90-degree angle shape has a more robust tip than the 60-degree angle on a triangular insert.

The edges of square or hexagonal materials are cut first in an 'interrupted cut', which is not smooth or continuous until the size of the job is reduced to the full diameter being cut. An interrupted cut impacts on the cutting tool for every revolution of the work material. If the tip of the tool is too slender, it will snap off.

If you are using high-speed steel (HSS) tool bits for turning, then grind one that will also give an angled shoulder and have a broad angled point. Because of this angled shoulder, the stopping position of the saddle feed will be sooner for each successive cut, so you will not be able to use a stop or a reading on the saddle wheel to come up to.

When the cutting tool is nearing the shoulder, drop out the power feed and

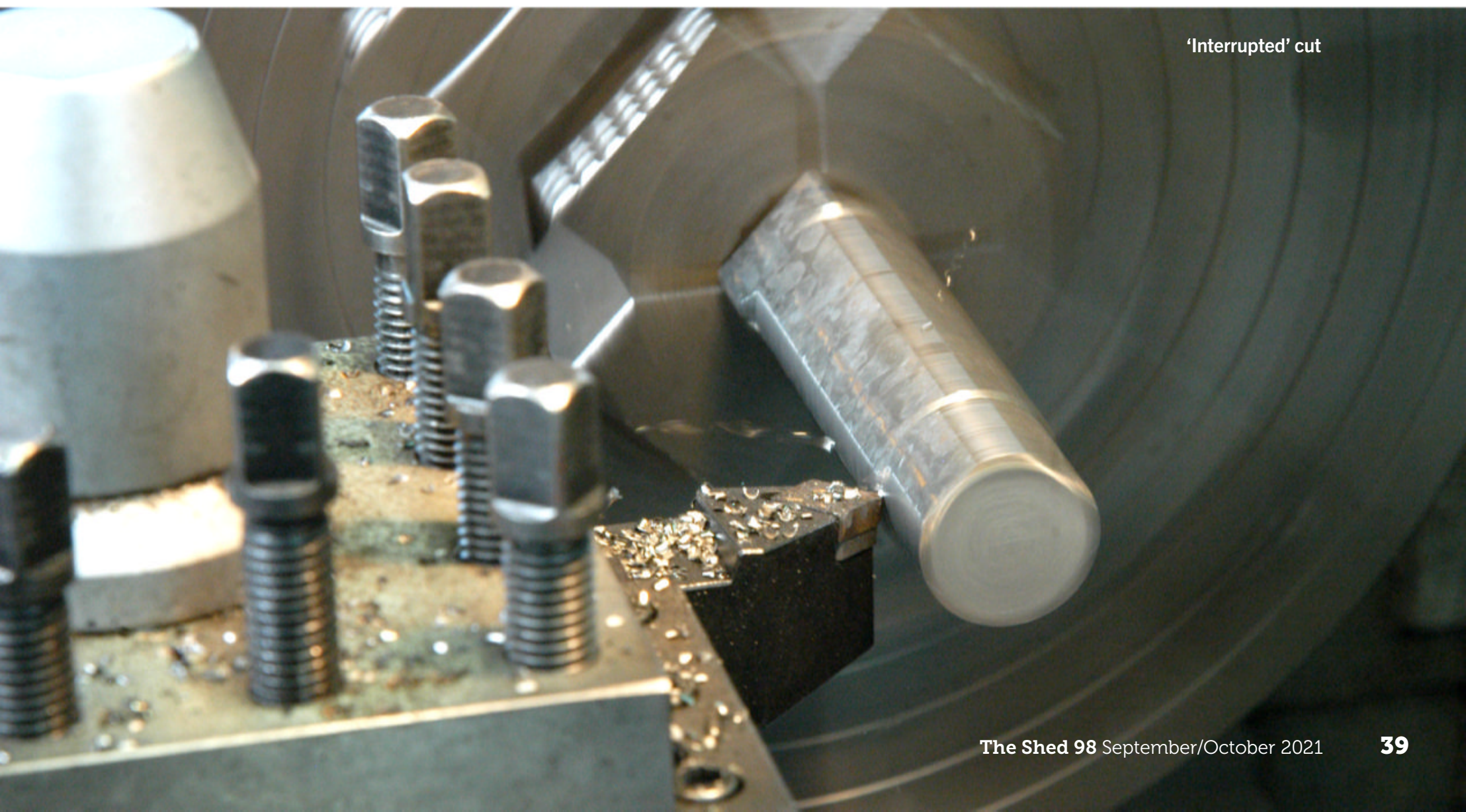


gently continue the feed by hand with the saddle wheel until the cutting tool just reaches the shoulder made by the previous cut. To know where to stop the first cut, I use a line drawn on the material with a felt-tip pen. The position of the shoulder is not very critical, so this is good enough. It is surprising how easily you can see the line when the material is revolving.

If you are making a very long boring bar, it will be best to support the end with a tailstock centre while turning along its length. While surface finish on the turned surface of the boring bar is not important, a smooth finish makes it pleasant to handle and swarf created when the boring bar is being used does not stick.

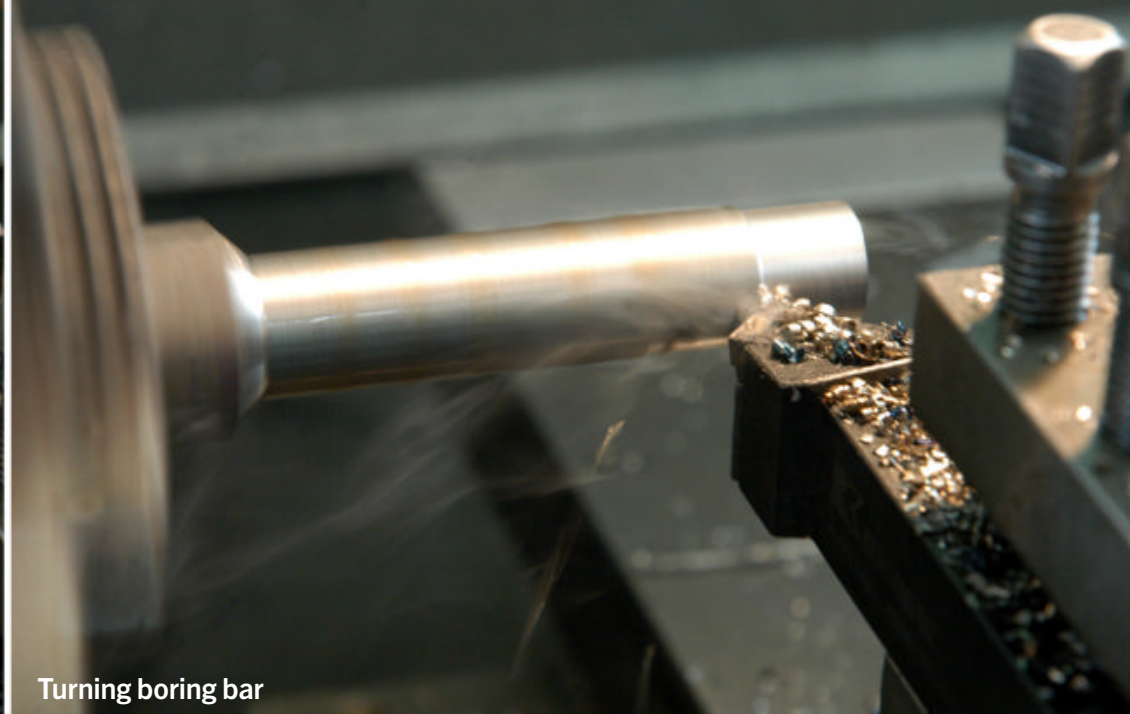
For this project, I use a square cutting-tool bit at a 45-degree angle. Angled faces must be machined on the end of the boring bar as shown and this would normally be done in a milling machine. However, if you don't have one of those you may have a face sanding wheel. ►

When the cutting tool is nearing the shoulder, drop out the power feed and gently continue the feed by hand





Applying cutting oil



Turning boring bar

These handy items are now fairly inexpensive. I have seen combination units with a belt sander and face wheel on the market. The face sanding wheel can be used to create the angled faces and, if you use a square and an angle gauge to check as you go, the result should be good enough.

Square hole

To broach a square hole, drill a round hole first in preparation. After broaching, drill and tap a hole for the grub screw, which will lock the tool bit in place. Round tool bits are held in the same way. Of course, you can buy boring bars with replaceable tips but, as mentioned, cost is a factor in home workshops where time is not, whereas in business it is worthwhile to invest in tooling that saves time.

How to use

To create a simple hole with a boring bar through the item you are making, rough out the hole in the metal first using a drill — if you begin with solid material. Use a boring bar that is as large as possible so that the cutting bit has the best rigidity. The resulting finish of the bored hole should be very good — not as good as a ground finish but way better than just drilling.

If the finish you are getting is not as good as you need, it will be necessary to vary speed (rpm) and feed rate to find the best combination. Usually, lowering the speed will stop chattering, but, surprisingly, increasing the feed rate can sometimes be more effective than decreasing it. In some cases, chattering can be overcome by fitting rubber bands on the boring bar to dampen vibrations. With some materials, using cutting oil also helps.

Cast iron is best machined dry. Mild steel and high-tensile steel definitely benefit from the cooling and lubricating effect of cutting oil. Aluminium prefers light oil such as kerosene. Brass is almost indifferent and machines well with or without cutting oil.

I have my own preferences for cutting oils based on my own experience and the brands I have used. It may be an idea for you to write in and tell us about

the cutting oils you have tried and what results you gained. If there is enough feedback to show trends, we could print a summary in future issues of *The Shed*.

Stepped hole

To create a stepped or blind hole, use the stop on the lathe bed so that the boring bar is fed to the same depth on every cut. Keep the roughing cuts approximately 0.2mm short of the full depth, then,



Using a face sanding wheel for an angled face



Setting the compound slide to an angle for a tapered hole

on the final finishing cut, wind on, say, 0.2mm on the compound slide so that the boring bar will feed to the full depth. Once at the full depth, hold the boring bar there and wind the cross slide towards the centre of the job, making a step face perfectly square to the bore.

Circlip groove

To make an internal circlip groove, sharpen the cutting bit to the width of the groove you want and grind the end flat. Measuring the diameter of the

groove will not be easy, so you must put your trust in the cross-slide dial. To begin, position the boring bar so that the groove will be at the right depth in the bore and lock both the compound slide and the saddle position.

Start the lathe up and wind the cross slide out slowly until you see the tip of the cutting bit just touch the job. Set the cross-slide dial to zero and then wind in the cut carefully until the required groove diameter is reached. Bear in mind that a cross-slide dial usually

reads twice the amount it moves. In other words, it shows the effect on a diameter size.

As an example, take a bore size of 60mm diameter and required groove size of 64mm diameter. Set the cross-slide diameter to zero. When the tool just contacts the 60mm diameter bore, winding the handle till the reading is 4mm will ensure a groove of 64mm in diameter. Remember to wind the tool back out of the groove before retracting it by winding back the saddle. ►



A boring bar at work

**Aluminium
prefers light
oil such as
kerosene.
Brass is almost
indifferent and
machines well
with or without
cutting oil**



Round cutting bits
are the easiest to
make holes for



Tightening a square cutting bit in a DIY boring bar



Broaching a square
hole in a boring bar

Your DIY boring bar can also be used to turn your lathe into a makeshift shaper

Tapered holes

Making holes that are tapered is simply a matter of setting the compound slide around to an angle. All the cutting movement must be done with the compound slide. A steady hand is needed to wind the handle at a slow and constant rate to achieve an even finish. During cutting it is best if the saddle is locked in position.

If you want to make internally and externally tapered parts that fit together, do not move the angular setting of the compound slide until both are done. Set it to make the first part, but do not change it until the second part is completed. This should ensure that the tapers are identical.

Internal keyways

Your DIY boring bar can also be used to turn your lathe into a makeshift shaper. A boring bar with a tool bit held at

90 degrees rather than 45 degrees will be best for this work (see diagram). You will need to grind a tool bit especially for the size of keyway you want, and you will also need to adjust the height of the boring bar so that the middle of the tool bit is on the machine centre.

To keep the chuck — and the job — still during the keyway cutting, select the lowest speed in the gearbox. If you have a lathe with a back gear, you can use that to effectively lock the spindle from rotating.

Move the boring bar into the hole and, using the cross-slide hand wheel, get the tool bit to just touch the inside of the bore. Set the cross-slide dial to zero and retract the boring bar. Setting small cuts each time with the cross slide, move the boring bar in and out of the hole with the saddle wheel until the full depth of the keyway is cut. 📄



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The author and his camper van, ready for the upgrades

IMPROVING YOUR MOTORHOME'S TECHNOLOGY 1

Want to be supremely comfortable and independent on the road? This series provides the know-how for some projects that could make that dream come true

By Enrico Miglino
Photographs: Enrico Miglino

RVs and smaller motorhomes are iconic examples of a fascinating lifestyle, whether you use them for holidays or — like me — for working while moving around to visit new places.

Brand-new vehicles of these types offer the latest technological advances and many of the improvements are easier than you would imagine, but if you ask for some of them from your dealer — if he can provide them — your mobile-home cost increases considerably.

Frequently, these features are part of some kind of personalisation available only on high-range, expensive models: smart sensors, high-quality sound distribution, artificial vision systems, hidden silent alarms, and more.

Making your own improvements

In this new series of articles in *The Shed*, I will introduce projects aimed at improving the comfort of a commercially built camper van or motorhome by adding features normally available only on bigger and more expensive vehicles: easy and intermediate projects to step up the motorhome to the next technology level in pure DIY style, at a very affordable budget.

Every project is developed, tested, and

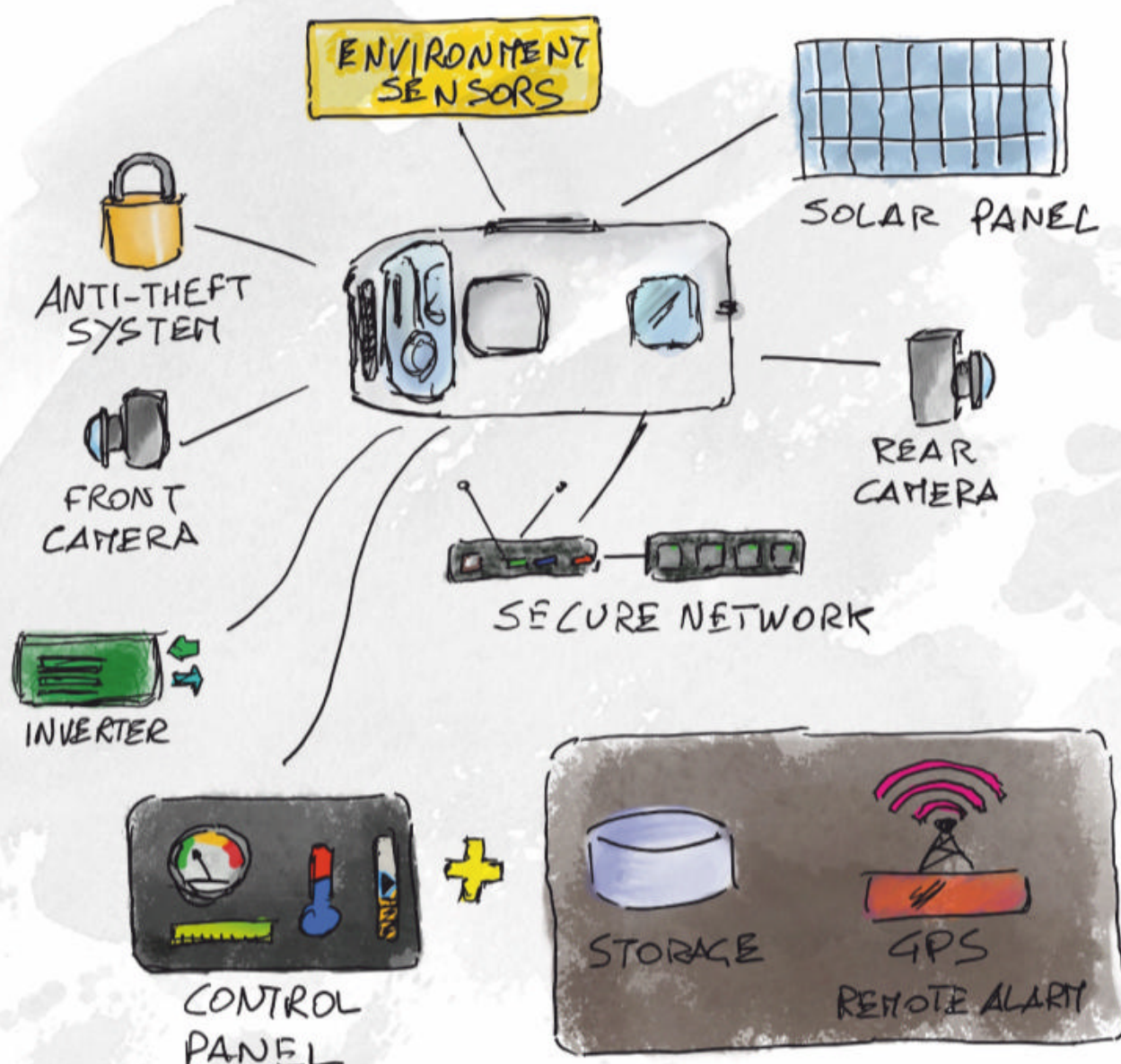
installed for real-world use; these are not just prototypes but implementations of which I am the first user.

Every project will be provided with a cost sheet and a list of the components used, as well as where you can source them. The projects have been designed to be easily adaptable to a wide range of vehicles, camper vans, and motorhomes; in many of them, I have used cheap microcontrollers or embedded Linux devices. The full documentation, schematics, and software are available on the GitHub repository.

I started planning the improvements on a commercial camper van; it is a good-quality vehicle based on the Fiat Ducato chassis — one of the most popular diesel motor bases adopted by the van and motorhome producers worldwide, including Citroën and Mercedes models. I have chosen a camper van equipped with what I consider the essential features for living on the go:

- chemical toilet and shower
- kitchen with sink and gas cooking plates
- air conditioner
- fridge
- working table — the driving cabin seats can rotate, creating two comfortable working places
- fixed bed
- a considerable amount of storage space. ►

I will introduce projects aimed at improving the comfort of a commercially built camper van or motorhome



Main design scheme — the diagram shows the first series of projects I have planned.

The initial scheduled project is the installation of the solar panel and a small 300W inverter.

In the next step, using a couple of Raspberry Pi 4s, I will implement a secure network: there is a device configured as the main router that can access any kind of Wi-Fi network — free, on payment, mobile hotspot, etc. — and act as an internal router and firewall to give a good level of security. A second device acts as an access point, providing the inside of the vehicle with both ethernet-wired access and Wi-Fi LAN. The sensors, security system, and cameras are all connected to the internal network as well as to a seven-inch touchscreen control panel included as a secondary feature of the network router. The architecture includes low-power SSD storage to keep track of logs, images, and other historical information



The 120W monocrystalline solar panel is mounted on top of the roof. There are several kinds of solar panels available: this is a rigid model that comes with an aluminium frame to fix it on the roof. I prefer the rigid model as it is more robust and has higher efficiency than the same kind of flexible one, at a reasonable price.

Considering the size of the living area of the camper is limited, a 12V DC air-conditioner solution can be more than sufficient

Good info is very helpful

If you plan to undertake some of these projects, I suggest trying to get from your dealer all the available installation manuals for the appliances. Having some knowledge of how the living area of the motorhome is wired and how the parts are connected is very useful.

Regardless of the cost, upgrading your vehicle with dedicated projects has the advantage of tailoring the improvements to your personal needs. The final goal is to create a living environment that is as much as possible autonomous, secure, and efficient. Following this general principle, I opted for a camper van that included a series of solutions that, in my opinion, represent one of the best ways to survive autonomously for as long as possible.

Heating system

I avoided gas heating because it is less efficient than other forms and you risk the heater consuming most of the gas available for cooking. My solution was based on a diesel heater using the same fuel as the motor. I experienced very low fuel consumption with this method as well as a short waiting time for hot water.

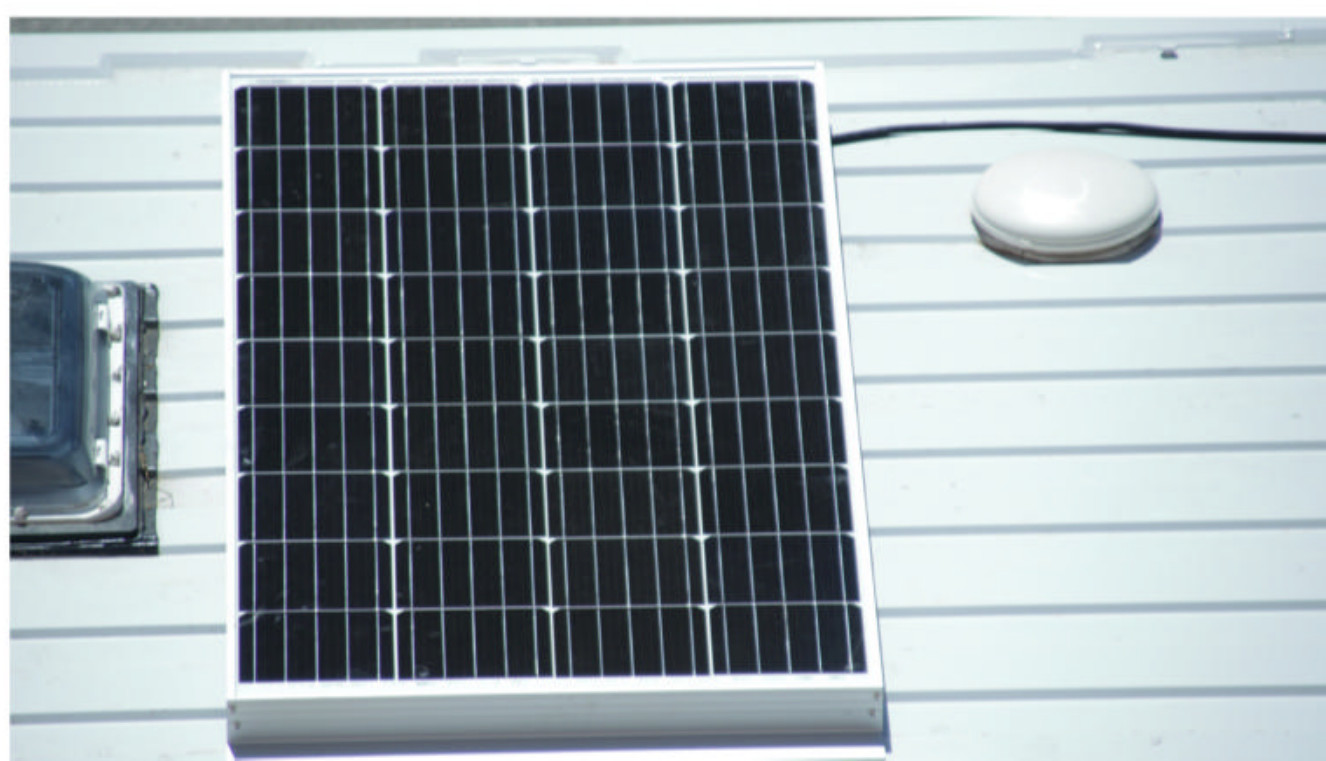
Air conditioner and fridge

For both these appliances I decided on electric; nowadays, there are appliances designed specifically for motorhomes that have very low power consumption. Two kinds of air conditioners are commonly available: those that are very similar to home models and require 220V AC and those that operate with the 12V DC power supplied by the 'leisure battery'.

Solar panel detail. The panel's aluminium frame is glued along two sides with the 3M 540 sealant. I was worried that gluing it only — without screwing it — was a risky choice; when I asked for some advice from my camper-van dealer, his technician explained to me that this sealant is a strong and durable automotive product.

This polyurethane paste needs to stay in place without the vehicle being moved for 24 hours; then it is stable and secure. After driving for 8500km, I can confirm that the panel is still in position.

When fixing the solar panel, take care that the front side — towards the front of the vehicle — is not sitting too proud. The sealant also helps to absorb the vibrations while the absence of holes on the roof avoids the risk of rust, water, and humidity infiltration



It is important to be sure that the solar panel comes with some overcharging protection.

The model I chose did include circuitry, etc. to avoid damage to the charger and the battery. This image shows a detail of the back of the solar panel frame with one of the sides that will be glued on the roof. Fill the frame side rails with a large amount of 3M 540 and place it on the roof, leaving it in situ for 24 hours before moving the vehicle

I have chosen a camper van equipped with what I consider the essential features for living on the go

Due to their higher power, 220V air conditioners can only be used when the van is parked and the power system is connected to the external 220V AC power source — or using a powerful inverter. Considering the size of the living area of the camper is limited, a 12V DC air-conditioner solution can be more than sufficient.

Both the fridge and the air conditioner can operate on both electrical systems: connected to the 220V AC plug while the



Adhesive sealant was used to fix all the solar-panel parts on the roof, as well as other components inside the camper van

vehicle is parked, and plugged into the 12V leisure battery when the van is being driven. For example, I can power the fridge the day before I start on a journey, having it ready when I go, as well as keeping the air conditioner operational while driving to keep the temperature of the environment under control.

Project design

Working on the base camper-van features provided by the dealer, first of all I evaluated the expected power consumption — for example, based on the water evaporation technology, the air conditioner will consume a maximum of 65W while working flat out, while the average power needed for the fridge is about 70W. The internal lighting, all based on LEDs, does not have any relevant impact on the energy drawn.

Knowing these parameters is important before designing the upgrade project. When possible, ask your dealer for the parameters regarding the power of the leisure battery, the suggested power of the solar panel, and the average power

consumption — best- and worst-case scenarios — of the appliances.

There is a measure unit to take into account to avoid confusion: in most cases the power consumption of the appliances, as well as the power that can be provided by the solar panel, is expressed in watts (W) while the power of the leisure battery is expressed in amperes per hour (Ah). Don't worry; just remember the following conversion: $V \times A = W$.

Solar-panel efficiency

Do not presume that the solar panel is sufficient if its output is only the same power as the battery!

The calculation, in this case, involves the battery-charging time. If the solar panel needs 10 hours for a full battery charge, doubling the solar-panel power charge time will be a little more than half of the time. According to the maximum power consumption of the fridge and the air conditioner, the required power is about 135W.

When I had a clear idea of the power set-up of my camper van, I designed the



Top and bottom views of the cable entry gland. This component should be sealed on the roof and protect the cable hole entering the inside of the vehicle. Insert the cable in the hole and screw the collector, then add the 3M 540 adhesive sealant on the bottom rail and fix it in place in correspondence with the roof hole. Again, leave it in place for 24 hours before moving the vehicle





This is the second part of the solar-panel installation: the PWM charge controller. There are many kinds, more or less expensive depending on the complexity, the kind of information, the display type, etc. It has the role of preventing the battery overcharging and regulating the battery charge when the solar panel is active (during daylight).

It is important that the PWM wattage is at least the same as that of the solar panel. In my case, for a 120W solar panel, I have used a 150W PWM charger.

new features and components I planned to add to the system:

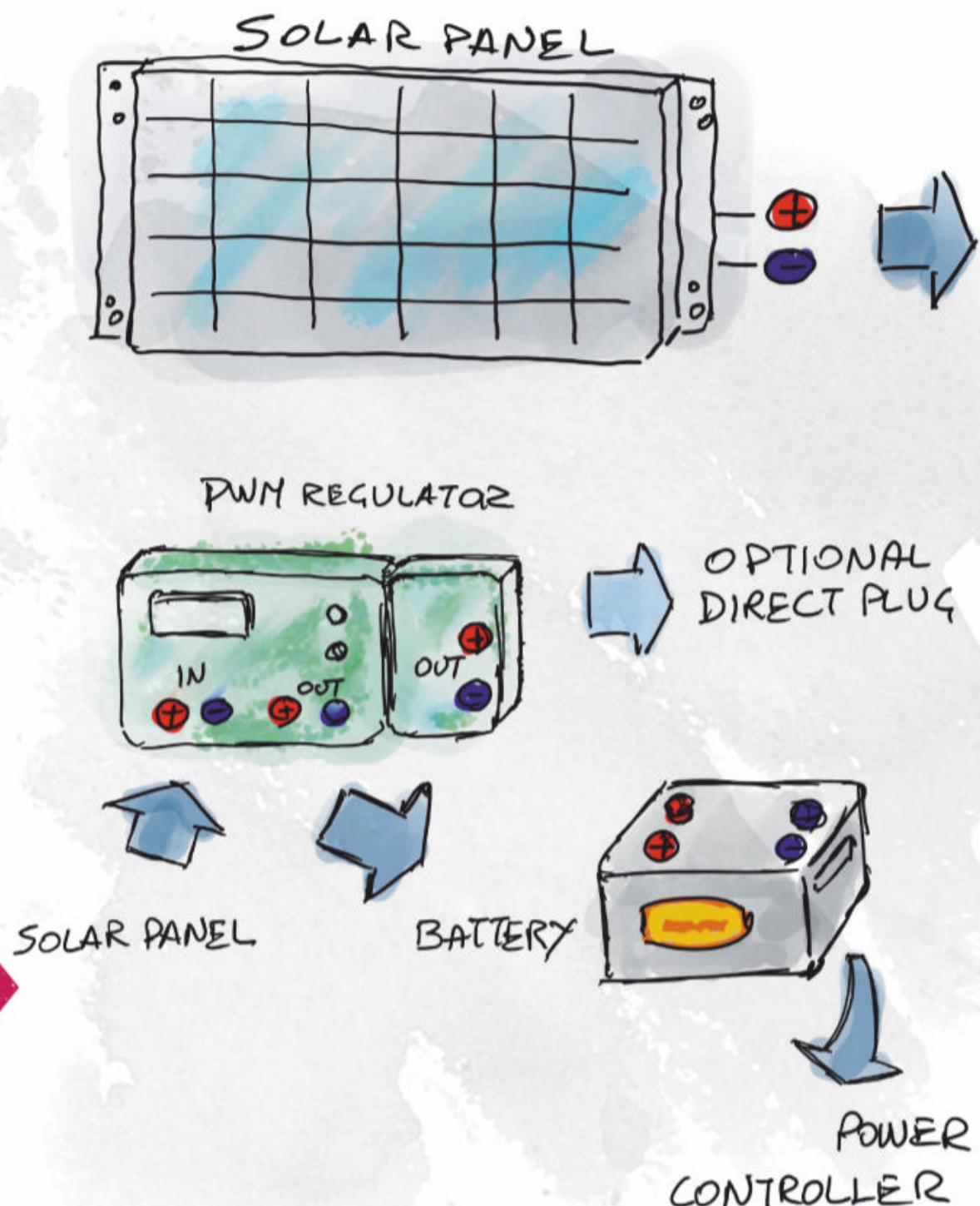
- environment sensors: a series of sensors to keep track of the status of the temperature, humidity, flammable gas detection, water level, etc.
- anti-theft system: an ultra-low-power microcontroller connected to some passive sensors — does not consume energy — able to trigger a silent alarm. Includes GPS tracking, and automates alert-message sending
- front camera: to work as a loop dash cam with some special features, based on artificial vision
- rear camera: to cover several roles, from helping parking to motion detection and more
- secure network: to make available an internal Wi-Fi protected network, as well as a wired LAN
- control panel: an interactive control panel, including low-power SSD mass storage and an independent GPS for vehicle tracking not related to the driver navigation system

- solar panel: one or more solar panels to keep the battery charged and power the automated alarm sensors
- 300W inverter: to provide 220V AC power to some appliances when the camper van is not connected to an external power plug.

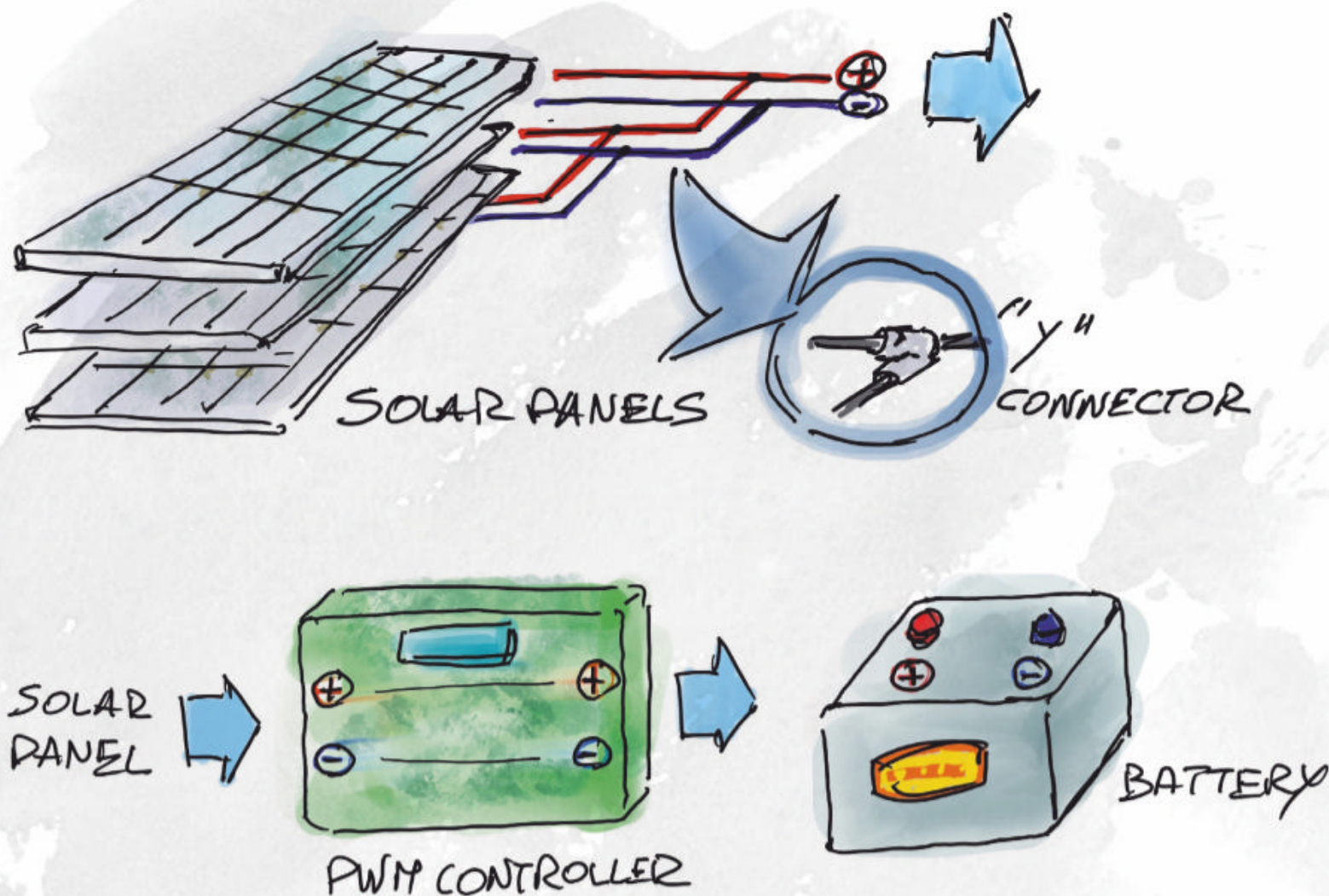
Solar-panel equations

In this issue we focus on the installation and wiring of a solar panel. In my opinion, a solar panel is the first thing to consider to ensure the right amount of electric power will be available in the living area of the vehicle.

Diagram of the connections of the solar panel. The diode-protected solar-panel cable is connected to the In socket of the PWM charge controller while the Out socket is connected to the leisure battery. I suggest choosing a model that also provides an extra power Out that can be directly connected to a device. The advantage of this type of Out DC socket is that it is also active when the central power of the vehicle is off, as it is directly connected to both the battery and the solar panel



In this issue we focus on the installation and wiring of a solar panel



To connect multiple solar panels, it is sufficient to wire the same cables of the two panels together following the colours: red with red (12V) and black with black (ground) using a waterproof Y-connector. Always use the correct-sized PWM charge controller; its power should be the same as, or higher than, the sum of the solar-panel power. For example, to connect two 120W solar panels use a PWM charge controller of at least 250W (120+120W).

The most important electrical component in the autonomous environment of a motorhome is the leisure battery. It is a separate battery providing 12V DC power for the van's lights and appliances.

This battery is normally recharged in two ways: when the vehicle is being driven — the alternator will recharge the leisure battery — and by being plugged into a mains power supply when the vehicle is parked. The most recent leisure batteries are rechargeable Li-ion units that supply around 90Ah or more. When the leisure battery is under charge attached to mains power, the alternate Rov (220V) is available; usually, the power is 1000–2000W. This solution is very efficient but with some important limitations.

If you park the vehicle in a garage for a month or more, the leisure battery tends to discharge; in this case, it needs a periodic recharge to avoid needing to be replaced. In fact, the Li-ion battery technology is efficient if the battery is never left fully discharged. Using the battery without a recharge — for example, to power the fridge — the autonomy is limited to a few days or less.

Also, mains power is not always available to recharge the battery when

After doing tests in several conditions, I can say that the solar panel was the most important improvement I have, until now, undertaken

you are parked, as you may not be in a camping ground. For this reason, to reach the level of energy freedom I wanted, the first improvement I made to the camper van was adding a 120W solar panel.

After doing tests in several conditions, I can say that the solar panel was the most important improvement I have, until now, undertaken.

The inverter

The 'inverter' is a device that can convert a 12V DC flow to 240V AC. In general, it is good practice not to exceed the power of the inverter required by the leisure battery.

If the inverter connected to the battery is oversized, the risk is that it will consume the battery charge too fast and eventually do serious damage to it. Do not forget that the inverter

is not the only device consuming the battery but is additional to the other appliances. Recalling the equivalence formula mentioned earlier, where $V \times A = W$, obviously the opposite is also valid: $A = W/V$.

So, in line with the characteristics of my camper van's electric circuit, I opted for a 300W inverter. This means that using it fully loaded consumes 25A of the battery — a quarter of the total power; more than acceptable.

Consumption and power efficiency

There are still two aspects we should take care of.

The first is the real consumption of the devices. The fridge consumes 70W but not continuously. Only when the fridge is working at full power — max. cooling ►

value — will it actually consume this amount of power. The same also goes for all the other devices. This means that, with a well-calibrated power distribution, it is extremely difficult to risk overcharging the battery.

Another important aspect that should be remembered is efficiency. The values mentioned on the data sheet of the devices — in particular of the inverter — are just nominal values. In reality, we should never expect it to reach 100 per cent of its efficiency. A good inverter can reach between 60 and 80 per cent of the efficiency, compared with the producer's declared nominal values. This means that we should not really expect more than 270W from a 300W inverter.

Costs

Solar panel — \$1000, including:

- N.1 120W monocrystalline rigid

solar panel fixed on top of the camper-van roof: similar product for reference only: Renogy 100W 12V Off Grid Solar Premium Kit with Monocrystalline Solar Panel and 20A MPPT Rover Controller (from amazon.com)

- N.1 adhesive sealant polyurethane tube, 3M 540
- N.1 cable entry gland, sealable cable cover for the solar panel wiring through the roof.

By using the 3M 540 adhesive and sealant, you avoid making holes in your vehicle's roof that might lead to leaks at a later date. I have verified that this product is widely used in industrial automotive applications and, at the time of writing, the camper van's solar panel is stable in its position after 8500km.

300W inverter — \$80: I used a 300W power inverter DC 12V to 240V AC, again sourced from amazon.com. 📄



To connect the solar panel to the battery, first wire the red (12V) and black (ground) cable terminals to the battery, taking care of the correct polarity. Fix the cable terminals strongly to the battery terminals — I used a nut — then reconnect them to the battery poles: 12V before and ground after



This means that, with a well-calibrated power distribution, it is extremely difficult to risk overcharging the battery

After wiring the cable to the battery, connect it to the battery socket of the PWM controller before the solar panel terminals. At this point, you should expect to see the PWM identifying the power connected. Lastly, connect the solar-panel terminals to the PWM socket and your system is ready to go



Connecting the 300W inverter is easy — just fix it near a 12V DC plug. When the leisure-battery power circuit is on, you can power the inverter to prove the 220V AC output



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WARMING TO OUR WORK

It's in our DNA — good friends eating, drinking, and chewing the fat around an outdoor fire

By Murray Grimwood

Photographs: Murray Grimwood

Nice when you can share your favourite place with your favourite partner

Was I ever hoisted with my own petard! Those seats (see *The Shed* Issue No. 97) set my partner thinking about what they surrounded — which was a brazier made from an old washing-machine drum. It had burned out, and the replacement idea, an old log burner, hadn't really worked. So, with winter approaching, we went together to Rietveld's, the second-hand machinery place I've written about before in *The Shed*, looking for something we could turn into a brazier. Nice when you can share your favourite place with your favourite partner.

The fun begins

All we were looking for was a simple, robust fire tub, but what we found opened up a ton of fun. We think it was a heat exchanger — pattern-drilled holes through some circular plates, a gas-axed body end with the same hole pattern, and a flanged end cap, lying in a bin over the back of beyond. I returned with a trailer the next day and took away one drilled plate, one end cap, and the cut-off body piece. I should have been brave enough to take another plate, but at the time I couldn't for the life of me see a use for it.



Obviously, I was going to have to space these items apart vertically, and initially I thought of threaded rods. Those turned out to be unavailable second-hand and fairly expensive new, so I hatched a plan around some very long, nicely galvanised, appropriately second-hand bolts.

I wasn't going to ruin perfectly good galvanising by welding, so cross holes and 6mm split pins did the job when I needed to trap something against a bolt head. Paired nuts trapping the middle plate gave the thing enough rigidity. Assembling it on its side and tipping it up went so fast that I forgot to get photos!

Test firing

Then, although it wasn't good Norwegian wood, we lit a fire — and quickly found the Achilles heel. I'd set the brazier up on three bricks for the trial, expecting the ash to be largely contained in the bowl, but the burn was so good, thanks to the myriad holes acting as a grate, that

the ash fell through them. It was going to need an ash pan, and that meant the bowl had to be better carried. Back went Muggins and got another drilled circular plate and three shorter bolts — just doing what I should have done initially, had I had half a brain. A quick circle of galvanised sheet, a bit of bending, and we had a perfect ash pan carried on a perfect base — plus levelling adjustment to boot!

Steampunk makes an appearance

Early on, I had decided that the thing looked sufficiently steampunkish to keep pushing the theme. It looked as if it needed eyes, so a couple of motorcycle indicators got attached — which led to a bath-claw-foot nose. Then it seemed to need arms; some gig/drill footsteps I'd had hanging around for decades looked perfect for the job. I thought they might carry glasses, mugs, or some such — in fact, they mostly carry tea-light candles. ►

The burn was so good, thanks to the myriad holes acting as a grate





Gig steps being bent in the blacksmith's vice — "I think of them every time I use it"

Auction fever

The gig steps had to be tweaked in my blacksmith's vice, which I never use without remembering its history: back when I supervised a work skill development team. The team didn't lack work skills — that was the official reason we had them — so we gave them others.

One day, I took my lot to a farm auction — of the kind now displaced by online forums. Several paddocks, several simultaneous auctions, much fun prioritising while staying on the right side of divorce — you know how it is. I explained to them that the blacksmith's vice, halfway along row three, was worth \$25 to me and that I'd pull out of the bidding there; that presetting a limit was how to avoid getting carried away.

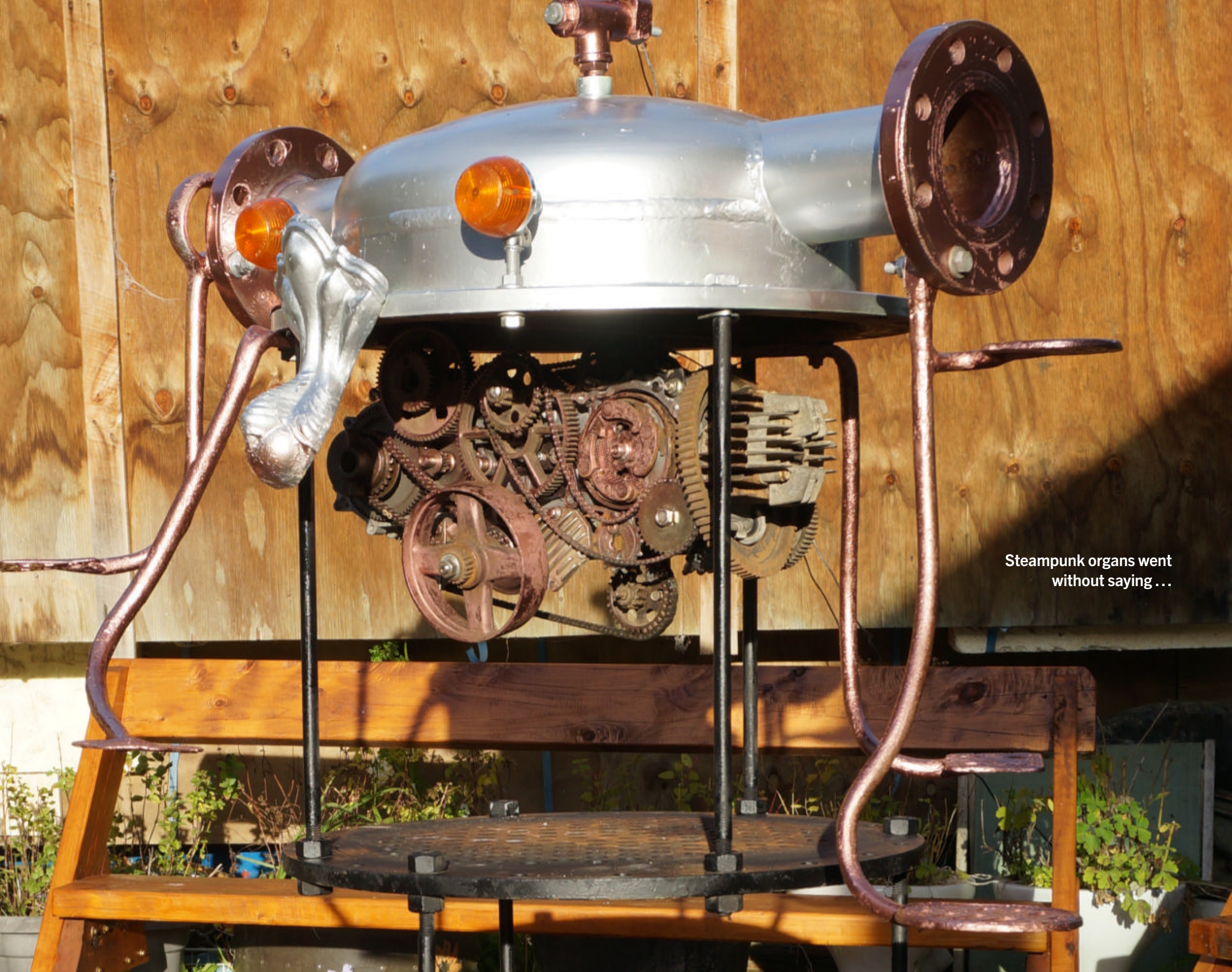
The auctioneer approached; the bidding began. I can't remember if I hit \$25, or if I hit \$24 and someone else hit \$25. Whatever, I made a point of physically walking away from the little crowd. Lesson given, I thought. Then spirited bidding broke out behind me — up and up and up! It topped out at \$48; ridiculous for one of those, then. I turned and saw one of the team racing after me with a big grin: "I got it for you, boss!" Hmm, maybe I'm not so good in the teaching department. I think I put in \$30 and they put in the rest; thus, I treasure it, and I think of them every time I use it.

Hollow arms

Anyway, with arms attached, the dalek seemed a little hollow, as if it needed



Pizzas and hot apple crumble



Steampunk organs went without saying ...

organs — steampunk organs, of course, went without saying. Well, I've always got the odd cog lying around, the odd bit of chain, the odd dead motor. The beauty of the genre is that it doesn't have to 'work'.

I'd been paralleling this build with submitting to / commenting on the Climate Change Commission's report so, in the spirit of carbon reduction, I removed the spark plug and carby — maybe over time it will sequester carbon too, who knows? A bit of heat-tolerant paint; some LEDs draped over; and, well, whatever the statement was, this thing was making it.

Party at Murray's

Time to invite some people round for steampunk pizza, using the pizza oven, which has a similar backstory to the vice. Once upon a time, we'd taken some apartment-dwelling Wwoofers to visit ►



LEDs changing colour





They laid the bricks, they poured the concrete, they moulded the sand, they danced in the mud

friends who'd built a pizza oven. The Wwoofers wanted to build one, and to see the whole project through before they left. They stayed six weeks. They laid the bricks, they poured the concrete, they moulded the sand, they danced in the mud, they layered it on. It is an epoch we won't forget; the result wasn't concours but it sure had patina and a backstory. Later, rain started to erode the mud

so I gave the oven a metal witch's hat, which was good but not good enough. Nowadays, it has a real corry-iron roof to protect it, and sports some fancy artwork thanks to our lockdown guests. My better half had long argued that the design didn't need a flue and ... well, you can't have a debate without a negative team, can you? It now has a flue, the cowl of which was once some trailer mudguards.

The magic a fire brings

We use a stainless-steel spade as a spatula, there is water to hand, there are places for oven mitts and firewood; in short, you know when a thing is 'right' — it needs no further development. The rules, for both pizza ovens and pit/brazier fires, say you need water close by and nothing flammable within 3m, so I bought some Zinalume sheets to clad our gypsy wagon, which was too close. The biggest threat is from windblown still-hot ash, easily contained in a pizza oven — ours has a closable door and spark-arresting mesh in the flue — but requiring more care under an open fire. We've also learnt that un-sparky wood like eucalyptus is better than sparky stuff like macrocarpa.

It was a good night: starry, frost-promising, still; hot pizzas on the production line, apple crumble on the warming plate; LEDs changing colour on the dalek. Good friends, good conversation, bad puns — sitting around fires is deep in our DNA. Here's to many more! 🍷



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The finished bender at work

THE MUST-HAVE TOOL FOR MANY A PROJECT

Nothing beats the satisfaction of making it yourself — even if it does end up costing as much as a bought one!

*By Coen Smit
Photographs: Coen Smit*



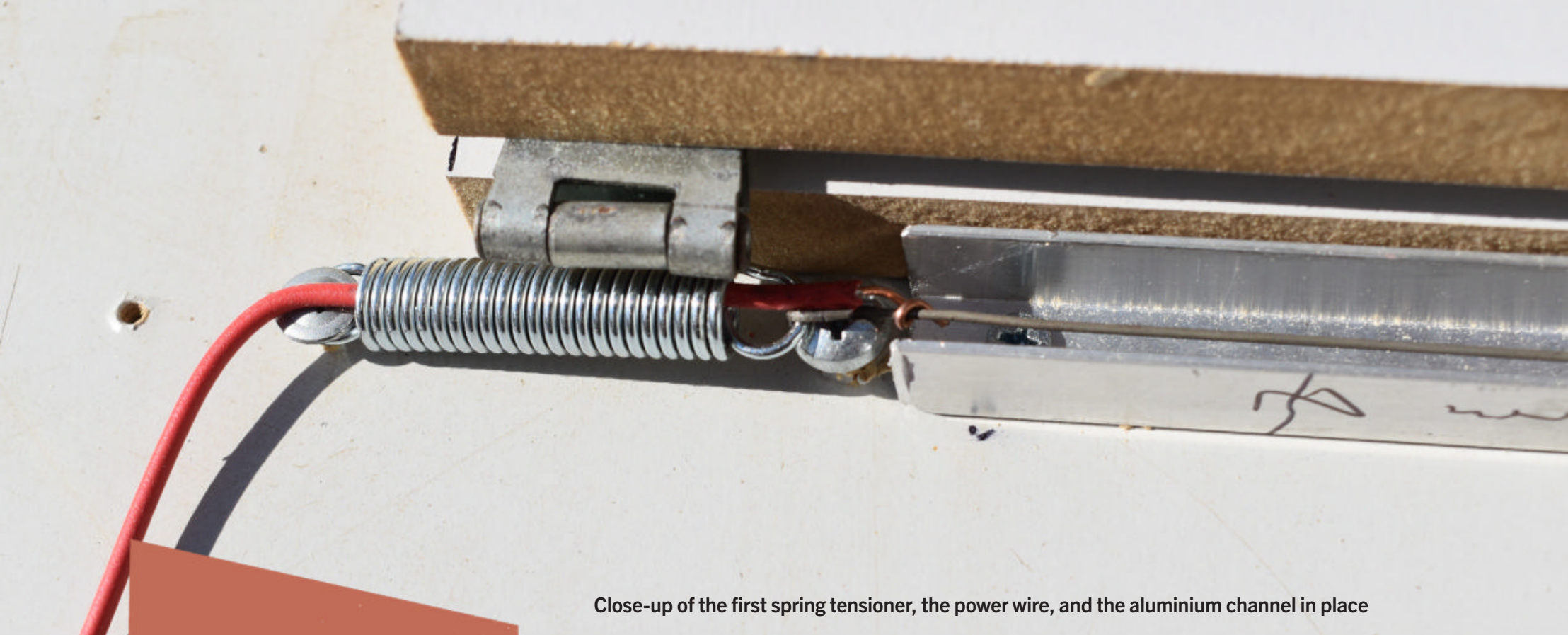
Every now and then I embark on a project that seems straightforward at the outset but I soon find myself revising, modifying, and adapting various aspects of it before it is completed. Making an acrylic bender proved to be a prime example. It was also a salutary lesson to take on projects featured on YouTube with a grain of salt.

Acrylic, or Perspex, is one of those materials that lends itself to a host of small projects. However, it is a material

that can be finicky to work with, difficult to glue, reluctant to bend, and prone to sudden and unexpected failure if pressure is applied to it incorrectly. On the other hand, it is non conductive, can be transparent or coloured, and can be bent into all sorts of shapes using an acrylic bender. So if you do any projects that incorporate Perspex, such as toy cars, aquariums, business-card holders, or bird feeders, an acrylic bender is a must-have tool. ►



If you
do any
projects that
incorporate
Perspex ...
an acrylic
bender is a
must-have
tool



Close-up of the first spring tensioner, the power wire, and the aluminium channel in place

A basic bender consists of a linear heating element over which a piece of acrylic can be positioned until it softens sufficiently to bend

I'll make my own

My online searches revealed that a half-decent unit would cost at least A\$300 and they quickly go up from there, depending on the size of the unit. The A\$300 bender came complete with water-cooling channels to keep the acrylic cool either side of the bender and a dedicated water pump, etc., all of which seemed a bit over the top for my needs.

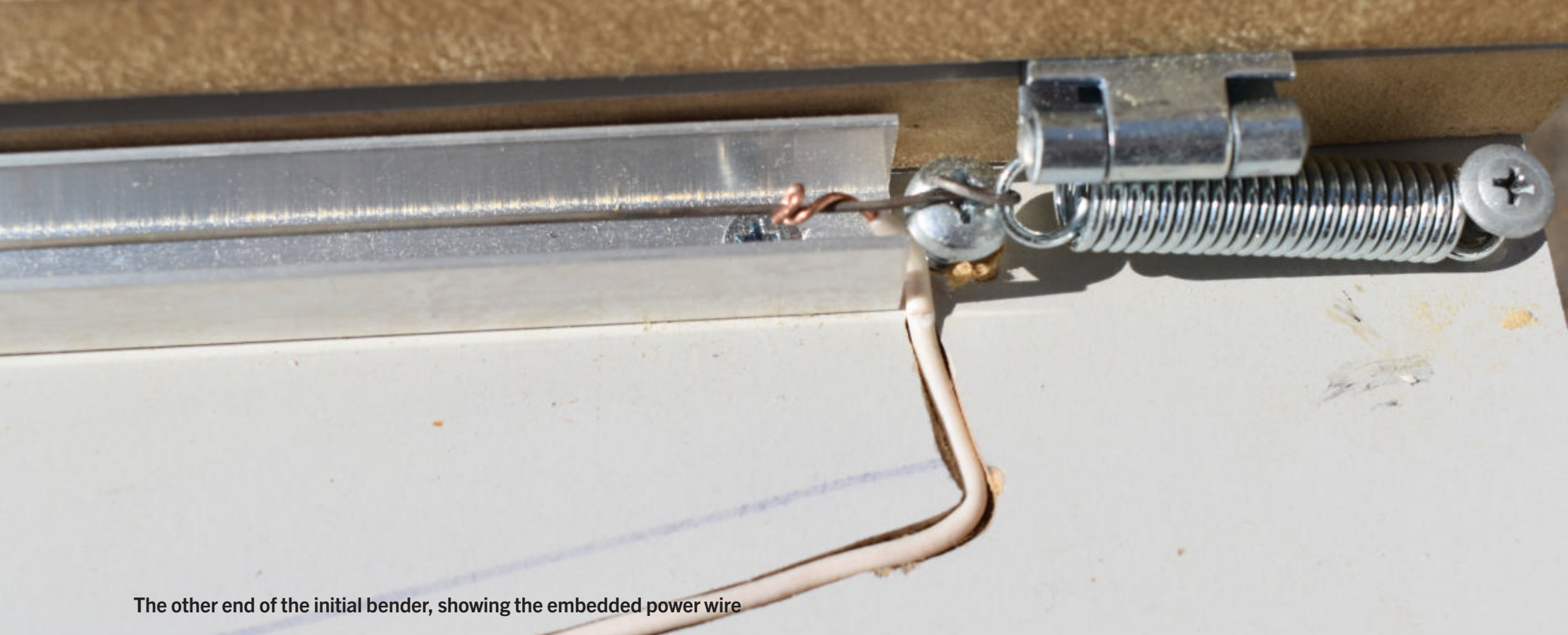
Naturally, I couldn't resist looking at YouTube clips earmarked by Google to explain how to make your own simpler version. These showed that it is quite straightforward, especially if you're only after a hobby unit and don't plan to go into business with it.

A basic bender consists of a linear heating element over which a piece of acrylic can be positioned until it softens sufficiently to bend. Once bent to the desired angle, the acrylic is removed from the bender and allowed to cool until it holds the correct angle.

The heating element is a length of nichrome wire heated by — in my case — a 13.8/40A DC-regulated power supply. These were the only two high-cost items in the build, adding up to just under A\$200. The power supply will be useful for other projects as well, so its acquisition cost doesn't have to be totally written off against the acrylic bender.



The initial version of the completed bender ready for work



The other end of the initial bender, showing the embedded power wire

Can't avoid that MDF

I selected a piece of laminated desktop as the base for the bender. Let me remind readers who have perused my other articles that I'm not a fan of MDF, Customwood, and the like, and normally try to avoid it whenever I can. However, in this instance I needed a wide, level surface that would not warp, twist, or otherwise show any individuality of character. Laminated Customwood provides that, if it avoids moisture.

On top of the base I fixed two surfaces separated by a 10mm aluminium channel section in which the nichrome wire is located. To maintain tension on the

nichrome wire as it heats and expands, a spring is clipped to one anchor post of the wire. This ensures that the wire will not sag in the aluminium channel and short out. The foldable section of the bender is fixed with a couple of hinges to the fixed platform, straddling the aluminium channel.

If, like me, you purchase your nichrome wire in a roll, it will need to

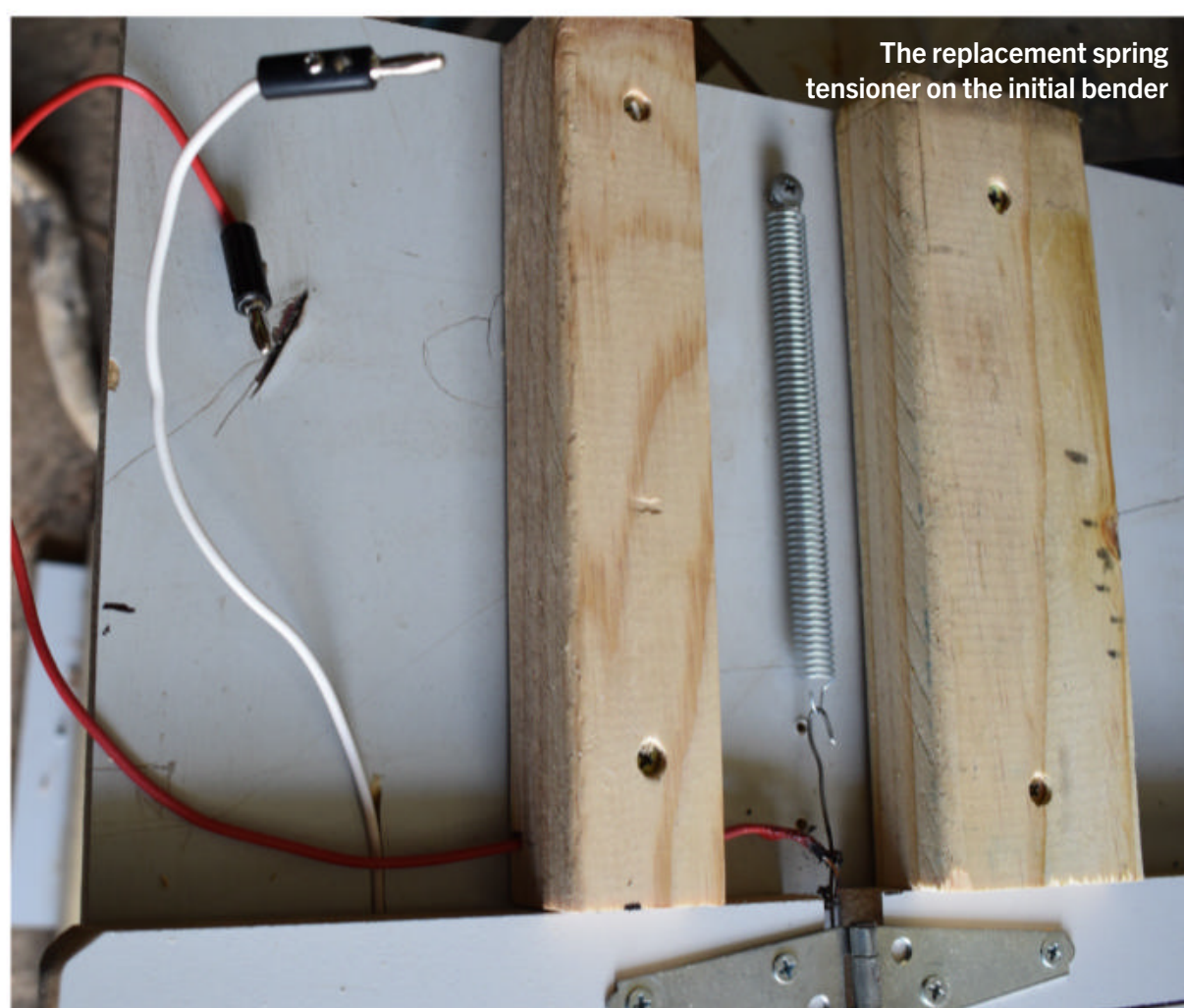
Personally I wouldn't have the peace of mind that comes with a 12V system

be straightened carefully before it is used in the bender. To do this I cut off the approximate length I needed and suspended it between two uprights. At one end I ran a piece of string over a pulley with a kilo weight attached. Using the power pack, I then heated the wire. As it heated, the red-hot, softened wire stretched straight, because, as the old saying goes, the shortest distance between two points is a straight line.

During the heating process I discovered that the power supply quickly heated a length of about 450mm, whereas a length of 1000mm would not get red-hot and was beyond its capabilities. Therefore, it's probably more efficient to keep the heating length to around 400mm to 500mm.

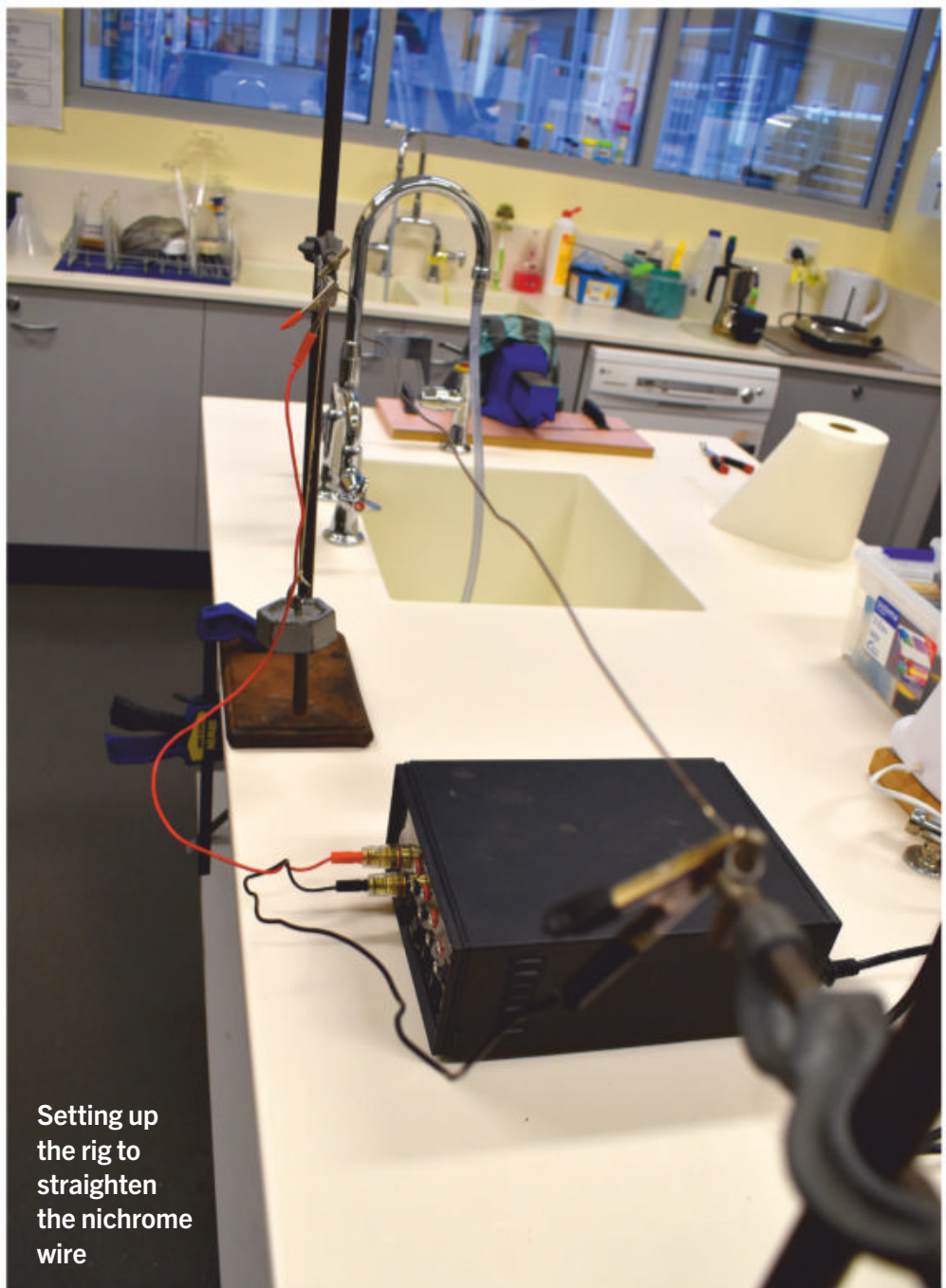
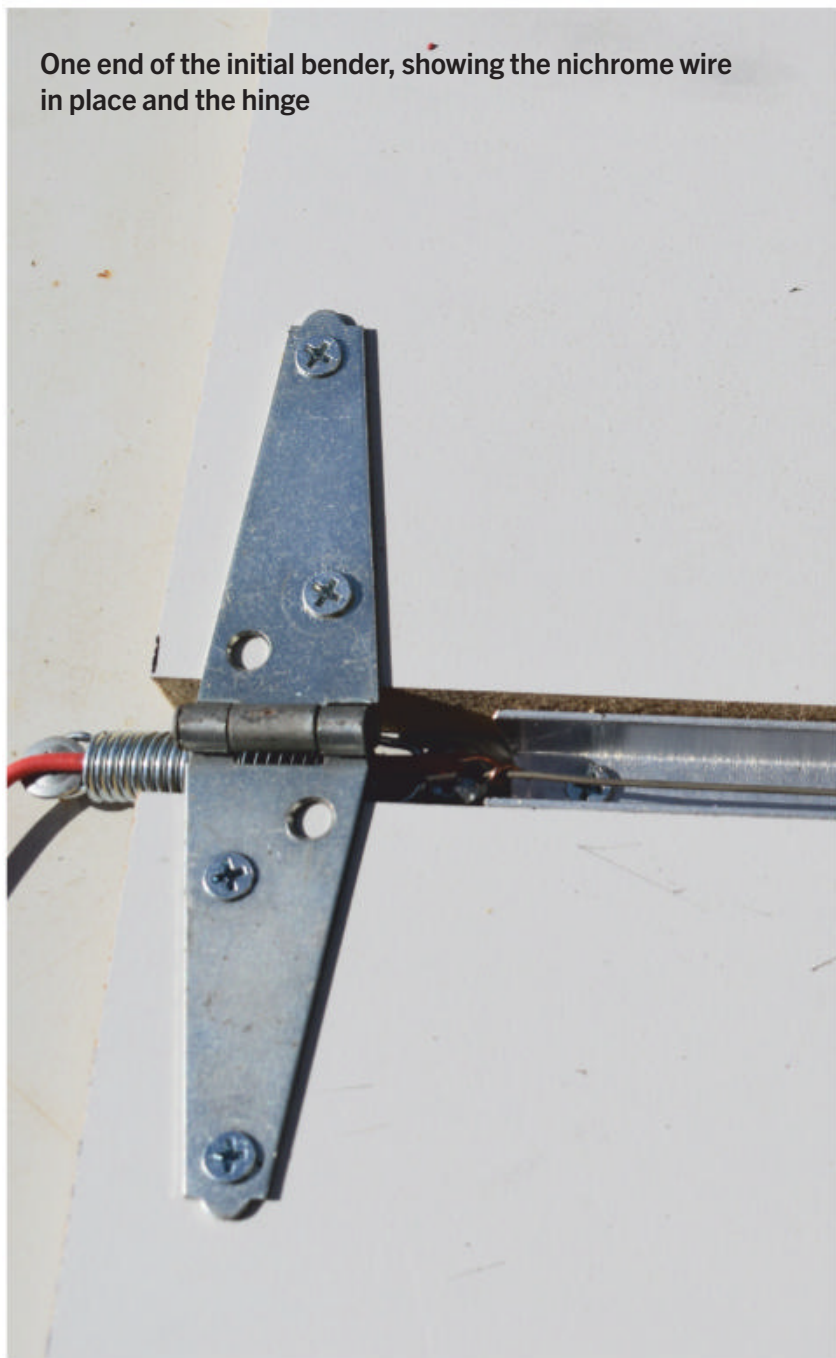
The 12V option is much safer

When I looked at building a bender some years ago, I did entertain using an electric-stove heating coil and straightening that out. However, that means 240V, which brings with it other considerations such as protecting the user from the higher voltage. Obviously, it is possible to build something suitable but personally I wouldn't have the peace of mind that comes with a 12V system, and straightening the heating coil neatly would be quite difficult. ►

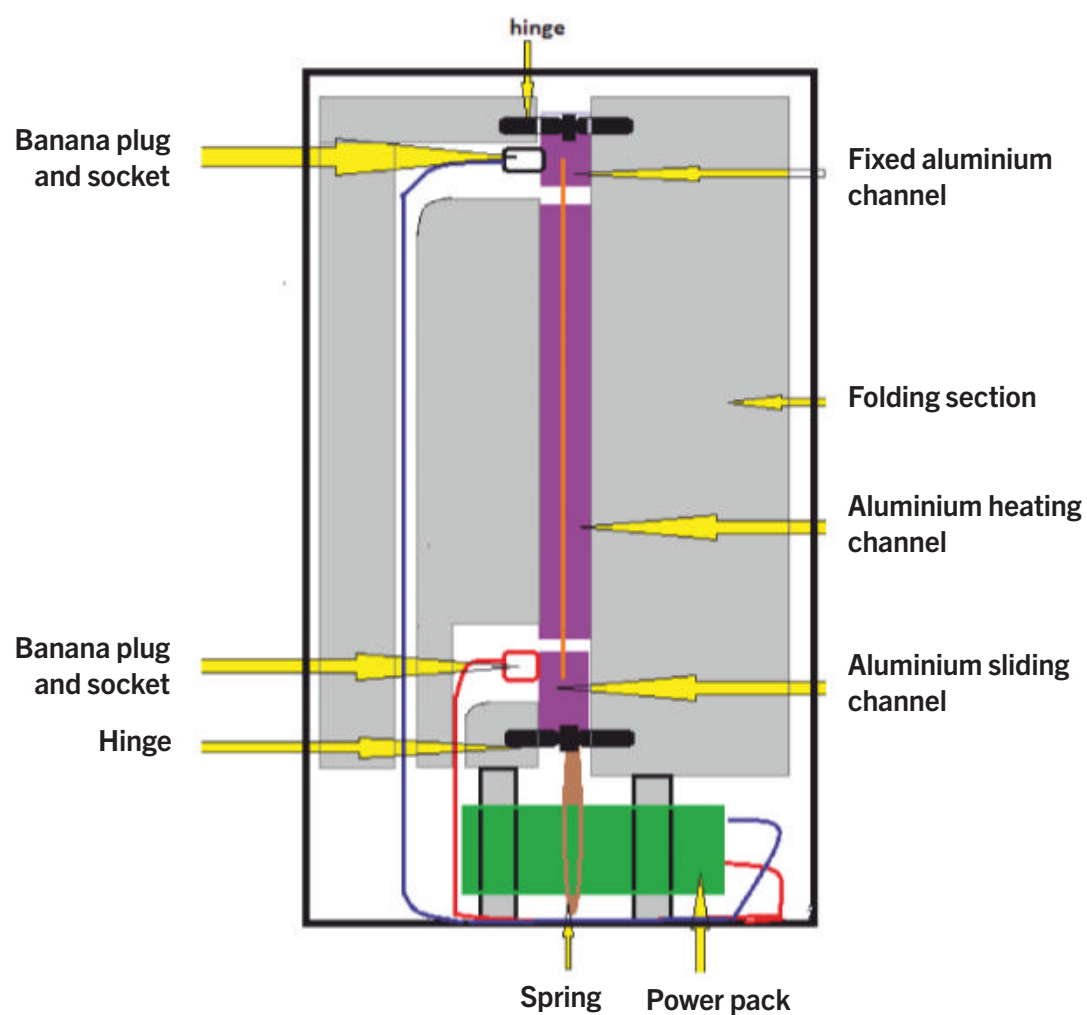


The replacement spring tensioner on the initial bender





Schematic of the final bender



To do its job properly, the nichrome wire must be suspended centrally in the aluminium channel, so I initially fixed a slotted screw at either end in which the wire sits. A second screw at either end acted as the anchor point for the spring and the wire.

When straightening the nichrome wire, I noticed that the 3mm insulated copper wire and alligator clamps struggled to cope with the amperage and heated up very quickly. So I opted to use household lighting cable for the bender instead, hoping it would handle the amperage better. As you can see in some of the accompanying photos, the 240V wire also struggled to cope with the power; hence my decision to use electric-stove cable in the final version of the bender.

To avoid the cable getting in the way when I am bending, I used a router to make a small channel in the baseboard. It holds the far cable — from the power pack — and is another reason to avoid the 3mm automotive cable that could otherwise melt its insulation and could get hot enough to set fire to the Customwood. ►

My first bender

The first iteration of the bender was built quickly and presented no challenging construction tasks. As expected, it worked! However, it wasn't all plain sailing when I started using it. A couple of problems quickly became apparent.

The short strong spring I started with wouldn't take up the slack properly as the wire expanded, so I replaced it with a single softer and longer spring with more stretch in it. That fixed the first problem. Then, more disconcertingly, the nichrome wire snapped after a couple of on-off cycles. I replaced it with a spare, only for the same thing to happen again. I also tried using the power source's 16A port rather than the 40A one, but it also snapped the wire.

The nichrome wire I used was 1.22mm

in diameter — the heaviest gauge I could buy. I decided to double it by twisting two strands together, giving an effective diameter of about 4.6mm. To do this I had to build a simple little T-shaped tool that is fitted to an electric drill and neatly twists the wires. Of course, the twisted wire led to more problems. The cables carrying the current from the power pack to the wire also needed to be upgraded, as the wire placed an even greater load on them, having doubled its mass.

The 30A cable does the trick

A couple of metres of electric-stove cable was the best solution my local electrical store could come up with. It's rated at 30A, has a silicone outer sheath, and costs A\$16 a metre. It's not cheap, and the home-made bender is starting to

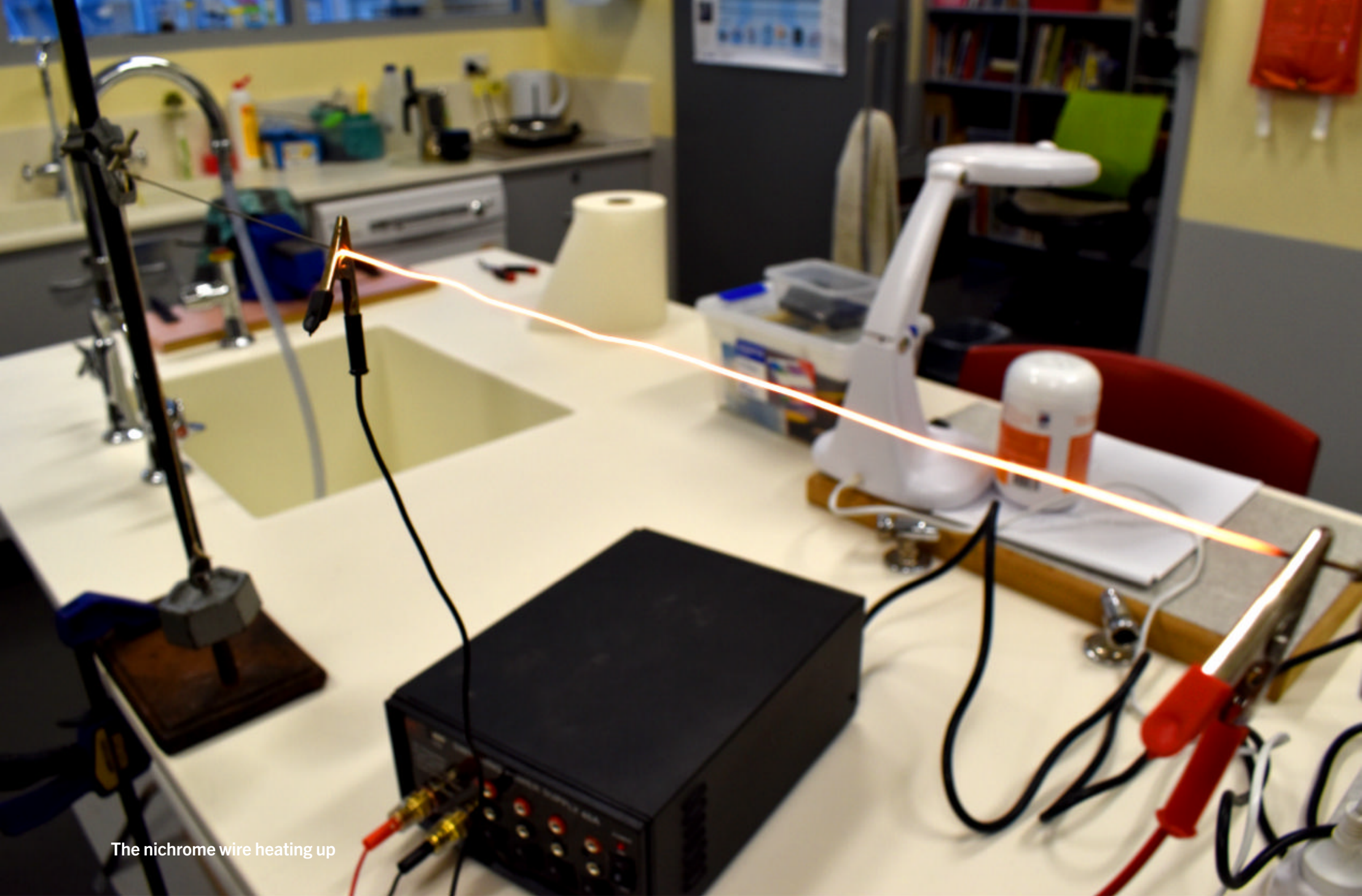


The little wire twister

However, I consoled myself that I still had the fun of making it, as well as the satisfaction of solving the various problems as they arose

The fixed end of the revised bender, showing the double-twist nichrome wire





The nichrome wire heating up

come close in price to the bought version. However, I consoled myself that I still had the fun of making it, as well as the satisfaction of solving the various problems as they arose.

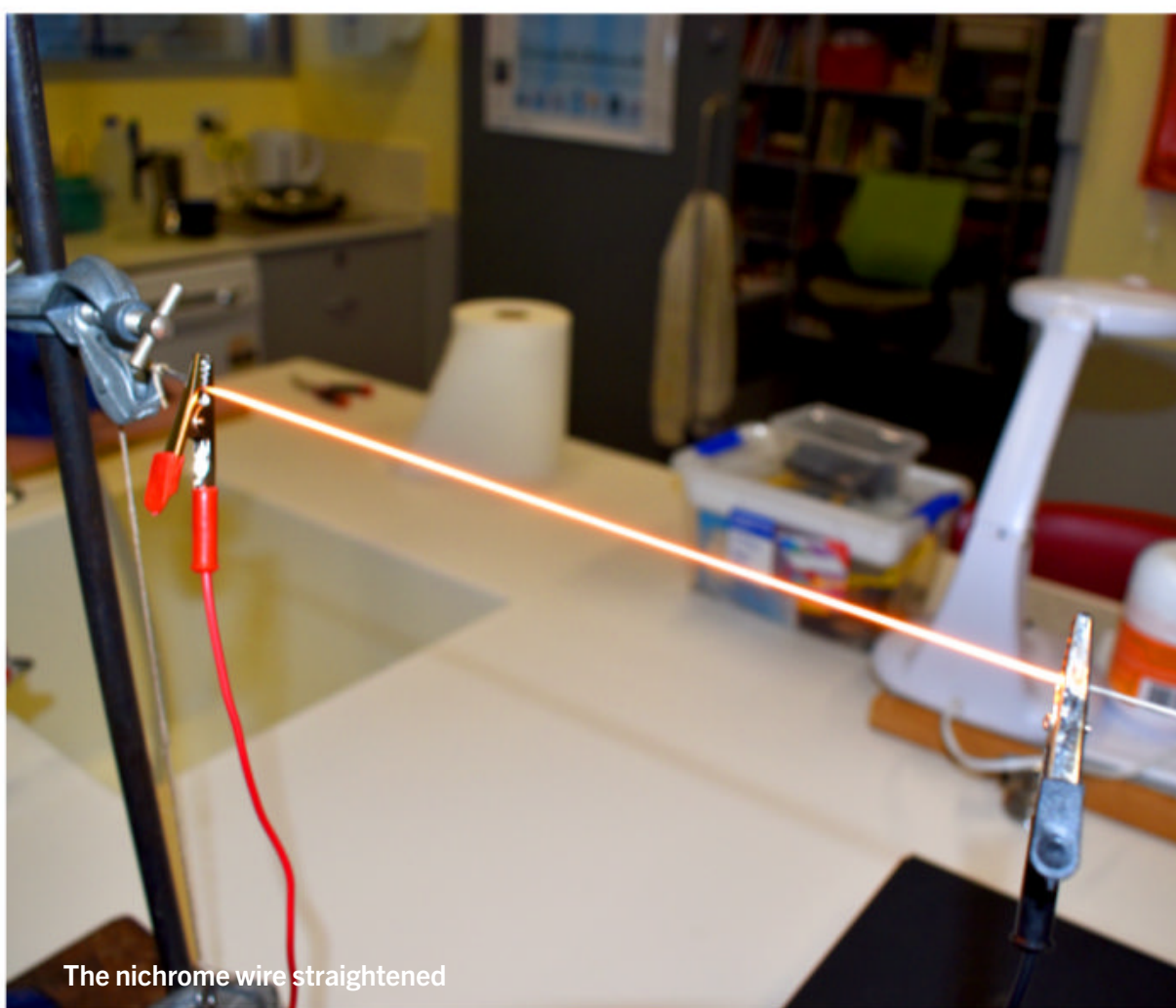
As you can see from the before and after photos, the heavier cable has necessitated a completely different approach to keep the whole unit tidy as well as to prevent the cables getting in the way of the acrylic as it is bent.

I had to use banana plugs at both ends of the cable as well as fixing banana sockets at either end of the nichrome wire. The combined weight of these bits threatened to drag the wire down onto the base of the heating channel, so I cut small sections of the excess aluminium U-channel, laid them on their side, and fixed the wire to the base of the banana sockets. One of the channel pieces is fixed in place while the other is attached to the spring and can slide back and forth as the wire heats and cools. I then cut and shut the fixed side of the bender platform to accommodate each of the cables and route them back to the power supply. (See photo of the final version of the bender.)

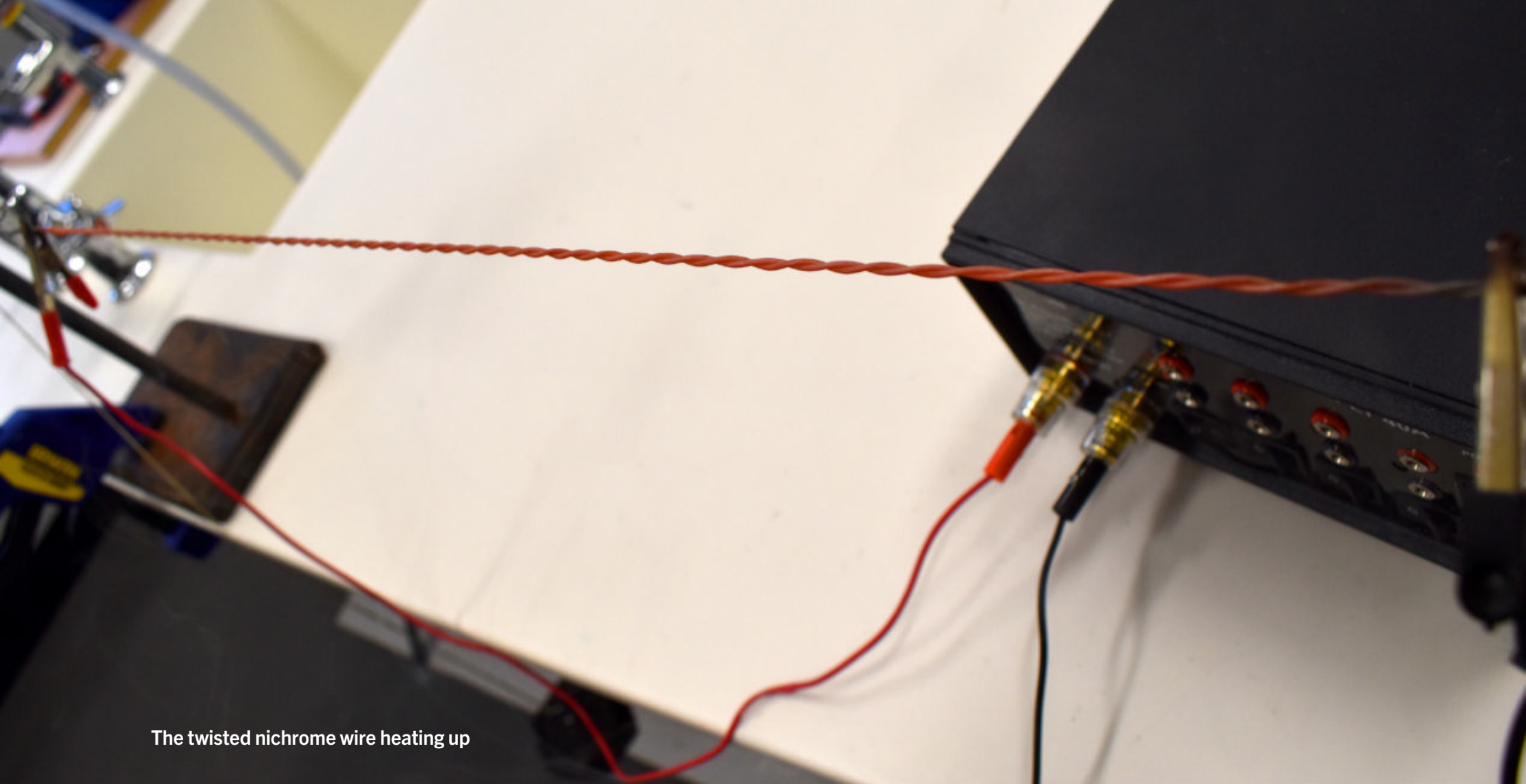
Securing the Perspex

Using the bender, I found that the hinged side of the table really isn't as useful as I thought it would be. Raising the platform slightly to see if the Perspex was soft enough to start bending causes it to slide

around and thereby lose the precise position where the bend is meant to occur. The only way to overcome this is to clamp the Perspex to the platform or be entirely sure that it is soft enough to bend — something that is difficult to judge by eye alone. ►



The nichrome wire straightened



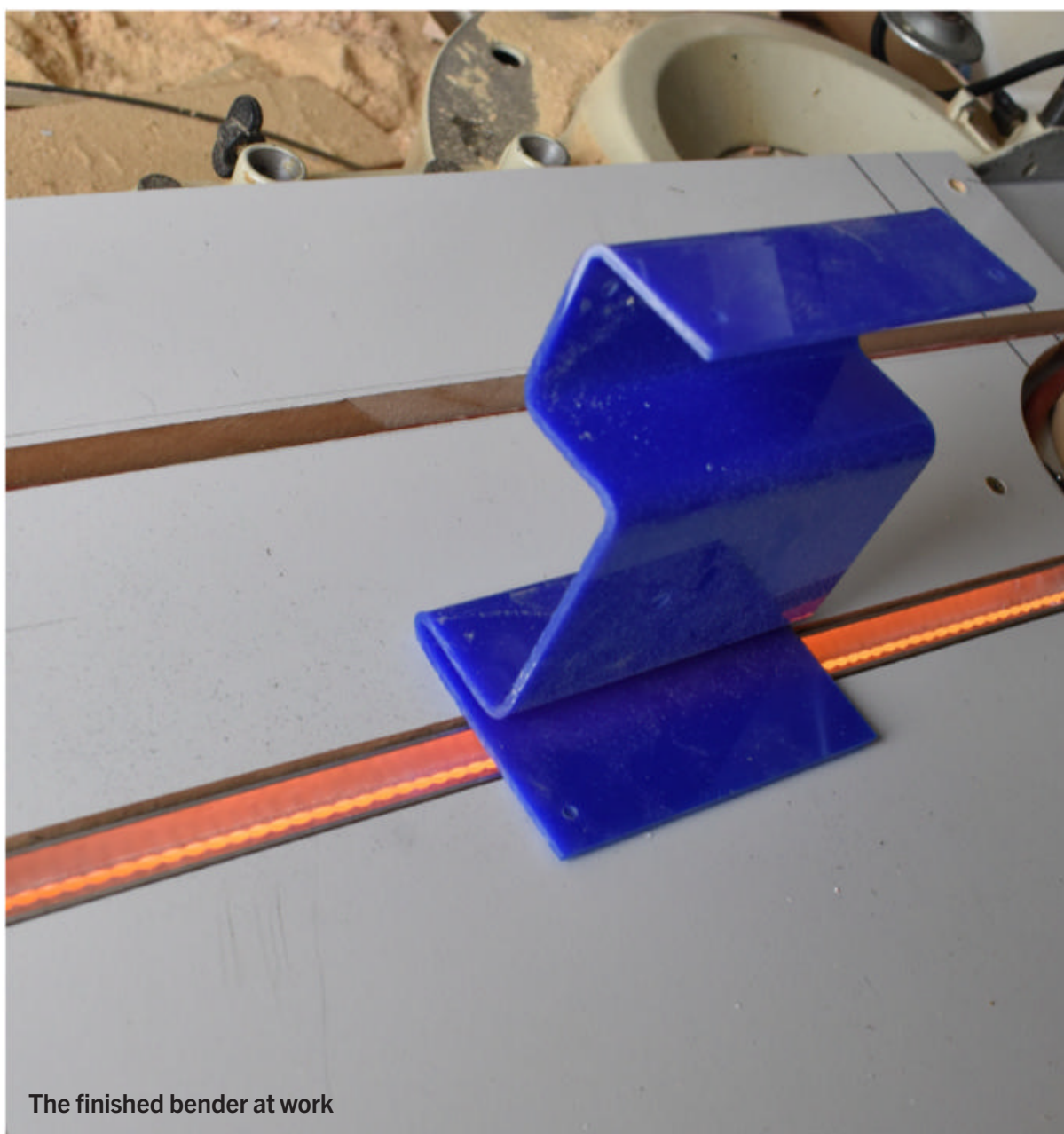
The twisted nichrome wire heating up

The bender turned out to be a more interesting project than I initially thought it would be

I find it easier to simply lay the Perspex on the heating strip and, holding both ends of the sample in place, gently try to bend it without using the hinged platform. If it bends easily, I remove it from the heating strip and hold it in place at the desired angle for a minute or two to let it cool.

If you decide to build your own bender, consider whether it's worth the extra hassle of hinging one side of the platform. If you clamp the Perspex, remember not to clamp both sides of the bend, as the Perspex will need to be able to stretch to cater for the curve. If you need to replicate a particular angle precisely, I suggest you construct a simple wooden jig that the softened Perspex can be wrapped around or fitted into. It will give you more accurate bends than a hinged platform.

In summary, the bender turned out to be a more interesting project than I initially thought it would be because of the various problems that had to be solved. I now have another useful tool to facilitate other projects in the future. 📖



The finished bender at work

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THE WORKINGMAN'S BEER

An always-unique seasonal ale created to quench the summer thirst of hot, tired farm workers

*By Bryan Livingston
Photographs: Robyn Livingston*



Often there was an allocation of beer to each worker as part of his or her wage

Ingredients

Barley, of course, forms the base for a saison but there could have been some malted and some un-malted product in the recipe. There were often no malting plants near the farms so most farms had to malt their own barley. It's fair to say there would have been a wide variation in this process between farms.

'Malting' is the process of allowing the raw grain to start germinating. That creates the enzymes we need for beer brewing. After a couple of days, the barley is dried to stop the germination process and the resulting product is malted barley.

Other fermentable ingredients that were added to the saison depended on what was available at the farm. Wheat or spelt (an heirloom wheat), oats (adding body and mouthfeel), and rye (contributing a spicy dryness to the beer) were all common ingredients, but the volume and mix differed based on what the farm had at the time of brewing. There was trading between farms but it's fair to say no two brews were the same!

Hops and spices

Before hops became common, spices were added to the brewing process. Ginger, coriander, and thyme were popular additions. As hops became more popular, the spices were added with the hops and later spices were replaced completely by hops. The idea was to make a thirst-quenching drink. The variety of hops would have been unique to the region, so Tettnanger, Hallertau, and even Saaz are good varieties for a saison. Hops add a herbaceous and spicy character to the beer. Citrus peel was also added; the balance of citrus and spice is a good marriage in both cooking and brewing.

The saison beer style is one of the widest styles that I have enjoyed brewing. These beers vary in colour, alcohol content, ingredients, and even crossover between an ale and a sour beer. To understand how we got to this, it's important to look back to where saison beer originated.

The 'saison' is a type of farmhouse ale originating from Belgium and northern France. In the 17th and 18th centuries, farmers in this largely rural region brewed ales for their workers who laboured in the heat of summer. Often there was an allocation of beer to each worker as part of his or her wage. This is where the term 'farmhouse ale' derived.

Farmhouse ales

Often the names 'saison ale' and 'farmhouse ale' are used interchangeably, but I believe it is better to consider a saison to be a subset of farmhouse ales. Saisons are farmhouse ales, but not all farmhouse ales are saisons.

The word *saison* translates from French as 'season'. These beers were made in the winter and spring to be consumed in the summer months or summer season when the workers arrived for the harvest. The beer was made from ingredients that were available on that farm, so you can understand that the taste differed from farm to farm and from region to region, depending on what ingredients were available at the time of brewing.

Yeast

The yeast plays a big part in the saison beer. These yeasts are highly attenuative, resulting in a dry-finishing beer. Often a hint of spice and fruitiness is contributed by the yeast complementing the other ingredients.

Dried yeasts such as Lallemend Belle Saison, Safale BE-134, or Mangrove Jack's French Saison are good, cost-effective options. There are also several options in the Wyeast and White Labs liquid yeast range, although you may need to plan your brewing and order these ahead of time ready for brew day.

The brewing temperature also affected the taste of the beer. Brewing in winter and spring was a challenge because the cold weather affected the way the yeast fermented. Often the brewery needed to be warmed to allow the yeast to ferment and, with an open fire creating the warmth, beers could differ dramatically based on the temperature that they fermented. Back in the 17th and 18th centuries, temperature-controlled brewing was not the science that it is today.

Alcohol content

This is an area that also had variation — not so much by region as by class. The owner of the farm may have higher alcohol content in his saison beer as he might use more malt in his brew to generate more flavour so as to impress his guests.

However, workers tended to get lower alcohol versions. Cost-cutting did form part of this, but it was also for productivity. If the workers all got drunk on their beer allocation at the end of the day, productivity would be low the next day — nobody likes working with a hangover! Making lower ABV beers made the beer cheaper to produce but it also quenched the workers' thirst without getting them too drunk.



Grains used in a saison depend on what is available to the brewer at the time

Cleanliness led to other farmhouse ale styles

On the farm all sorts of bacteria could have an impact on the beer. Sour beers and funky farmhouse ales developed more by accident than by planning. However, once these flavours became popular, inoculating brews also became popular — not necessarily in the way we add *Brettanomyces* to beers today to give the wet leather and barnyard characteristics but more likely by cultures and yeasts being traded between farms. Can you picture a farmer visiting a neighbour and commenting on the delightful new taste in his beer? The neighbour takes some of the dregs from the fermenting barrel and passes these to the farmer so he can add them to his next brew — and the cloning of beer styles starts!

Brewing a saison today

So we know that, under the saison style, beer colour, alcohol content, ingredients, and recipes all vary. This makes it great to add your own style to your saison. I have had great success adding modern citrusy hops to the dry-finishing saison. It definitely has the dryness of the saison but with the aroma and flavour of a tropical pale ale.

If you want to stay traditional, you can add spices such as ginger, coriander, and even mint to your beer. The different options of malt allow for a huge number of different flavours for you to consider.

There really aren't any rules to follow. Make your saison your way and enjoy your seasonal ale. 🍷

Summer saison recipe

Volume: 23 litres

Est. OG: 1.051

Est. FG: 1.008

Est. ABV: 5.6 per cent

Bitterness: 31.9 IBU

Ingredients

Malt

- 3.6kg German Pilsner
- 400g flaked oats
- 500g Redback
- 500g wheat
- 300g rye

Hops

- 10g Simcoe (60 minutes)
- 20g Simcoe (20 minutes)
- 20g Motueka (10 minutes)
- 20g Simcoe (dry-hopped at yeast pitch)
- 20g Motueka (dry-hopped at yeast pitch)
- 25g Simcoe (dry-hopped day four for four days)
- 25g Motueka (dry-hopped day four for four days)
- Zest of two oranges (add to the fermenter on day four)

Yeast

- 1x Lallemend Belle Saison

Instructions

- Mash at 64°C for 1 hour.
- Boil for 1 hour with hop additions as in ingredients list.



Dried saison yeasts are readily available at your local home-brew shop



FOLLOW THE DREAM

“To be really happy and really safe, one ought to have at least two or three hobbies, and they must all be real” — Winston Churchill

By Mark Seek

We are all bloody geniuses. The T-shirt read: “Restoring is boring”.

In recent times I have found that having a project of any calibre can be very therapeutic. Offering up my oily little two-stroke Indian to the gods of speed could be interpreted as potentially mad, overzealous, even deranged, but restoring the little machine makes me do other portions of my simple life with more determination and ingenuity.

I recall the night I was first introduced to the little ‘Injun’ — affectionately renamed by my mates. Several years ago, while my wife slept peacefully, blissfully unaware, Trade Me flirted and then enticed me to push the Buy Now button on a 1974 ME 125cc Indian trail bike.

A dream comes true

In the morning, I proudly announced that I had made the purchase of my dreams. In reality, I had bought a very dilapidated, underpowered, broken trail bike that would require months of blood, sweat, and frustration — and then more of the same. Undeterred, I made my humble shed a shrine to anything Indian related. Burt Munro became my mentor, and I shared the same kindred spirit.

My interest in this particular model began when I was a schoolboy in shorts. My neighbour would push his fire-engine-

red Minarelli-powered Indian out of the shed each school day and kick it over until it fired up. As I ate my Weet-Bix, looking out the window watching intently as he roared up the shingle driveway, blue smoke filled up the now-empty space where he’d parked it prior to ‘take off’.

It represents a time in my life when I was carefree and could believe that anything was possible

Ahh ... those were the days

The Injun in my possession represents my youth, and it represents a time in my life when I was carefree and could believe that anything was possible, that sense of rite of passage into adulthood. Now, I was about to reconnect with something that held some mystery and fascination in

my life. I would restore it to honour that passage of time.

In my line of work as a resilience coach it has become apparent that many blokes have forgotten the importance of having dreams and following them through. I have spoken to many who don’t believe in the relevance of, or value the significance of, connecting to something they are passionate about. If you know a guy who has gotten out of sorts, lend him some tools, or take him along to a swap meet, or ask him to give you a hand in your shed — it could be the best thing he’s done in a while. No matter what project you’re up to your elbows in, remember it’s probably more important than you think.

Einsteins aplenty

Getting back to the genius bit: Mr Albert Einstein — considered by most to be a genius — said, “It’s not that I’m so smart; it’s just that I stay with problems longer.”

Let’s face it, trying to fix something that you have never worked on before requires a bit of Einstein thinking. We could all be more like Einstein. I have now included Einstein along with Munro — both great blokes to have on your side when your finger is hovering over the Buy Now button in the middle of the night.

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Ohmio Lift vehicle on the Wellington waterfront



FUTURE- ENABLING AUTONOMOUS VEHICLES

Now there's an interesting combination

By Nigel Young

Photographs: Supplied and Nigel Young

The chance finding of a news clip on TechTV led recently to a ride in an autonomous vehicle in a church car park in Auckland's Pakuranga.

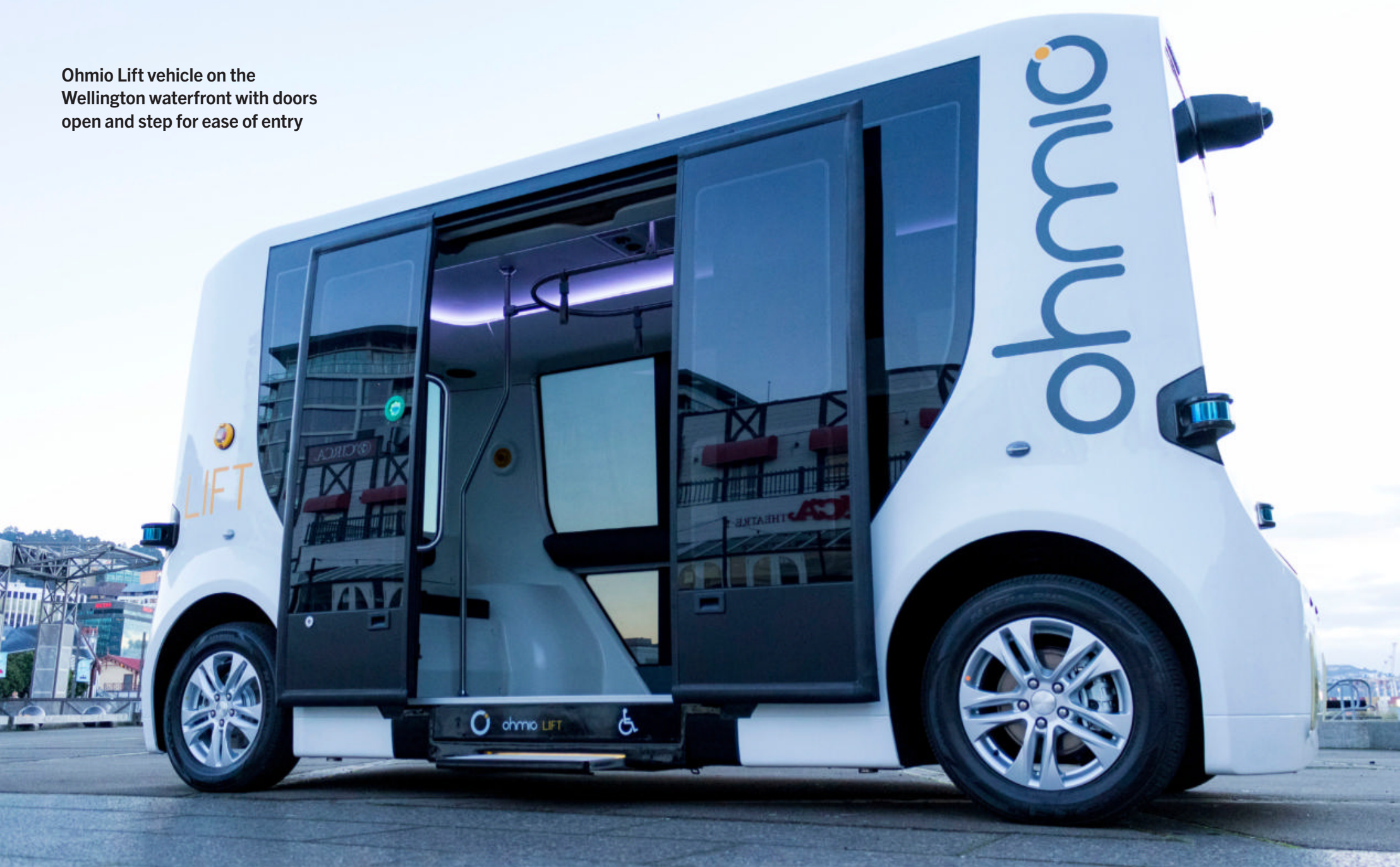
In the clip, entitled A NZ Mobility Innovation That Will Change the World, Mohammed Hikmet, executive chairman of HMI Technologies Ltd and president of Intelligent Transport Systems New Zealand from 2015 to 2017, was describing the

data-driven ecosystem that he and his team at Ohmio Automotion Ltd have developed alongside their vehicle.

Winner of the New Zealand Trade and Enterprises-sponsored 2018 TIN Rocket Award as a technology exporter, HMI gathers real-time data from its network of road signs throughout New Zealand and Australia — through which its vehicle moves — and uses the data collected to create the ecosystem. ►



Ohmio Lift vehicle on the Wellington waterfront with doors open and step for ease of entry



Direction is not set

Styled like a small bus, the Ohmio has no distinct front or back, due to its ability to move in either direction as required. Hartmut Beintken, Ohmio's chief engineering and research officer, told me that potential buyers in Korea insisted that under Korean law there had to be a defining difference. The initial thought was simply to cover the headlights at one end, but this was not regarded as sufficient, so, to comply, a new panel had to be formed and fitted in place of the previous one.

The ride was impressive, with a vertically mounted screen showing the vehicle's immediate track within two decreasing risk boundaries each 200mm wide, giving a default 400mm non-approach zone all around the vehicle. Using a combination of GPS and lidar (light detection and ranging) at either end, a road cone placed in its way was sufficient to slow then stop the vehicle before the cone was removed. Both it and the guy doing the moving were visible on the screen — albeit as grey shadows rather than identifiable images.

"We have demonstrated that it can be done safely, without incident, and in compliance with road-safety laws,"

stated Dean Zabrieszach, CEO of HMI Technologies, after receiving a report from La Trobe University — the result of a 12-month trial around its Bundoora campus in Victoria.

David Franks, CEO of Keolis Downer, an Australian public-transport operator, commented, "The trial demonstrated autonomous buses can and should play an important role in the mobility mix as a complementary service to existing public transport."

This raises the issue of the role of both central government and local authorities with regard to the legislative environment the vehicle will need to operate within, with this Korean example giving an indication of the specific nature such legislation can require.

The Ohmio has no distinct front or back, due to its ability to move in either direction as required

Front and rear grilles — these cover the charging points for the vehicle



Auckland Harbour Bridge

However, more than legislative definition needs to be considered. With the announcement of a new bridge to be built alongside the Auckland Harbour Bridge, perhaps the consideration of autonomous public transport being included would not only increase the toll opportunity to help fund it but also provide a real and viable alternative to vehicles on the main bridge itself.

I suggest this to Dr Mahmood Hikmet, head of research and development and Mohammed's son, who replies, "We would work with an authority to make that happen if that was their intent. However, these vehicles are mostly for the first and last mile of transportation to get people to and from a transit station and increase ridership on the main lines.

"The Harbour Bridge crossing would be a main line with a relatively high capacity requirement for vehicles going over it [such as] a bus or long vehicle of some sort. A larger vehicle in that case with capacity for more people would mean that the cost of a driver would be covered by the commuters — so, in my opinion, the need for autonomy diminishes. The Harbour Bridge crossing wouldn't be my first pick for an autonomous shuttle like ours. But if this was something that someone wanted to do, we would work with them to make it happen."



Dispatch to destination

'The first and the last mile' concept is taken from supply-chain management and refers to the transportation of goods from a central dispatch facility to their final, increasingly residential, destination. In terms of commuting, it is the first route from the front door to the bus / commuter train stop, with the final route — stop to destination — being essentially replicated. Both these aspects of the commute are usually proportionally longer in time than the second route from stop to stop. It is these portions of the route that the Ohmio will be focusing on, where the small bus becomes more of a shared taxi.

"There is no silver-bullet when it comes to autonomous vehicle technology," according to Dr Hikmet. "All we can do is try to offer different modes of transport and choice to people — this vehicle is another choice."

I'm sitting in a meeting with this inspiring father and son team, discussing the interface between their vehicle and my area of interest: affordable housing. That might seem a strange combination, but even affordable housing has to look to the future and incorporate 'smart' technology where it can. This is where the vehicle's ecosystem could extend into the home, particularly if monitoring for health reasons is an issue for the passenger. ►

ITS NZ YTP (Young Transport Professionals) in front of the Ohmio Lift vehicle with Minister of Transport Michael Wood





The motivation for Ohmio

This comment also reveals an interesting motivation for Ohmio Automotion — that of seamlessness in the interface between the vehicle and the passenger. Calling this “future enabled”, and with reference to the principles of universal design, Dr Hikmet speaks passionately about the need to be responsible for all social groups, regardless of economic circumstances.

“Most innovations are aimed at the wealthy. This vehicle will allow someone who can’t afford an electric vehicle to electrify part of the journey.”

I respond with the comment that poverty is a form of discrimination — if you want to cut a certain segment of people out of something, just put the prices up. Both Hikmets agree.

I ask Dr Hikmet to explain how future enabled might develop.

“For us, future enabled ensures that we don’t limit what we can do or where we can pivot to going forward; that the needs and requirements for something will evolve and change over time, and that our solution should be able to also evolve and change over time to meet them. That means we maintain an iterative approach towards design and deployment. If we

find a better way of doing something in the future, such as meeting the needs of a person with a disability, we can look at upgrading. If it’s a software update, that makes things easier, but we can also augment and change hardware to an extent.

“We don’t have the answers to all the questions ourselves — these are things that will be learned and discovered over time either by us or by others — and we need to recognise and be ready to take on those learnings so that we can ultimately better serve people.”

Keeping the door open to whatever developments may come along is sound development practice. I suggest an example: that of on-board charging by passengers — perhaps the battery on an electric mobility scooter has got too low for comfort.

“That’s technically a possible function to implement. If a community or the operation saw there was a need for functionality like that, we could add it. What makes sense in one jurisdiction or deployment might not make very much sense in another — the needs are sometimes mutually exclusive. Rather than having all the answers ourselves,



Ohmio Lift on Wellington waterfront next to Te Papa



Interior of Ohmio Lift



Corner of Ohmio Lift vehicle showing turn signal, 360-degree lidar, and emergency door-release lever



This could be considered the front or back of the vehicle. Ohmio engineers use “doors left/doors right” to reference movement direction

The need for the vehicle to be ‘aware’ and prepared for any passenger regardless of their circumstances

we instead take an outcome-based approach where we work with a partner to recognise their functional and operational needs, and then alter our technology solution to meet the needs.”

Accessibility for all

This emphasis on inclusion and dignity — particularly around accessibility and disability — came just a few days after I had met with Helen James, sales manager at Lifemark and advocate of the Lifemark Standards.

Lifemark — a division of CCS Disability Action — audits and accredits house designs and planning based on strict criteria intended to guide designers and architects to ‘design for life’. We’d been having a discussion around the state of readiness new houses could achieve with remarkably little cost, provided it is taken into account during the planning and pre-construction stages rather than

having to be retrofitted afterwards.

“There is enough trauma around the realisation of immobility and the loss of independence after a serious accident, without having to suffer the indignity of having your house disrupted while [you are] still learning to come to terms with this new compromised reality,” commented James.

“You’re preaching to the converted,” agreed Ben Lucas, lead advisor, disability, for Customer Systems & Intelligence at the ACC. Having a coffee with Ben in Christchurch and seeing his frustration around things I take for granted shows up the reality of restricted movement, particularly when wheelchair bound.

No need to reinvent the wheel

Having said that, Lucas’s wheelchair — from New Zealand company Omeo — is based around Segway technology, and is a superb example of adaptation and

adoption and the realisation that there is no need to reinvent the wheel. We too had been discussing the need to prepare new houses for potential post-accident refurbishment, which makes the connection back to the Ohmio vehicle even more relevant.

However, inclusion is more than just a seamless awareness around mobility. Hikmet Snr speaks of inclusiveness at fundamental social levels, and the need to prevent barriers to access that aren’t physical. This is part of the future enabling referred to earlier and the need for the vehicle to be ‘aware’ and prepared for any passenger regardless of their circumstances.

Having watched Ben Lucas navigating the same space I was navigating helped me realise that this philosophy is as much a reminder to the independent as it is an empowerment to those for who independence is restricted. ►



Ohmio Lift with doors open and access step extended

Those data from road signs

The data that supply the ecosystem come from those digital road signs that we take for granted. How does it work?

“That’s also entirely dependent on the jurisdiction!” says Dr Hikmet. “There are quite a few standards and communication mediums used for V2X [vehicle to everything] communication.

“In Korea, we’re using a DSRC [dedicated short-range communications] connection to communicate with traffic lights. We have used 5G in the past for communication between the vehicle and other types of infrastructure. We’ve also used lower frequency RF [radio frequency] connections, as well as just an internet connection. There isn’t one set way of doing things — it’s different everywhere.

“We don’t want to get stuck in a position where we have a stock of a particular technology or way of doing things and convince people that it’s the best way to do it. Sometimes the cost of switching to a different mode of communication might outweigh the benefits of what the new medium is able to introduce. So instead, we work with the organisations which procure our products to ensure that they receive something which suits and fits the ecosystem that they have there already.

“If we didn’t do that, the capability of our products would be vastly reduced because they’d be working in isolation. We don’t want that to happen. We want something that naturally fits into the ecosystem.”

Ohmio’s potential

Christchurch Airport is looking at using Ohmios around its facilities, and the Christchurch City Council has trialled them around the Botanic Gardens. Yet these examples don’t show off the Ohmio’s potential.

Paerata Rise is described as the largest housing development currently under construction in Auckland. Last November an announcement was made that it “is set to become the ultimate Smart Village with the creation of New Zealand’s first community-based private mobile network and an autonomous shuttle for residents. Ohmio, Think Robotics, and Dense Air have partnered to develop and build this cutting-edge system that will provide on-demand transport to future residents of Paerata Rise via a smartphone app”.

Now that is more like it. This combination of tech innovation, future enabling, and social responsibility is an inspiring motivation. As mobility innovators, the Hikmets and Ohmio can indeed change the world.

As a diehard petrolhead, I find this truly impressive — as was the electric Harley I saw when I visited Motat earlier in my brief time in Auckland. Then there’s the Omeo wheelchair mentioned earlier, developed by another high-tech Kiwi company. What a fascinating trio, all in the same arena yet all spectacularly different. 📁

Communication protocols

Dr Hikmet mentioned several communications protocols in his answer on how it all works, but what do they all mean? Lance Hastie of Com Technology explains:

“Dedicated short-range communications (DSRC) is a short-/medium-distance communication protocol for vehicles using on-board-unit (OBU) technology. An example is to warn nearby vehicles of an approaching emergency vehicle or hazard.

“Vehicle to everything (V2X) is a broad term covering communication between a car and nearby points. Specific instances include V2I (vehicle to infrastructure), which connects a vehicle to a roadside connection (including the internet); V2V (vehicle to vehicle) — example: warning of a hazard at a location; V2P (vehicle to pedestrian) — example: proximity to pedestrian or cyclist; V2D (vehicle to device) — example: e-bike or scooter; and V2G (vehicle to grid), for refuelling.

“Radio frequency (RF) describes a wireless signal used for sending or receiving information. The frequency defines the rate of oscillation of the signal.”

What a fascinating trio, all in the same arena yet all spectacularly different



Non-door side of Ohmio Lift

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Image 3. My second prototype, A Loving Hand — still in daily use two years later

A HELPING HAND

Needs must — an accident spurred the invention of a very useful device

By Adrian Faulkner
Photographs: Adrian Faulkner

There's a famous Zen Buddhist meditation called 'the sound of one hand clapping'. Such a saying is known as a 'koan', a sort of nonsense phrase that monks use for mind training in their search for enlightenment.

I'm no monk, but I was facing another nonsense phrase — 'the sound of a one-handed jar opener' — which had nothing to do with enlightenment. Rather, it was cries of frustration from my wife with a

newly broken wrist trying to open a jar with one hand. We were quickly learning that you just can't do that. Try opening your favourite jam, or beer in a screw-top bottle — it's just not possible with one hand. For small items like pill bottles, you can use your mouth to gain leverage, but not with a jam jar, or a wine bottle ... no way! Not my mouth — though maybe Winston Peters could! (Image 1.)

And it's not just one-handed people

who face this difficulty. Many people with two hands find that their strength wanes with age or that arthritis makes it just too painful to exert a sufficient grip. My wife's sad accident had made me confront a widespread challenge: gripping and opening jars, bottles, and cans with damaged or weakened hands. And watching the struggles of someone you love is a strong incentive to help.

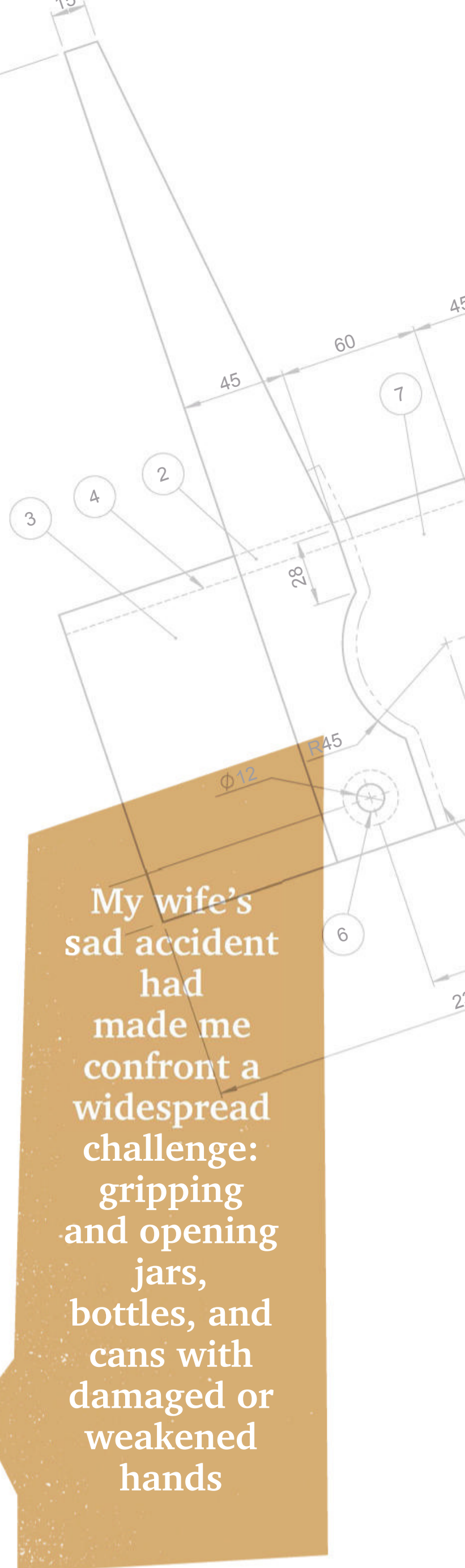
Physics and ancient tools

From now on I'll use the word 'jar' to refer to anything with a screw-top lid. Opening a jar requires two opposed forces of rotation. One force exerted at the bottom resists the jar's rotation, while the other twists the lid with increasing force until the lid starts to move and disengage.

To twist the lid, first grip it with your hand. If the hand is weak or damaged, or the lid tight, use one of the excellent tools sold in hardware stores. But unless you have another hand that can apply a sufficient resisting force to the bottom

of the jar, it will rotate, and the lid will stay closed. Sadly, and amazingly, there are no excellent tools available to help the one-handed (or weak-handed) do that — neither in hardware stores nor in the specialty shops for the elderly or handicapped. I was about to change that!

I realised that my wife might be able to open jars if we could harness some other part of her body. I thought of the elegant tools used since long before the pyramid builders — wedges and levers. And I thought of her elegant thighs — could the answer for gripping the jar lie with her thighs and these tools? ►



My wife's sad accident had made me confront a widespread challenge: gripping and opening jars, bottles, and cans with damaged or weakened hands

Image 1. Helen with her broken wrist in plaster



Image 2. My first prototype. Note the clamp and two excellent lid-gripping tools



Image 4. A range of 20–90mm diameter containers that can be held

It is best if the Hand is semi-permanently mounted

A lever is the way to go

I decided a lever that could be operated by gentle thigh or hip pressure would be simplest. Mounted on a base clamped at bench height, this moving lever could push the jar against a block fixed to that base. Lining the contact surfaces with soft rubber would increase the gripping

friction needed to hold the jar, and a curved shape on each side would both locate the jar and further increase friction by increasing contact area. With the jar base now held firmly, her good hand could grip the lid.

I soon had my first prototype made from scraps of wood and rubber. Lacking

a compass, its circular shapes were copied from a preserving-jar ring. This size proved remarkably effective for a range of jars from 50mm to 90mm in diameter (and not only circular) (Image 2).

My second prototype soon followed, made with better materials. Adjacent to the circular jar holder, I'd created a section where the two rubber-lined faces of lever and block meet parallel to each other. Called 'Little Gripper', this could grip small containers and other small items, extending the range from 20mm to 90mm in a variety of shapes that cover most domestic needs. I christened this version 'A Loving Hand'. It's been in continuous use in our kitchen for nearly two years now — and will stay forever! (Images 3 and 4.)

Into the kitchen

It is best if the Hand is semi-permanently mounted. Stored in a cupboard, it would be too much trouble to get out to open one jar and it'll be needed frequently.

However, apart from clamping it down there are two ways to use it temporarily. Both require the user to press inwards on the lever and downwards on the jar. This requires careful technique, but it will work with practice (Image 11). ►

Image 9. Production jig No. 1 for cutting the levers. Finished components are shown here and in Image 10 to show the resulting parts



Making A Third Hand

The plans pictured here show the geometry and sizes that work well. To make more than one or two, it's best make some jigs to ensure that your work is efficient and reproducible. All my jigs were made from workshop scraps, so they may not look flash but they work well. This brief description of the process is best read with reference to the plans and photos supplied. Makers are welcome to modify the design to improve production or use.

Lever and block

The lever is formed from 45x45mm pine clears. My Jig No. 1 holds the timber firmly (drive in a wedge where marked) and guides my Skilsaw to the exact cut required for the tapering handle. Each cut creates two levers using about a 62.5cm length of timber. These are then docked to remove the sharp ends and the second lever at the correct length. Blocks are cut from the same timber.

Mark all edges of the lever and block where the rubber strip is to be glued on, or where the block meets the base. Round all unmarked edges with a router. Note that the blocks are rounded differently for left and right push (see following). Finish all surfaces with a sander.

Forming the jar locator

My Jig No. 2 holds both the lever and block in the correct position for drilling. Two pieces of alloy bar locate exact drill positions. The two items must be held very firmly in place with a clamped support, as in Image 10. A Bosch 90mm hole saw, lowered slowly in a drill press, cuts the jar-locator curves on both. Sand surfaces with a linisher. The same jig and drill press is used to cut the pivot hole, using a half-inch drill that allows clearance over the 12mm pivot pin (Images 9 and 10).

Base

The standard base is cut from 18mm pine ply at 230x140mm. Then rebate and glue a 40mm downturn of 9mm ply onto one long side — this locates the Hand against the edge of a bench. Custom bases can be made to suit specific locations, but they will need a similar footprint, perhaps without the downturn (Image 3).

To allow for different kitchen layouts, I make two standard versions that are mirrors of each other. Push the lever to the left (as on the plan), or to the right (as on my prototypes). Mark the pivot position you want onto the base and drill with a 12mm spade drill in a press. Cut 63mm pivot pins from 12mm stainless rod, grind off the sharp edge at one (top) end, and roughen the surface of the first 15mm at the other (glued) end. Set

the rod into the base with glue (I used Gorilla Glue for the downturn and pivot pins), clamping to a bench while the glue sets. To hold the rod at 90 degrees to the base while gluing, slip over a block that has been press-drilled with a half-inch drill (wax to prevent the glue binding).

Drill and countersink holes in the base to hold the block (use 3x38mm square posidrive screws), and another from the top for screwing the base to a bench. As the latter may never be used, I close it after varnishing with a cut-off dummy screw. I made simple jigs for marking screw holes and where to lay the butyl rubber strip used for holding down the base. Finally, sand the base, slightly rounding all sharp edges and corners, ready for varnishing (Images 11 and 12).

Finish and assembly

Check all surfaces for a smooth finish. Apply two coats of satin polyurethane, lightly sanding between coats. Glue the rubber strip to the block and screw it to the base. Fit the lever and mark where its rubber strip must end, then cut and glue this.

When selling each item, I used a plastic box to contain instructions (I can email them if contacted), butyl rubber strips, and a slide-clamp (\$20 extra).

For more info, contact Adrian Faulkner at: adrianmandala8@gmail.com.



Image 11. Temporary mounting: (left) press the base onto a damp dish cloth; (right) the base is lined with a non-slip mat

The simplest and most effective mounting is to screw the base to a bench

Semi-permanent mounting is easier to use and there are two further choices. For those who don't want to (or cannot, e.g., due to rental rules) screw into a bench, put four strips of sticky butyl rubber tape onto the bottom of the base, as indicated. I used Butyl Sealant Lap Tape from Premier Tapes NZ Ltd, which is a bit like Blu Tack and so viscous that it firmly grips the base-to-bench connection but can be removed years later (by slowly wedging the base off and cleaning with turps) without damage to either surface (Image 12).

The base may move slightly over time, but a strong person can push it back into place.

The simplest and most effective

mounting is to screw the base to a bench with a 40mm screw (supplied, fitted into the back edge of the base — see Images 11 and 12) in a 3mm hole. Damage to the bench is minimal and the hole can be filled later if the Hand is removed.

Custom bases can be made to take advantage of unique positions, like my second prototype (held now for two years with butyl rubber) where some support is gained from the adjacent stove top. No downturn of the base is needed.

Tins, cans, and other kitchen challenges

Watching another person struggle is a great way to learn how to help them. Watching my wife's frustration with

Materials needed, with approximate cost per Hand

Item	Cost	Cost/unit (at 20 per cent waste)
18mm untreated pine ply — 230x140mm	\$61/sheet	\$0.90
9mm untreated pine ply — 230x40mm	\$32/sheet	\$0.13
45x45mm untreated pine clears — 2.4m	\$29/length	\$7.25
12mm bar, 4m	\$46.74/length	\$0.93
Glue, screws, washers, varnish		\$0.50
Sponge strip 36x6mm (300mm/unit)	\$10/m	\$2.78
Total cost per Third Hand		\$13.52

Build time: about two hours



Image 7. Little Gripper can hold a wide variety of things. Here, it's helping to remove a nozzle from a hand-held vacuum cleaner

I simplified the design and made jigs for mass production of what I now called 'A Third Hand'

the lift tabs on cans of tomatoes, I realised the Hand could help. Gripping the can, lifting the tab gently until the can's seal breaks, then inserting a bar (a sharpening steel is ideal) and levering off the lid results in success.

In fact there are lots of tasks that need two strong hands: tab-top beer cans and crown-top bottles are difficult or impossible to open if you haven't got two strong hands. We are still finding new uses for the Hand (Images 5–7).

Into the world

I'd invented A Loving Hand to help my wife. Convinced that it would be invaluable to many others, I decided to make more. I simplified the design and made jigs for mass production of what I now called 'A Third Hand'. I hoped to involve my local Menzshed in production, as a fundraiser and community service. But I had to prove there was a market first.

The *Nelson Mail* published an excellent article on my invention ►



Image 12. Semi-permanent mounting: (left) the base is held by four strips of butyl rubber; (right) the base is held down onto the bench with a 38mm screw



Image 10. Production jig No. 2 for cutting the 90mm gripping form and the pivot hole

There was a flood of interest and of orders. Within a week I'd sold all 10 Hands that I'd made

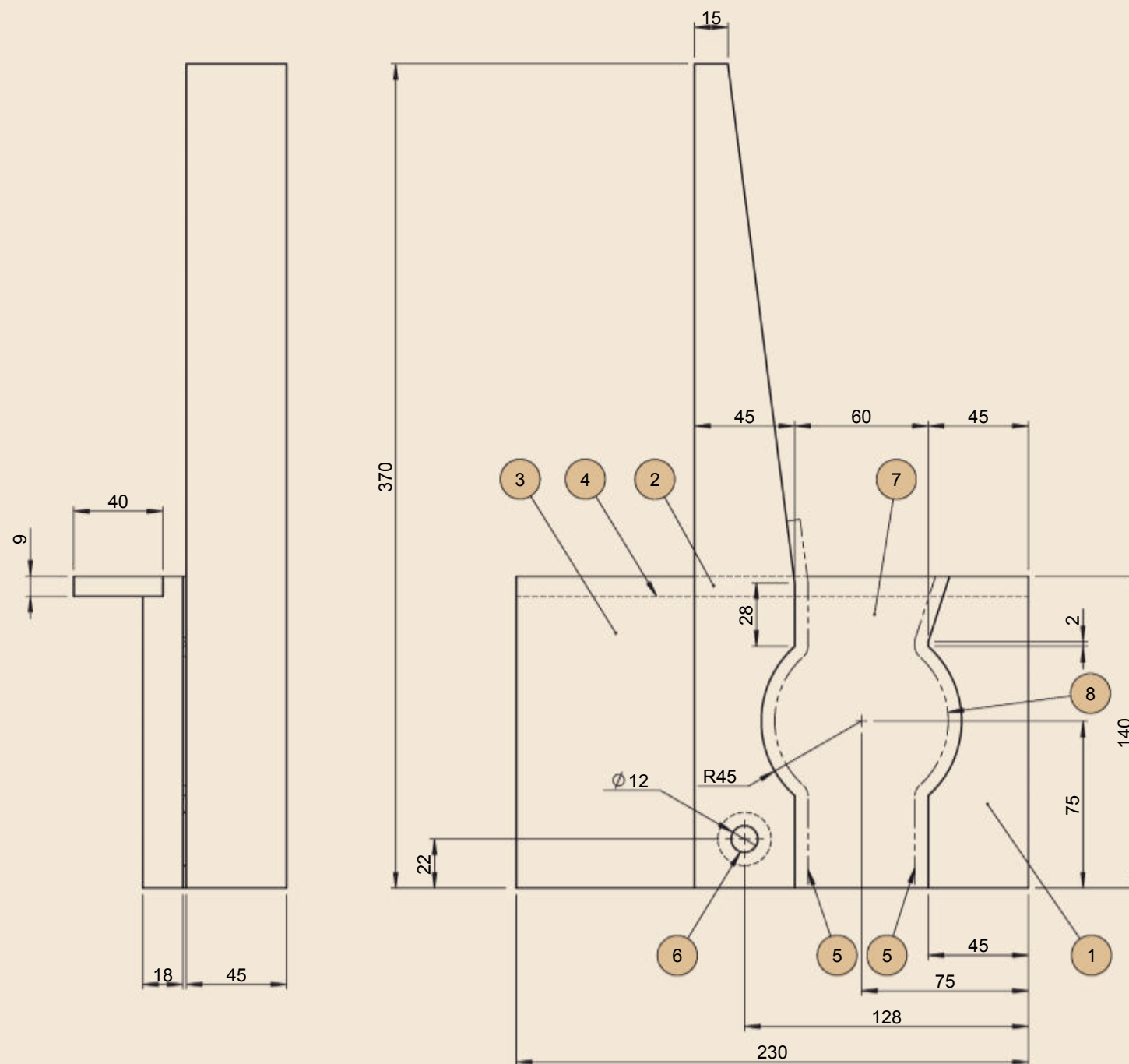
(stuff.co.nz/life-style/homed/retirement/123002567/nelson-mans-jargripping-device-lends-an-extra-hand-to-anyone-struggling-with-lids). There was a flood of interest and of orders. Within a week I'd sold all 10 Hands that I'd made and had a few further orders to fill. And then interest dried up just as quickly. That was a year ago and the concept has lain dormant since then. No matter how good it was, it had no wider use until I could market it.

Made for sharing

I refuse to give up — the Third Hand concept must be shared! It needs people with both the skill to make them (any competent woodworker) and the skill to market them (though some can perhaps be given, or lent, to the needy). Ideally, the maker will sell them at farmers' markets, or community stores, where customers can try out an example Third Hand on display and where mark-up costs are low. Commercial margins ►



Plan of the push-to-the-left device



THIRD HAND PLAN — KEY

1. Block
2. Lever
3. Base
4. Downturn
5. Sponge rubber strip
6. Stainless pivot with 25mm washer to separate lever from base
7. Little Gripper zone
8. Jar-locator zone: 90mm diameter, cut with block and lever parallel, separated by 60mm



Image 5. Opening a ring-pull tomato tin



Image 6. Beer cans made easier

are too high for this handmade device to be affordable.

Eventually someone will take the concept and make Third Hands on an industrial scale in plastic or metal — there is a vast market out there. How about 3D printing? I considered patenting the design, but that was all too hard. I need neither the money nor the stress. I'd rather just offer it as freeware for anyone to make. I'm sure handmade, varnished wood products would attract discerning buyers, even if

there is a flashy plastic competitor.

To encourage this, I am sharing the plans I've developed with readers of *The Shed*, along with some guidance on how to make them. I only want to know people are being helped, though I'd appreciate some feedback and to be acknowledged as the inventor of the Third Hand. I also have a small run of hands for sale (\$70 each), which would be helpful to those planning to make more. 📄

I'd rather just offer it as freeware
for anyone to make

Image 8. A production run of 10 (one got damaged)



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NEW MICRO-CONTROLLERS

The latest microcontrollers lend themselves to a myriad of uses

*By Mark Beckett
Photographs: Mark Beckett*

Quite a few years ago, the Arduino was the go-to microcontroller. It was cheap, versatile, and easy to program. Fast forward to today and the ESP8266 and ESP32 are the new go-to microcontrollers.

Arduino set a new standard with its open-source hardware and software, along with the range of shields (add-

on boards), but they lacked on-board wireless and Bluetooth. Yes, some boards had it, or you could add it, but the costs escalated and the size increased with each extra module.

ESP8266 ended that problem with built-in wireless and Bluetooth. The ESP devices generally have less GPIO (general purpose input output) but, on the plus

side, they cost only a few dollars.

Programming was solved with inclusion into the Arduino IDE, and Expressif (www.espressif.com) has been providing all the supporting libraries and board information, along with other software to program them.

There are a large number of links at <http://esp32.net/> and <http://esp8266.net/>

A camera can be added

The latest version of the ESP32 includes a 2MB camera for around US\$5. I bought mine from <https://www.aliexpress.com/item/33015018296.html>. While it is not a high-definition camera, it compares with many of the lower cost security cameras and includes wireless capability — with the ability to add an external antenna. There are a few variations and the difference is the pin allocation for the camera.

It is important to note the board doesn't contain any mounting arrangement for the camera, so you'll need to build your own. Raspberry Pi cameras are similar but include a PCB to assist with mounting to holders or cases.

Most of the ESP32-CAM boards do not include a USB connection, so you will

need an FTDI programmer — interfaces the USB to Tx/Rx along with power — or some other means of programming.

I found I needed to upgrade to the latest Arduino IDE (ver 1.8.8) in order to include the latest libraries that some people are using when programming the ESP32-CAM boards.

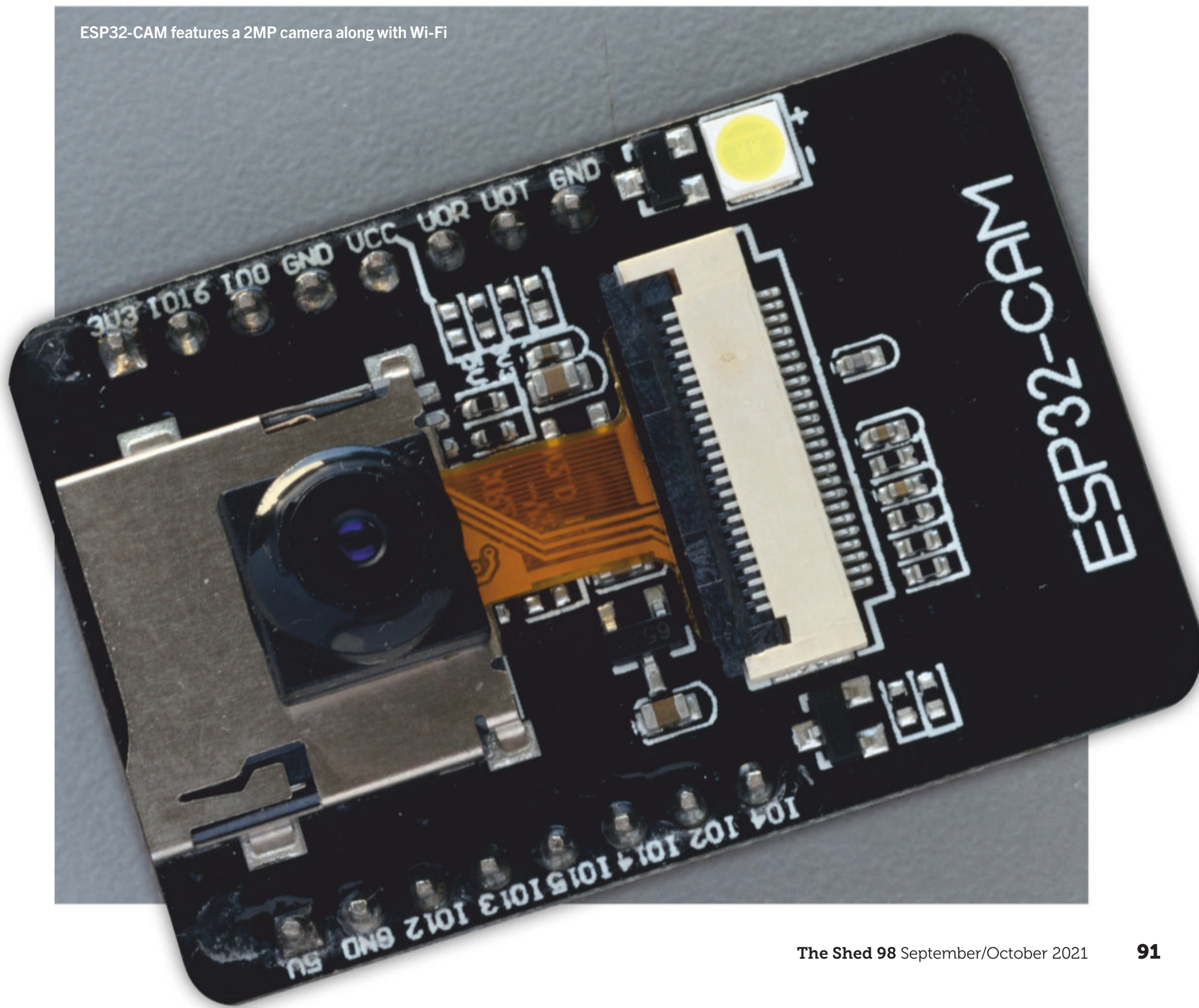
Programming

I followed the instructions here <https://randomnerdtutorials.com/esp32-cam-video-streaming-face-recognition-arduino-ide/> but you will need to add the board and libraries to the Arduino IDE.

In earlier Arduino IDE versions, the libraries were all in the same place as the IDE. Sadly, for whatever reason, they are now stored in your profile, which is a right pain. ►

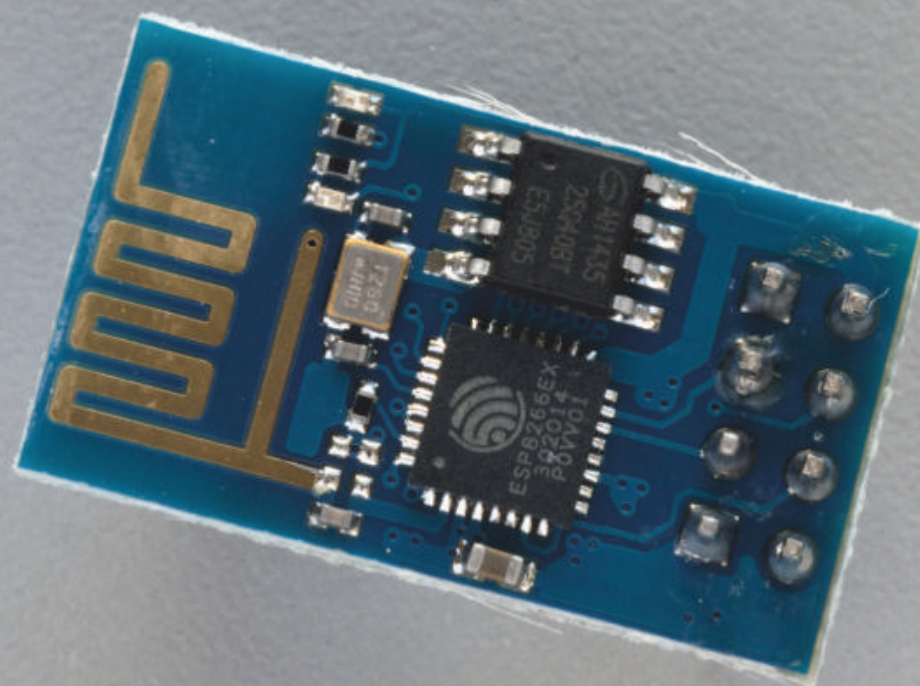
“It is important to note the board doesn't contain any mounting arrangement for the camera, so you'll need to build your own”

ESP32-CAM features a 2MP camera along with Wi-Fi





ESP32-CAM with AA battery as size comparison



ESP8266 — very small form factor and limited GPIO pins

To add the library and boards you need to open File – Preferences and add the link in the additional board’s URL. https://dl.espressif.com/dl/package_esp32_index.json

There is a full explanation with pictures at:

<https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/>

I would suggest including the ESP8266 (shown at bottom of step two) by clicking on the folders icon on the far right and adding it on a new line — or add a

semicolon between entries.

Click OK and then, under, Tools select a board, scroll up to the Board Manager, search for ESP32, and then click install.

Personally, I find this a strange way to deal with boards and examples, but then I’m just a casual user.

Sketch

When you open Examples – ESP32 – Camera – CameraWebServer, the code is loaded for you. You will need to change to the correct camera and enter your SSID and password so the ESP32 can connect

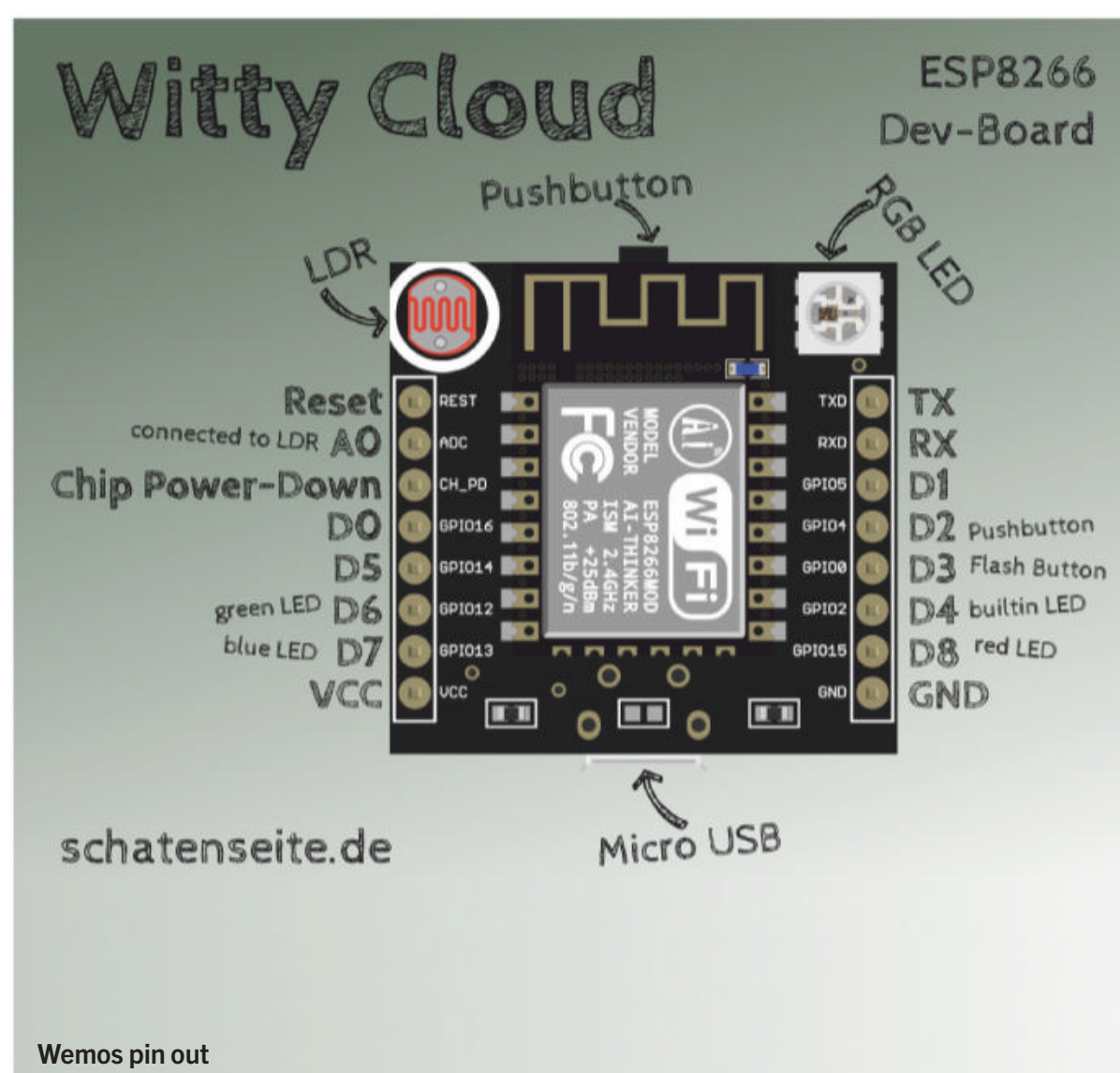
to your wireless network.

The ESP devices need to be placed into ‘flash’ mode before they will accept a sketch. This varies but usually involves holding GPIO 0 to ground.

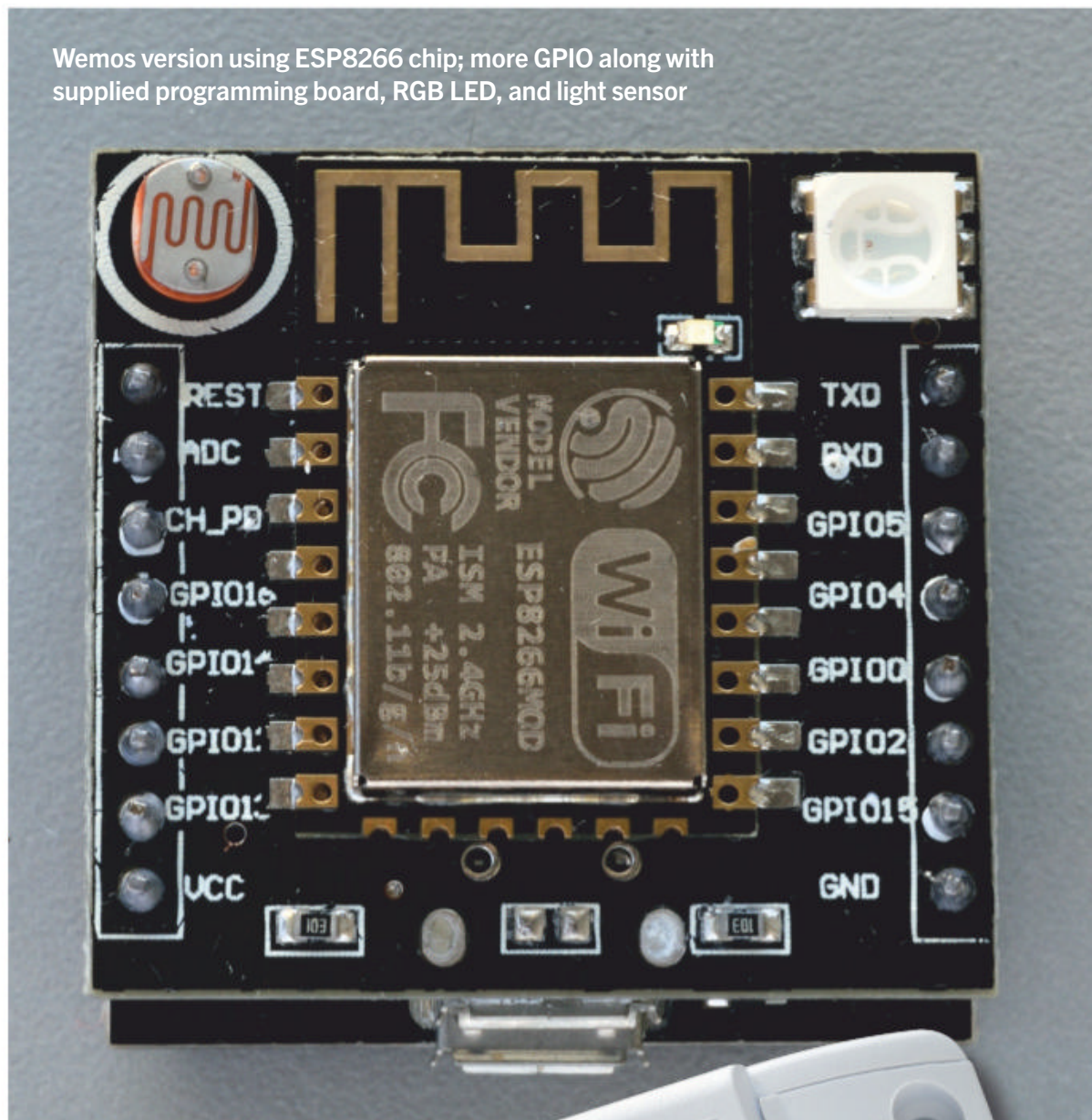
The sketch will compile and upload. You need to remove the ‘flash’ mode jumper and reboot it.

Your home router should allocate an IP number (if DHCP is enabled) and you’ll need to know this before you can connect to it. The links show how to read it, or you can check on your router for new wireless connections.

“Personally I find this a strange way to deal with boards and examples, but then I’m just a casual user”



Wemos version using ESP8266 chip; more GPIO along with supplied programming board, RGB LED, and light sensor



Sonoff wireless power switch using ESP8266 chipset

Operation

I found the image very good and certainly suitable for a door monitor or something else that had relatively static objects. The higher the definition, the greater the lag.

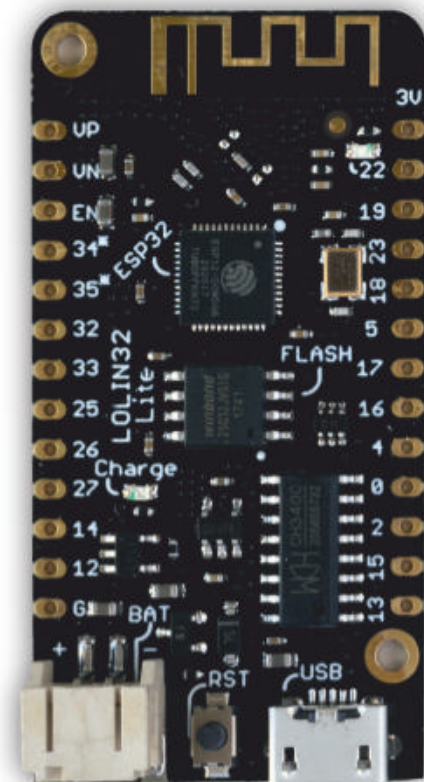
My first use will be to replace the caravan rear-view camera that was detailed in *The Shed* Issue 64, Dec 2015–Jan 2016. The reduced size allows it to be permanently fitted to the window, which solves a range of issues.

I had no concrete plans when I hit the ‘Buy now’ button for the ESP32-CAM boards, but the size and cost allow multiple units to be deployed around a house.

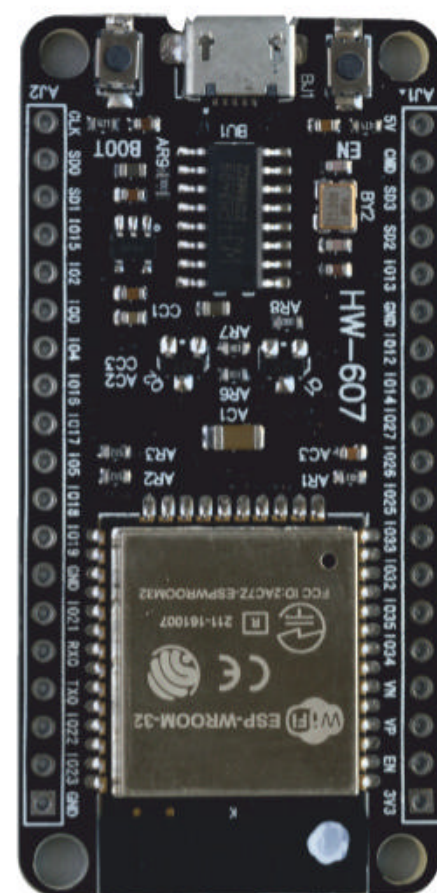
ESP devices

The ESP8266 and ESP32 are quite powerful devices and have found many uses in MTM (Machine to Machine) or IoT (Internet of Things) applications. These are where information is collected and passed onto another device that is monitoring or reacting to that information.

Remote temperature sensing is one example where data is collected by an ESP8266 that is connected via Wi-Fi to a logging application hosted by Google or some other large corporation. Alternatively, the remote temperature sensor connects to the fan or heater



ESP32 with built-in LiPo battery charging



ESP32 with lots of GPIO



Sonoff wireless switch with ESP8266 chip on right

device and it reacts to the incoming data information.

I was asked recently to make an old traffic light flash. I decided it would be nice to adjust the flash rate and lock it onto one colour. Rather than drill holes for switches and knobs, I could use an ESP8266 and the owner could control it from his smartphone.

The ESP8266 provides a Wi-Fi service that you connect to — similar to any Wi-Fi hotspot in a cafe, motel, hotel, or workplace. Once connected, you enter the device IP address in the browser and it allows interaction.

Yet another use

I've also used an ESP8266 to control a circle of 12 neoPixels (see *The Shed* Issue 66, April–May 2016). The device was intended to warn someone that a vehicle was approaching by flashing red, but while idle it provided the time with a different colour for the minutes and hours.

The onboard Wi-Fi connected to the

home wireless and went out to an online time server to get updated time at regular intervals. Any number of these could be deployed around the house and powered by a phone USB charger.

One of the other features is OTA (over the air) programming. Rather than having to physically connect a lead to the device and program it, most devices will allow you to update them using Wi-Fi.

<https://docs.espressif.com/projects/esp-idf/en/latest/esp32/api-reference/system/ota.html> and <https://randomnerdtutorials.com/esp32-over-the-air-ota-programming/> give you the idea.

So, if you've built this device that is difficult to access you might be able to update the software without disconnecting and retrieving it.

I hope this has given a few readers some idea of the new microcontrollers that offer new features. Many of the features aren't possible on the Arduino but, as with any technology, time never stands still, and I'm sure in years to come these will be considered dinosaurs. 📄

Links

www.espressif.com

<http://esp32.net/>

<http://esp8266.net/>

<https://www.aliexpress.com/item/33015018296.html>

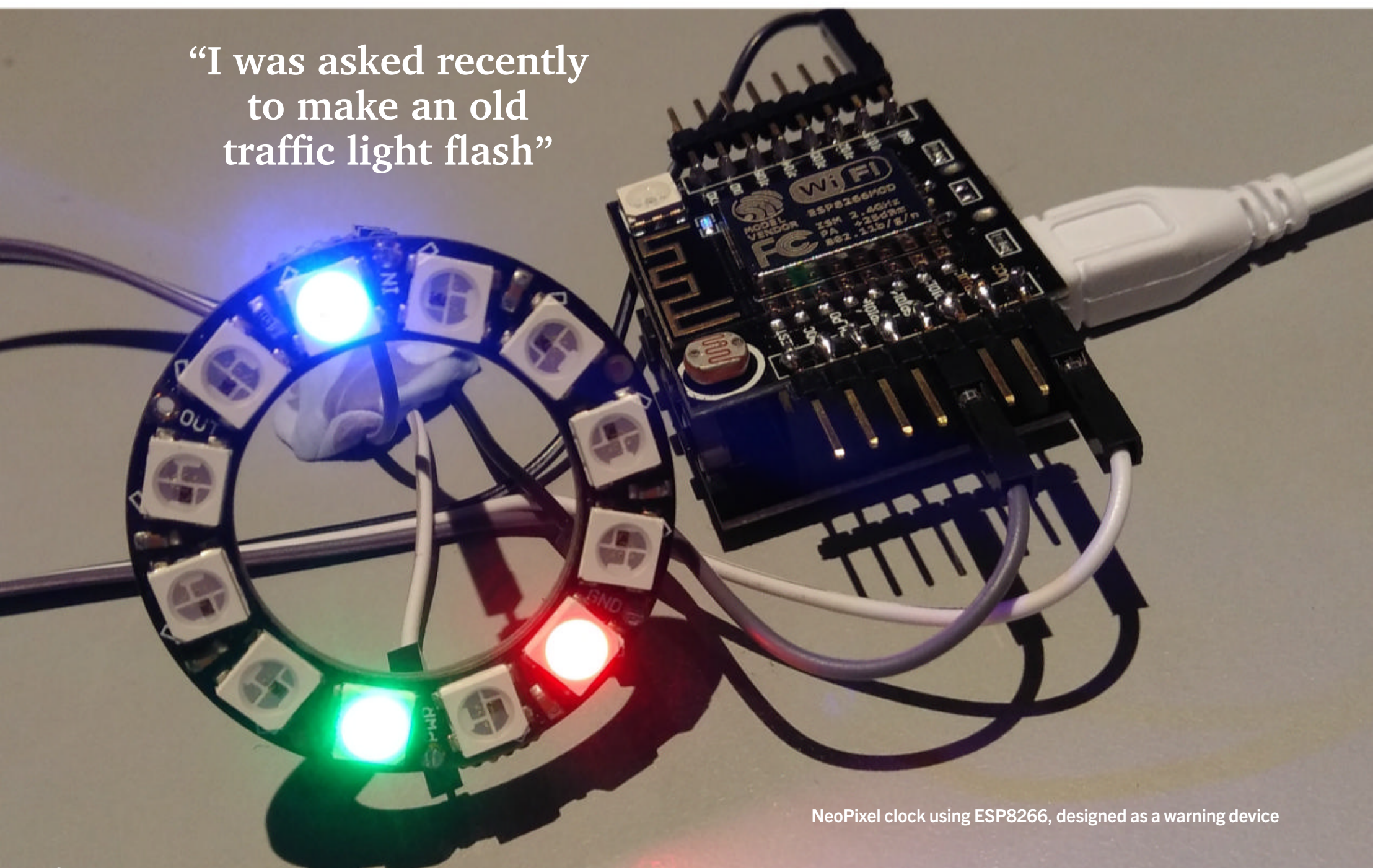
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https://dl.espressif.com/dl/package_esp32_index.json

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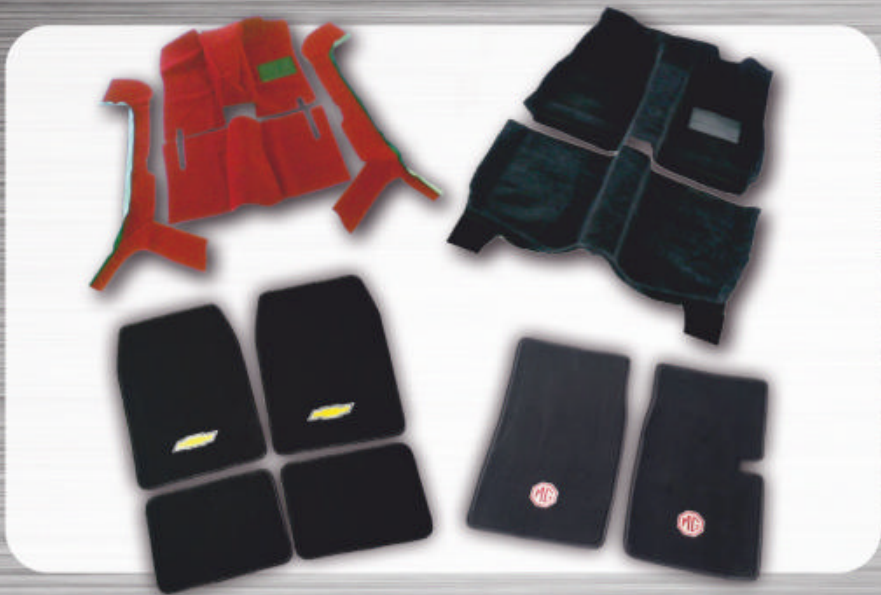
<https://docs.espressif.com/projects/esp-idf/en/latest/esp32/api-reference/system/ota.html> <https://randomnerdtutorials.com/esp32-over-the-air-ota-programming/>

“I was asked recently to make an old traffic light flash”



NeoPixel clock using ESP8266, designed as a warning device

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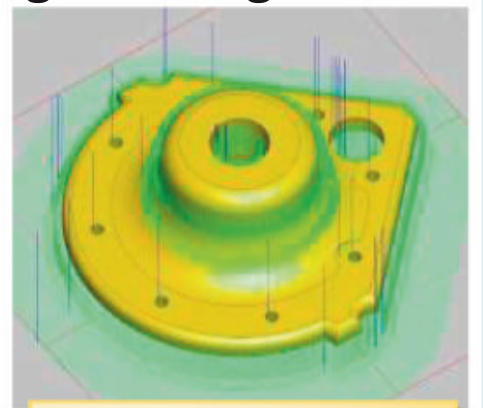
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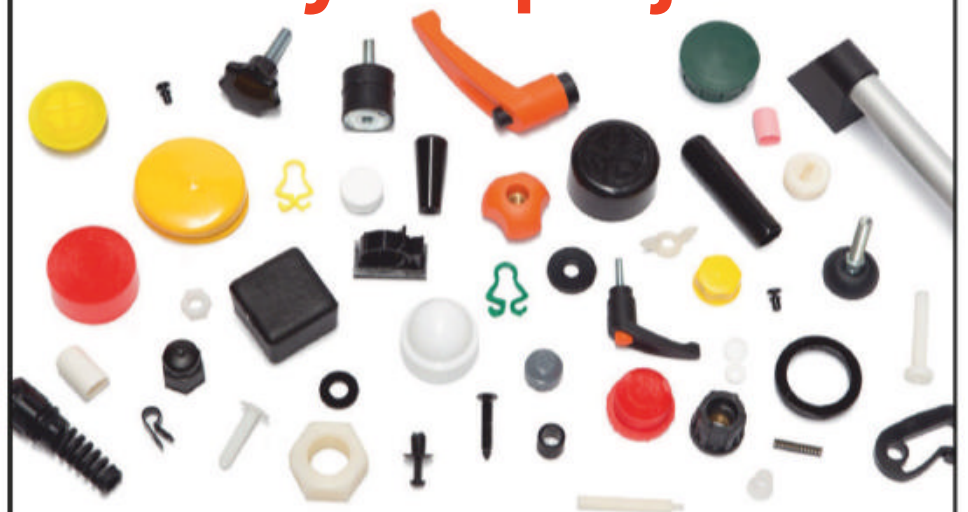
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REV THERAPY

Jody Hooker lives his life at full throttle, scraping through some tight bends yet showing no sign of slowing down

*By Jason Burgess
Photographs: Jason Burgess*

Jody Hooker in his
happy place, the
HKR workshop

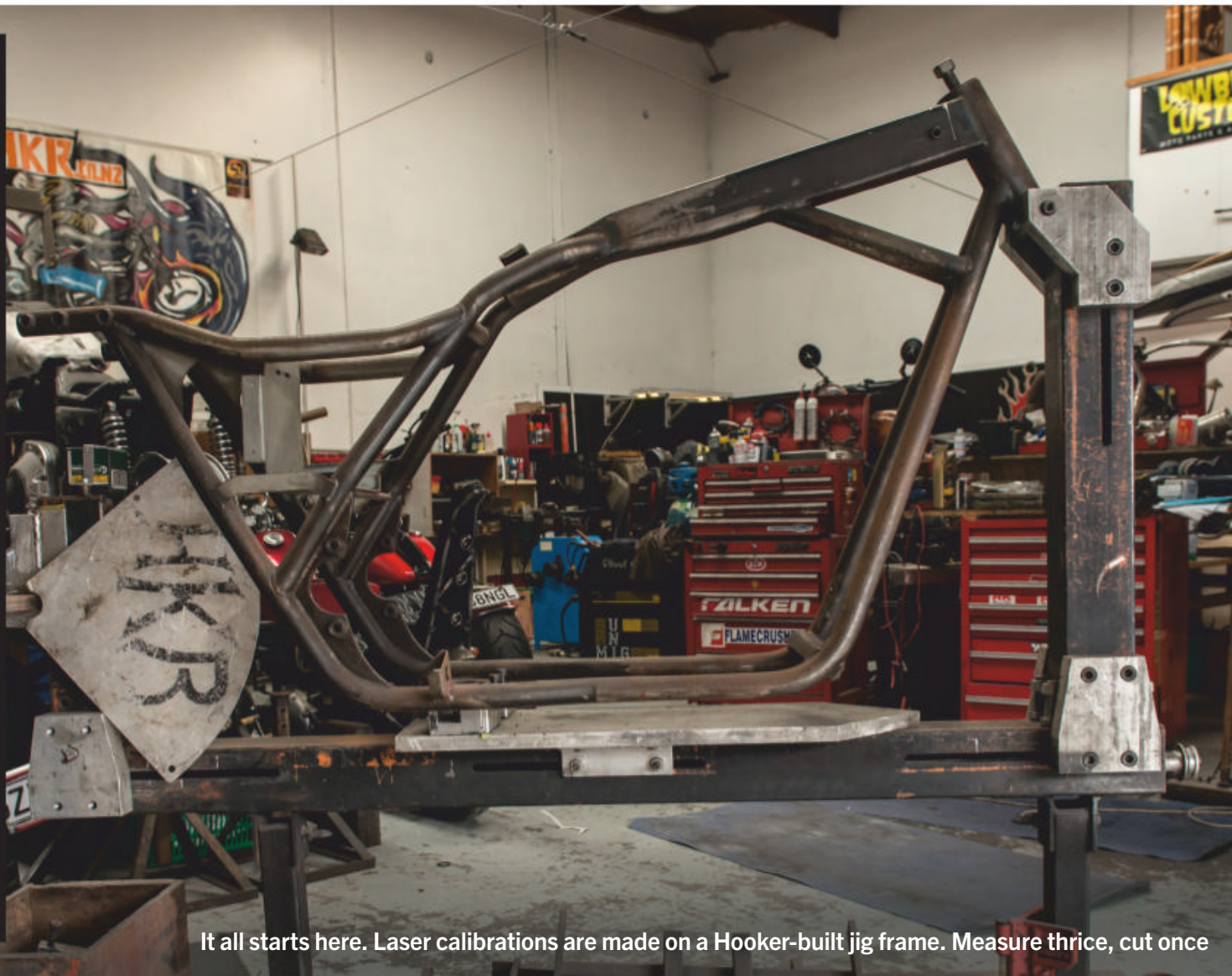




The 'Arley Eater: a
Mad Max-inspired
chopper

Building your own bike?

Jody says: “Go for it. Do your homework. Ask questions and talk to the certification guys about what you want to do. The guidelines are continually changing, and they will tell you what is going on. There are a lot of books on how to build a chopper but they are mostly American. In the US, they don’t have Warrant of Fitness and certifications like we do. We have to jump through a lot of hoops to get bikes legal. But don’t be afraid of that, because the guidelines are there for us to stay safe.”



It all starts here. Laser calibrations are made on a Hooker-built jig frame. Measure thrice, cut once

With a CV that ranges from stuntman and stock car driver to pyrotechnician, Jody Hooker has had more than his fair share of tumbles. Add big-wave surfer, steel worker, rally circuit crewman, creator, and rider of off-the-wall motorcycles to the inventory and you get the picture — this is someone who fully embraces his wild streak.

Surfing, Jody says, was where he learned to conquer his fear: “Out on a big wave, if you hesitate you’re stuffed. You can’t wait for later; you have to do it now.”

A business begins

These days, Jody channels that fearless spirit into custom-building dream rides for bikers who like to express themselves. The first bike he made for himself was cobbled together from whatever he could find in his shed. He hand built the frame and used dumb-bell weights for peg mounts, a knuckleduster for a kick pedal, chains for handlebars, upcycled stock car con rods as levers, and an old piece of leather for the saddle.

“I called it ‘White Trash’. It was a hardtail with a 650 Yamaha motor, barely legal, but I rode it for years,” he says. ►



Some heavy-wall tube for creating bike necks



HKR accessories, anywhere you like



A bullet detail in the hangers of the 'Arley Eater

“I thought I could do it all but I don’t have the time”

Curious bikers would approach with caution, but soon many started enquiring about making modifications to their own machines. Thus began Hookers Kustom Rides (HKR).

Prize-winning bikes

Jody is a welder by trade and splits his work week between a gig at a Penrose paper mill — where he hard faces all the blades — and the multiple bike projects that inhabit his workshop, where he also lives.

Since 2007, he has single-handedly completed more than 30 scratch-built and prize-winning bikes — from flat tube to roadworthy — and modified dozens more. He considers his commissions as collaborations with his customers.

“They come with an idea and I make it reality,” he says. “I don’t draw plans. I kind of freehand it for clients. With custom-built frames, you build the bike to fit the rider.”

Jody handles all the fabricating, rider fitting, safety requirements, and legal processes. He outsources mechanical and paint work, as they both involve distinct tool requirements and extra workspace.

“I thought I could do it all, but I don’t have the time. This way I can support other local businesses that I trust,” he explains.

He acknowledges the support of his partner, Tina, in steering him through the challenges of operating a small business from home.

Inspiration

Jody calls his finished choppers “rideable sculptures” and credits his father with the inspiration: “He was into hot rods, drag racing, and solo speedway. My father passed away at age 32. I was seven years old so I didn’t get a chance to do this with Dad but I know I got my craft from him.” ►



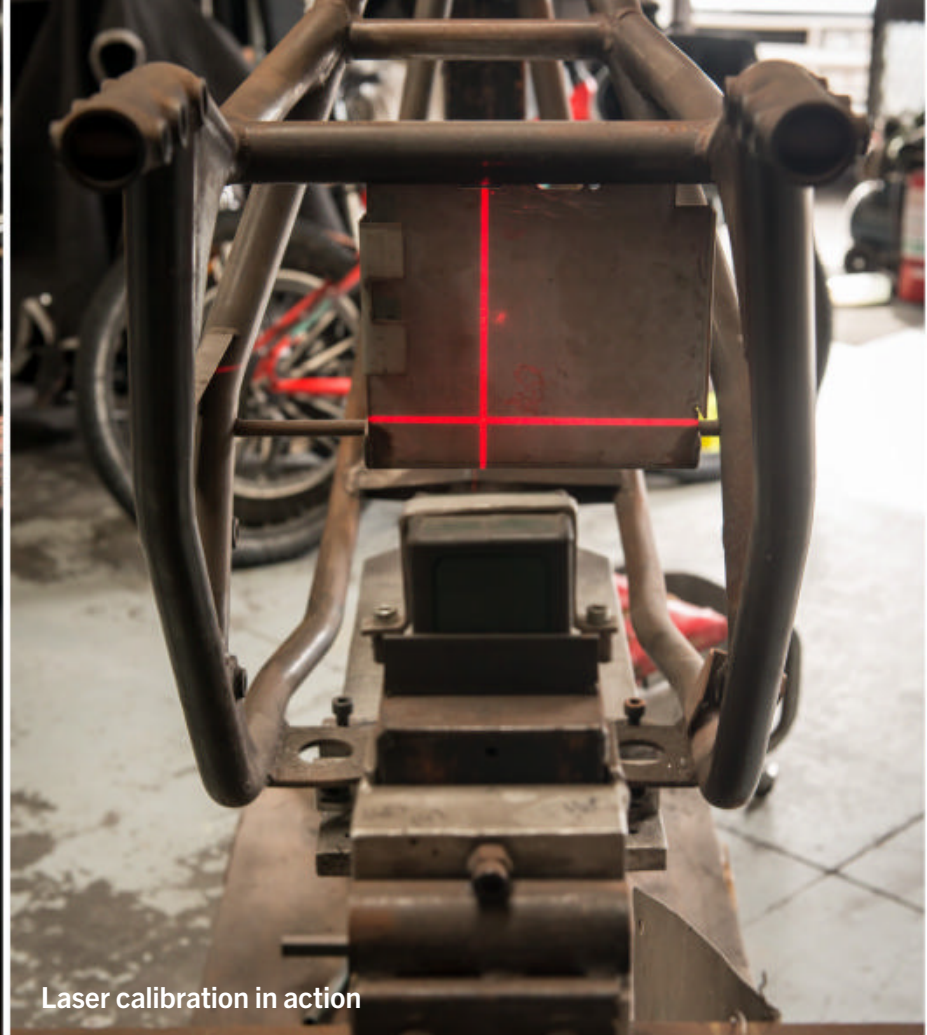
HKR cafe racer with a vintage fire extinguisher repurposed to house the electrics

Jody setting up the 1966
Herbert jobbing lathe





Reworking the pipe route on a 1941 Indian Scout



Laser calibration in action



Size isn't everything



Handmade swivelling pegs built from trampoline springs



A vintage car wheel cover repurposed as a rear-wheel fender



A custom project chopped from a 1960s Ural sidecar with a BSA tank

As a youngster, Jody was exposed to two films that made a lasting impact. At age six he saw *Vanishing Point*, and afterwards thought, *I want to be a stuntman*. Later he watched the original *Mad Max*, which started him on a mission to deconstruct and rebuild all his model cars as *Mad Max* vehicles, ultimately blowing them up in dioramas that he and a mate made together.

“I think that’s where my interest in pyrotechnics came into play!” he says.

One of the choppers that Jody is most fond of today is his current ride, a *Mad Max*-inspired chopper. He used a 900cc Honda CBR Fireblade as his donor bike. This post-apocalyptic beast is a showstopper wherever Jody dismounts. With exception of the engine, rear swing arm, and part of the monorail frame, everything else was hand built and restyled, including the tank and the radiator.

“It looks like I made it out of random parts — ‘a get the hell out of dodge quickly’ bike. It does 120kph in first gear off the lights. I called it ‘Arley Eater’ — take the H off Harley — but I really should have called it ‘Licence Eater’!

Right look, right feel

As off-beat as Jody’s creations might seem, safety is fundamental in all his designs.

“The most important thing is the geometry of the steering,” he says.

“As long as you get that right, you can have any shape of bike you like. If the geometry is out, your bike will handle poorly. My motto is that I build my bikes to ride in the hills. I like to lean over and turn to ride.”

Mostly, Jody works from a donor bike that a customer wants remodelled.

“Bike enthusiasts probably hate me. I’m the guy who will cut anything in half — old or new — if that’s what the customer wants,” he says.

Jody is a fan of old-school chopper aesthetics but can work to order. He hand builds forks, frames, and details to suit any aesthetic. He TIG welds, as he considers that the purest form of welding. One thing he will not compromise on is cheap parts: “I have a lifetime guarantee on my frames. If it’s cracked, bring it back. I haven’t had one come back yet.”

Accessorising can include anything from cut-down vintage car-wheel covers for fenders to old fire extinguishers for housing the battery and electrics.

Jody also favours some tried and true technology. Take a springer front end: “Springers have it over telescopic forks because they are stable; they don’t dive in the corners or bounce around as much. When you give it plenty of front brake ►

“The most important thing is the geometry of the steering. As long as you get that right, you can have any shape of bike you like”



Getting it right

Jody says: “The steering has to be on the nail; you only have 0.04mm leeway in the steering, so start with the front geometry. You can have any length bike with the right steering. You can adjust the steering trail to suit your riding. Learn your trail first.

“Then it’s the brakes. Simply put: you have to be able to stop. Use E-Mark lights; they have to be fitted in designated locations. An exhaust should be less than 100dB.

“If you scratch-build a bike, you have to provide a VIN with a completed place-of-origin sheet. Once you have done that, you can get the certification process started. When you go for a VIN, be sure to get a VIN assign number. That way, you have a year to do any changes to the bike. If you go straight for compliance, you will only have 20 days.”

going into a corner, telescopic forks will sink; that changes the geometry of your steering. Springers and leaf-spring front ends are great pieces of engineering that have been around for a very long time.”

Jody is wary of the current oversized, fat back-tyre craze. “They are designed for California highways, where they have 50-cent corners. Here we have 10-cent corners,” he says.

From there to here

Early in his career, Jody designed and built roll-cage chassis for WRX Imprezas

on the international rally scene. For two years he travelled the Asia-Pacific Rally Championship circuit as support crew for the Tein team. He rates dining with champions such as the late Colin McRae, Finnish driver Tommi Mäkinen, and Spanish racer Carlos Sainz as career high points.

Creating a roll cage means first building it as a balsa-wood model, then twisting a pen between the chassis rails to see what kind of torsional rigidity or flex is in the cage and where to stiffen it when fabricating. On the circuit,

A restoration in progress: 1941 Indian Scout hydro-dipped to look rusty



Jody's team boss, Yoshio Fujimoto, was also a co-driver, mentoring younger Japanese drivers.

"In Indonesia, they went off the corner at 140kph, straight into a rubber tree. The boss took the whole impact; the panels were flattened but the cage did its job," Jody says.

Jody, however, was not so lucky when, as passenger in a support vehicle in China, he took the brunt of a head-on with a coal truck, cutting short his rally experience.

Street stock cars

From the early '90s, Jody started building and driving street stock cars at Waikaraka Park. Street stocks use standard cars, so they are a great place for developing safety features.

"I built some pretty tough cages and cars that could last me a few seasons. I designed them with bend points so they could flex on impact. My front bumpers were made to bend into a smiley face at the end of a night. It was a sign that I had had a good night!" he says.

Later in the decade he began designing and driving stunt cars for Stunt Corp, his own hand-picked team of daredevils who produced no-holds-barred live shows. They were renowned at the Kumeu Classic Car and Hot Rod Festival and Smashfest at Waikaraka Park for their prodigiously large arsenal of pyrotechnics.

Says Jody, "Each show involved five months of preparation — sourcing the cars, stripping and setting them up for stunt work, getting permits for the pyrotechnics, and making the charges for the fireballs."

Jody has recently revisited his childhood dream of racing cars. He bought a dirt track saloon racer during lockdown, and it is currently getting some Hooker modifications, including a rebuilt 350-cubic-inch Chev engine. He hopes to be up and racing for the season opener in October at Waikaraka Park.

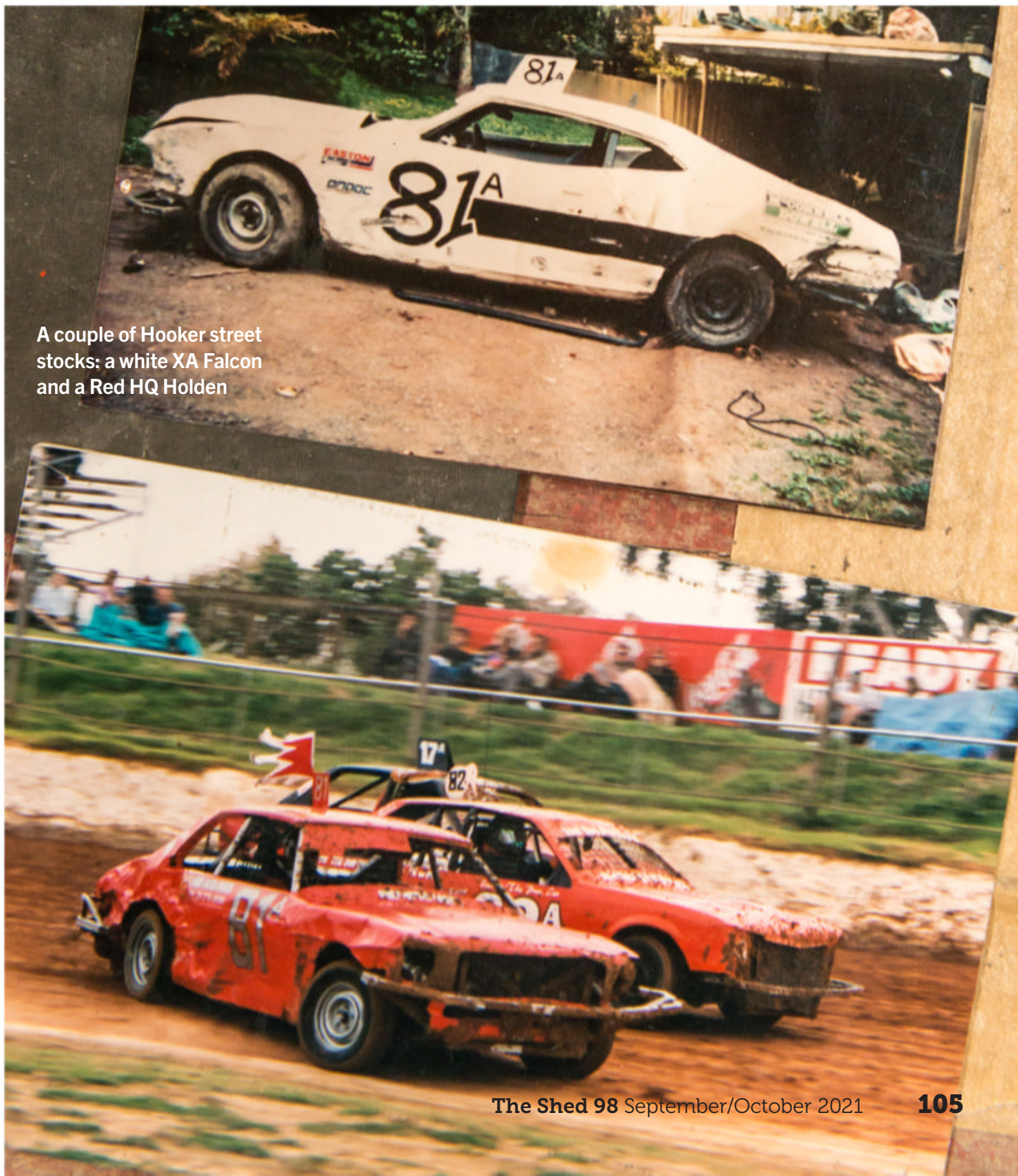
Back in the day Jody earned the nickname 'The Stirrer', but he admits that he is now on a learning curve: "I can't knock guys around any more; this is more gentleman's racing — with a touch of aggression." ►

A Hooker-built WRX roll cage



"I can't knock guys around any more;
this is more gentleman's racing —
with a touch of aggression"

A couple of Hooker street stocks: a white XA Falcon and a Red HQ Holden



Life and limb

“In my group of mates,” Jody recalls, “I was always the guy to go over the ledge first. The rule of thumb was: if he made it we can all make it.”

That derring-do came at a considerable cost. At 52, Jody has had 57 major operations.

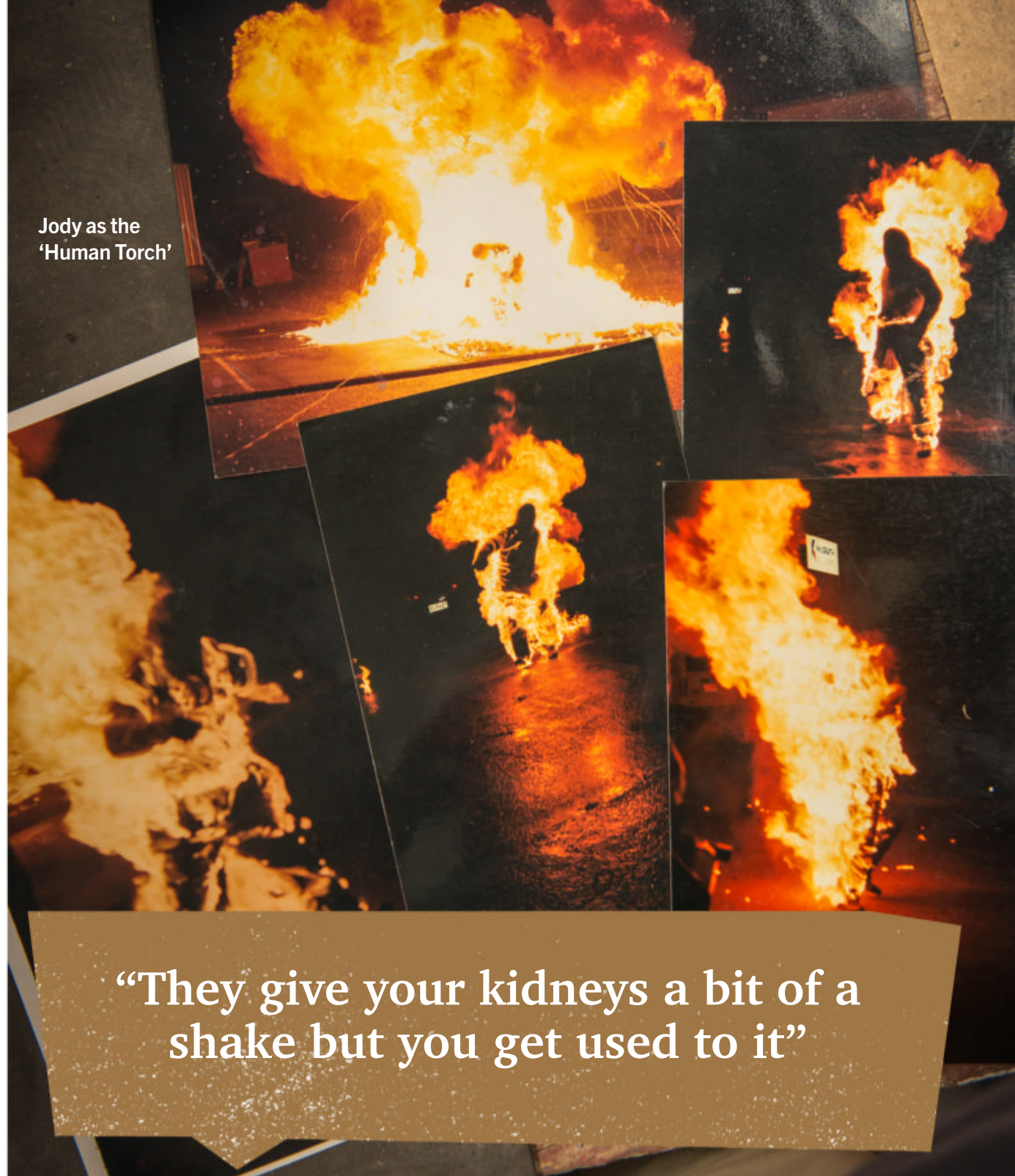
For a bloke who loves working with steel, it is ironic to think that he himself has been surgically rebuilt with the use of steel bolts, pins, and plates. He once nearly suffocated while walking through an explosion, but credits the video that went viral afterwards with getting him noticed in stunt circles. His life took an unexpected turn when he suffered life-threatening burns doing “a simple throwaway stunt” — driving through a wall of fire on the set of the Kiwi movie *The Devil Dared Me To* in 2006.

HKR begins

That year, just before *The Devil Dared Me To* went into production, Jody had begun work on his White Trash bike. He shelved that when the film went into development, as he was contracted to design and build all the props, stunt vehicles, and ‘rocket cars’ for it. After the accident, he spent eight months in hospital undergoing multiple operations and skin grafts. Doctors told him he would never regain full use of his arm, but through sheer persistence he has. He finished White Trash with the use of one arm.

“My desire to get back to the bikes was a desire to get back to some sort of reality,” he says.

Jody reckons it is fitness and his mindset that sees him through. Positivity, he says, is the key and that is why he started building choppers in his shed. “This is my place of positivity and creativity.”



Jody as the
'Human Torch'

“They give your kidneys a bit of a shake but you get used to it”

When it comes to getting out onto the road, Jody’s passion is for hardtails.

He reckons, “They give your kidneys a bit of a shake but you get used to it.”

Jody prefers a low-slung back-end design, because the lower weight to centre of gravity ratio helps the bike handle better, and chooses the long way over motorways.

“With the wind in my face and just the sound of the engine, leaning into the turns and feeling the road, that’s freedom. ‘Rev’ therapy!” he says. 🏠

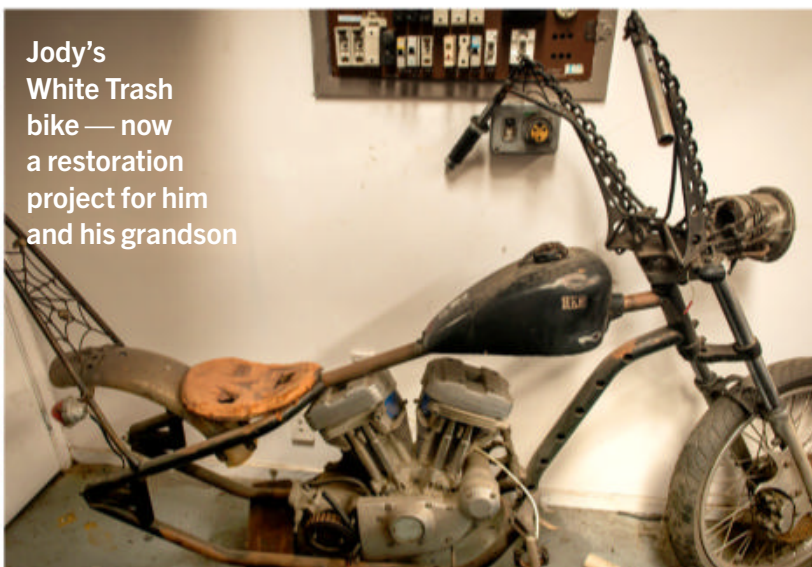
Weld testing

“Any welds to do with braking, steering, and peg mounts have to have a weld test,” says Jody. “Tack them into the position you want, find a competent welder, and get them welded properly. One pinhole, one crack, and that weld is a failure. My advice is get someone who TIG welds. Without the weld or noise tests, your bike is dead in the water.

“Same if you have no proof of ownership. If you import bikes from overseas without the correct paperwork, that bike becomes nothing but an ornament. In that case, I say we can use it as a scratch-build bike — take all the running gear but build another frame.”



The grinder is a mainstay in the HKR workshop



Jody's
White Trash
bike — now
a restoration
project for him
and his grandson

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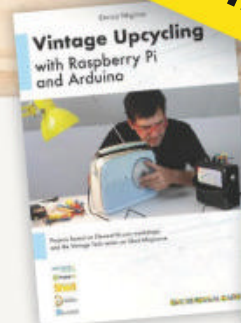
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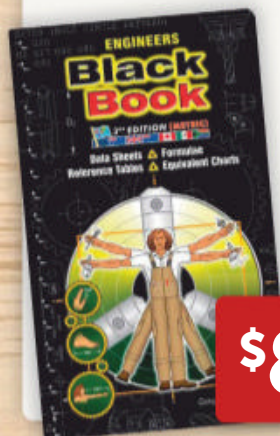
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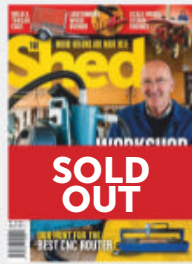
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FOSSILISED DRIVING

Can New Zealand blaze the trail again?

By Jude Woodside

I've been thinking of upgrading my ride. Actually, it's more like adding to the fleet. I currently drive a two-door flat-deck diesel ute. I need it; I move a lot of material and, with a lifestyle block, I am often moving large quantities of timber, gravel, rocks, lime, fertiliser, etc.

In fact, I want to upgrade the ute and add a tipper deck. However, I also want a smallish runabout to do all the day-to-day running around that doesn't require a lot of carrying. I like diesel — it's efficient, less polluting, and more economical, although the RUC tends to even out the savings.

The issues

Naturally, I have considered electric vehicles (EVs) — specifically, a plug-in hybrid electric vehicle (PHEV). I can charge the car at home from my solar array and it should be able to allow me to run into town and back on one charge, as long as I drive at 50kph. Two things have changed my outlook on that.

The first is the major weakness of all EVs: their battery. Most of them are designed to last for either 10 years or 150,000km and naturally the only affordable second-hand models are around eight years old. They will soon need the battery reconditioned or replaced, and replacement is around \$20K. You can recondition one for less but it's still an additional cost. The other drawback is the government rebate. Naturally, dealers took it as a green light to raise their prices by the same amount.

So, I have had to put off my plans to be green. It's just not affordable. The models I want all cost more than a nearly new petrol or diesel vehicle and they are up to five years old. I can get a diesel vehicle for half the price. Admittedly, the running costs are higher but you will have to pay RUC for your EV in 2024, and by then it would need a new battery.

EVs are not the answer

I think our dear leaders have grasped the wrong end of the stick. Our future will not be secured through electric cars. EVs, for all their virtues, have one major flaw: their reliance on battery technology. Batteries simply don't last forever and, even though they are getting better, they still have a life of around 10–15 years and there is not yet the technology to recycle them safely and reliably.

Many EV pioneers are now concentrating on hydrogen-powered vehicles. Hydrogen makes sense in many ways. It can be used either as a gas fuel or as a fuel cell generating electricity.

Naturally,
I have
considered
EVs

Its only by-product is water vapour. There is an existing distribution system that could be converted to hydrogen. We could produce vast quantities using renewable energy. Plus, there is the very real prospect of upgrading the existing fleet to run on hydrogen rather than simply dumping millions of perfectly serviceable vehicles. New Zealand, of all countries, should know about running cars on gas; we were a world leader in doing so.

We can do this

Hydrogen has its issues: although a great fuel, it needs to be transported, often in a compressed format, and

that is intrinsically dangerous. But there is feverish research going on worldwide to solve the problems. Liquid organic hydrogen carriers (LOHCs) could be the answer to the problem of hydrogen storage. This is a method of storing hydrogen in a liquid at ambient temperatures in such a way that the gas can be retrieved safely and you could effectively fill up at a pump just as we now do with petrol.

We have the ability to produce vast quantities of hydrogen cheaply, and oxygen as a by-product. We could be world leaders in the field, especially while our cousins across the ditch have their heads up a coal mine. We do need an alternative to fossil fuel, and soon. Both my wallet and the planet depend on it. 📄



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